Alabbar School of Management

Program: Bachelor of Commerce (Hons.)

2023-24

Programme Educational Objective (PEO)Programme Outcomes (POs) Programme Specific Outcomes (PSOs) Course Outcomes (COs)

RAFFLES UNIVERSITY

RAFFLES UNIVERSITY, NEEMRANA, ALWAR, RAJASTHAN

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BACHELOR OF COMMERCE (B.COM)- 4 Years

1. Vision

To educate and inspire capable and competent leaders with a futuristic business acumen & entrepreneurial spirit.

2. Mission

To equip the students of school of commerce & management with the ability to explore, examine, think critically and develop professional skills to become responsible global leaders who can contribute meaningfully to the industry and society through excellence in learning and practice-oriented research.

3. Program Educational Objectives

PEO1: To apply business principles and concepts to solve real-world problems and make informed decisions across various business domains.

PEO2: To evaluate and critique business practices and ethical considerations, demonstrating responsible leadership and effective communication.

PEO3: To create innovative solutions and strategies by adapting to global business trends and engaging in continuous professional development.

4. Programme Outcomes (POs)

After completing the program students will be able to

PO1: To remember the conceptual knowledge with an integrated approach to various functions of management.

PO2: To develop leadership and communication skills to become successful business leaders and managers.

PO3: To encourage and develop critical thinking, analysis and initiative ability skills.

PO4: To develop problem-solving skills through experiential learning and innovative pedagogy to ensure utilization of knowledge in professional careers.

PO5: To apply the various concepts, theories and models in the area of HR, Marketing, Finance.

PO6: To develop a positive attitude and life skills to become a multi facet personality with a sense of environmental consciousness and ethical values.

5. Programme Specific Outcomes (PSOs):

After completing the program students will be able to:

PSO1: Acquire Practical learning through summer internship, industrial visit and Business Plan etc.

PSO2: Demonstrate analytical and problem-solving skills through core elective area of specialization in Finance, Human Recourse, and Marketing to solve the business issues.

PSO3: Understand and develop the new dimensions of knowledge through open electives to cater the need of the industry.

Semester I								
SN	**Paper Code**	**Course**		**Credits**				
		Type	**Title**					
					L	**T**	**P**	**Marks**
1	COM- 101	AECC	English Language-I	2	1	1	0	50
2	COM-102	SEC	MS Office-I	3	1	0	2	100
3	COM-103	Core	Principles of Management	3	2	1	0	100
4	COM-104	Core	Business Organization and Environment	3	2	1	0	100
5	COM-105	Core	Financial Accounting	3	2	1	0	100
6	COM-106	Core	Business Statistics	3	2	1	0	100
7	COM-107	GE	Fundamentals of Computer and IT	3	2	0	1	100
8	COM-108	VAC	Human Values	2	2	0	0	50
Total				**22**				**700**

L-Lecture, T-Tutorial, P-Practical

COURSE OUTCOMES (COs):

Course	Course outcomes: - After completion of these courses' students should beable to
Semester – I	
English Language -1	**CO1:** Define communication concepts, explain its process, functions, and importance, and identify essential elements for effective communication. **CO2:** Convert direct speech into reported speech accurately and use it appropriately in various contexts. **CO3:** Demonstrate effective oral communication techniques, participate in different forms of verbal interactions, and apply principles of active listening. **CO4:** Draft various business letters, reports, and professional documents with clarity and precision, adhering to standard formats. **CO5:** Identify and correct grammatical errors in writing, focusing on key areas like tenses, modals, and subject-verb agreement.
MS Office-I	**CO1:** Communicate effectively in English, both verbally and in writing, within a business context. **CO2:** Write clear, concise, and professional business documents, including emails, letters, and reports. **CO3:** Demonstrate knowledge of key business vocabulary and terminology. **CO4:** Deliver informative and persuasive presentations using appropriate visual aids and non-verbal communication techniques. **CO5:** Understand and analyse business-related texts, including reports, articles, and proposals.
Principles of Management	**CO1:** Understand the basic concept of management, different thoughts. Nature and purpose of management **CO2:** Evaluate the global context for taking managerial actions of planning and Decision Making. **CO3:** Specify how the managerial tasks of organizing, and directing can be executed in a variety of circumstances. **CO4:** Understand the concept of controlling and coordination for the purpose of smooth functioning of work. **CO5:** Analysis of different management issues and workplace ethics and social responsibilities

Business Organization and Environment	**CO1:** Explain the foundations of individual behavior by analyzing personality, learning, attitudes, values, and perception. **CO2:** Apply various motivation and leadership theories to enhance individual and organizational performance. **CO3:** Analyze group dynamics and team effectiveness, and apply conflict management strategies in organizational settings. **CO4:** Evaluate organizational structures and cultures, and their impact on employee behavior and organizational performance. **CO5:** Identify and implement strategies to manage organizational change and stress effectively, addressing resistance and promoting positive outcomes.
Functional Accounting	**CO1:** Understand and apply fundamental accounting principles, including the preparation of financial statements for sole proprietorships and non-profit organizations. **CO2:** Analyze and apply methods of depreciation and inventory valuation, adhering to relevant accounting standards. **CO3:** Explain and perform accounting for special transactions, including hire purchase, leases, branches, and departmental accounts. **CO4:** Understand and apply accounting procedures for partnership firms, including admission, retirement, and dissolution of partnerships. **CO5:** Utilize computerized accounting systems to create and manage accounting records, generate reports, and perform financial analysis.
Business Statistics	**CO1:** Identify and recall fundamental statistical concepts, terminology, and formulas. **CO2:** Explain the importance of statistical methods in business decision-making and describe various measures of central tendency, dispersion, correlation, and regression. **CO3:** Compute measures of central tendency, dispersion, correlation coefficients, regression lines, and probabilities for given data sets. **CO4:** Interpret the results of statistical analyses, including index numbers and time series data, to make informed business decisions. **CO5:** Assess the appropriateness of different statistical techniques for various types of data and business problems.
Fundamentals of Computer and IT	**CO1:** Explain the concept and functionality of computer input and output devices. **CO2**: Demonstrate working knowledge of paragraph formatting, macros, and mail merge in MS Word. **CO3:** Apply practical skills in using MS Excel for data management and analysis. **CO4:** Utilize MS PowerPoint for creating and formatting presentations. **CO5:** Describe the evolution of the internet and its basic services and applications.

Human Values	**CO1:** Understand and apply ethical principles and values in a business context. **CO2:** Demonstrate ethical decision-making skills and critical thinking in business scenarios. **CO3:** Analyse the impact of human values on individual and organizational behavior. **CO4:** Develop personal and professional values for ethical leadership. **CO5:** Effectively address ethical dilemmas and challenges in business settings.

Mapping: Semester – I

COM-101	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	-	2	2	3	3
CO2	3	2	3	3	3	1
CO3	2	3	1	2	-	3
CO4	3	3	3	1	2	2
CO5	-	1	-	2	3	1

COM-102	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	2	2
CO2	3	3	2	3	3	-
CO3	2	3	2	2	3	2
CO4	3	2	3	3	2	2
CO5	3	3	3	3	2	3

COM-103	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	3	2	2
CO2	2	2	2	-	2	3
CO3	2	2	3	3	3	2
CO4	3	3	1	2	1	2
CO5	3	3	2	3	3	2

COM-104	PO1	PO2	PO3	PO4	PO5	PO6
CO1		2	2		3	
CO2	3	2		3		
CO3	3	3		2		3
CO4	2	3	3		3	
CO5	3	3	3	3		

COM-105	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	1	2		2
CO2	3	2	3	3	2	3
CO3	2		2	2		3
CO4	1	2	2	2	2	2
CO5	3	3	2	3	3	2

COM-106	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	2	-	2	1
CO2	3	3	1	2	1	3
CO3	2	2	3	3	2	3
CO4	2	2	3	2	2	-
CO5	3	3	3	3	3	3

COM-107	PO1	PO2	PO3	PO4	PO5	PO6
CO1		2	2		3	
CO2	3	2		3		
CO3	3	3		2		3
CO4	2	3	3		3	
CO5	3	3	3	3		

COM-108	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	-	2	2	3	3
CO2	3	2	3	3	3	1
CO3	2	3	1	2	-	3
CO4	3	3	3	1	2	2
CO5	-	1	-	2	3	1

Lesson Plan: Semester – I

COM 101 – English Language – I

Unit	Particulars	Class No.	Pedagogy of Class
Unit I	Introduction to course	C1	Lecture
Unit I	Meaning and Definition of Communication	C2	Lecture
Unit I	Process of Communication	C3	Lecture
Unit I	Functions and Objectives of Communication	C4	Lecture
Unit I	Importance and Essentials of Good Communication	C5	Lecture
Unit - I	Communication Barriers	C6	Lecture
Unit - I	Overcoming Communication Barriers	C7	Lecture
Unit - I	Applying Analytical Skills	C8	Activity
Unit - I	Evaluating Conclusions and Inferences	C9	Lecture
Unit - I	Clarification Class I	C10	Clarification Class
Unit - II	Introduction to Reported Speech	C11	Lecture
Unit - II	Usage of Reported Speech	C12	Lecture
Unit - II	How to Report Speech of Second Person	C13	Lecture
Unit - II	Words Used in Reported Speech	C14	Lecture
Unit - II	Problem-Solving Using Reported Speech	C15	Lecture
Unit - II	Spatial Reasoning in Reported Speech	C16	Activity
Unit - II	Hypothesis, Reasons, and Inferences in Reported Speech	C17	Lecture
Unit – II	Clarification Class II	C18	Clarification Class
Unit-III	Meaning, Nature, and Scope of Oral Communication	C19	Lecture
Unit - III	Principles of Effective Oral Communication	C20	Lecture
Unit-III	Techniques of Effective Speech	C21	Lecture

Unit-III	Media of Oral Communication	C22	Lecture
Unit-III	Art of Listening and Principles of Good Listening	C23	Lecture
Unit-III	Jam Sessions, Debates	C24	Activity
Unit-III	Role Plays and Self-Critic Exercises	C25	Activity
Unit-III	Newspaper Reading/Comprehension Exercises	C26	Classroom Assignment
Unit III	Clarification Class III	C27	Clarification Class
Unit IV	Need and Functions of Business Letters	C28	Lecture
Unit IV	Planning and Layout of Business Letters	C29	Lecture
Unit IV	Kinds of Business Letters	C30	Lecture
Unit IV	Drafting of Business Letters	C31	Activity
Unit IV	Enquiries, Replies, and Orders	C32	Classroom Assignment
Unit-IV	Complaints, Follow-ups, and Sales Letters	C33	Classroom Assignment
Unit-IV	Circular Letters, Applications for Employment	C34	Classroom Assignment
Unit-IV	Report Writing	C35	Lecture
Unit-IV	Notices, Agenda, and Minutes of Meetings	C36	Lecture
Unit-IV	Clarification Class IV	C37	Clarification Class
Unit - V	Aids to Correct Writing	C38	Lecture
Unit - V	Tenses and Modals	C39	Lecture
Unit - V	Subject-Verb Agreement	C40	Lecture
Unit-V	Common Errors in Writing	C41	Lecture
Unit - V	Resume Writing	C42	Classroom Assignment
Unit - V	Clarification Class V	C43	Clarification Class
Unit - V	Final Review and Practice	C44	Classroom Assignment
Unit - V	Exam Preparation and Doubt Clearing	C45	Clarification Class

Unit-V	Mock Test/Quiz	C46	Quiz
Unit - V	Evaluation and Feedback	C47	Lecture
Unit - V	Revision and Wrap-up	C48	Lecture
Unit - V	Group Discussion on Writing Techniques	C49	Group Discussion
Unit - V	Final Exam	C50	Assessment

COM 102 – MS Office - I

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Overview of MS Office applications and their business relevance	C1	Lecture
Unit 1	Exploring the MS Office interface and basic features	C2	Lecture
Unit 1	File management techniques and best practices	C3	Lecture
Unit 1	Customizing the MS Office environment to suit individual preferences	C4	Lecture
Unit 1	Hands-on Practice: Exploring MS Office environment	C5	Practical Class
Unit 1	Overview and practical applications in business	C6	Lecture
Unit 1	Practical Class: File management techniques	C7	Practical Class
Unit 1	Advanced customization and settings	C8	Lecture
Unit 1	Review and Q&A session	C9	Clarification Class
Unit 2	Introduction to MS Word features and interface	C10	Lecture
Unit 2	Creating, formatting, and editing documents	C11	Lecture
Unit 2	Working with text formatting, styles, and themes	C12	Lecture
Unit 2	Inserting and formatting tables, images, and other graphical elements	C13	Lecture
Unit 2	Collaborative editing and reviewing features	C14	Lecture
Unit 2	Creating mail merge documents and envelopes	C15	Lecture
Unit 2	Hands-on Practice: Document creation and formatting	C16	Practical Class

Unit 2	Practical Class: Mail merge and collaborative features	C17	Practical Class
Unit 2	Advanced features and templates in MS Word	C18	Lecture
Unit 2	Review and Q&A session	C19	Clarification Class
Unit 3	Introduction to spreadsheets and data organization	C20	Lecture
Unit 3	Formulas and functions for data analysis and calculations	C21	Lecture
Unit 3	Formatting and conditional formatting of cells and ranges	C22	Lecture
Unit 3	Creating charts and graphs for data visualization	C23	Lecture
Unit 3	Data sorting, filtering, and basic data analysis techniques	C24	Lecture
Unit 3	Hands-on Practice: Data entry, formulas, and formatting	C25	Practical Class
Unit 3	Practical Class: Advanced charting and data analysis	C26	Practical Class
Unit 3	Advanced functions and data manipulation	C27	Lecture
Unit 3	Review and Q&A session	C28	Clarification Class
Unit 4	Designing effective and visually appealing presentations	C29	Lecture
Unit 4	Creating and formatting slides, text boxes, and objects	C30	Lecture
Unit 4	Inserting and formatting images, videos, and audio elements	C31	Lecture
Unit 4	Utilizing slide transitions and animation effects	C32	Lecture
Unit 4	Delivering presentations with confidence and professionalism	C33	Lecture
Unit 4	Hands-on Practice: Creating and delivering a presentation	C34	Practical Class
Unit 4	Practical Class: Advanced slide design and multimedia elements	C35	Practical Class
Unit 4	Review and Q&A session	C36	Clarification Class
Unit 5	Advanced data analysis and visualization techniques in MS Excel	C37	Lecture
Unit 5	Creating and managing databases in MS Access	C38	Lecture
Unit 5	Automation and time-saving techniques using macros	C39	Lecture
Unit 5	Integration and data sharing between MS Office applications	C40	Lecture

Unit 5	Troubleshooting common issues and optimizing performance	C41	Lecture
Unit 5	Hands-on Practice: Advanced Excel techniques and database management	C42	Practical Class
Unit 5	Practical Class: Macro creation and automation	C43	Practical Class
Unit 5	Review and Q&A session	C44	Clarification Class
Unit 5	Final Review and Practice	C45	Classroom Assignment
Unit 5	Exam Preparation and Doubt Clearing	C46	Clarification Class
Unit 5	Mock Test/Quiz	C47	Quiz
Unit 5	Evaluation and Feedback	C48	Lecture
Unit 5	Revision and Wrap-up	C49	Lecture
Unit 5	Group Discussion on MS Office Features and Techniques	C50	Group Discussion

COM 103- Principles of Management

Unit	Particulars	Class No.	Pedagogy of Class
Unit I	Introduction to Management	C1	Lecture
Unit I	Nature of Management: Meaning and Definition	C2	Lecture
Unit I	Purpose, Importance, and Functions of Management	C3	Lecture
Unit I	Evolution of Management Thoughts: F.W. Taylor	C4	Lecture
Unit I	Henri Fayol's Contribution	C5	Lecture
Unit I	Elton Mayo's Contribution	C6	Lecture
Unit I	Chester Barnard's Contribution	C7	Lecture
Unit I	Peter Drucker's Contribution	C8	Lecture
Unit I	Various Management Approaches	C9	Lecture
Unit I	Indian Management Thought	C10	Lecture
Unit I	Clarification and Review	C11	Clarification Class
Unit II	Planning: Introduction, Need, and Importance	C12	Lecture
Unit II	Types and Levels of Planning	C13	Lecture
Unit II	Advantages and Limitations of Planning	C14	Lecture
Unit	Forecasting: Need and Techniques	C15	Lecture

II			
Unit II	Decision Making: Types	C16	Lecture
Unit II	Decision Making Process	C17	Lecture
Unit II	Decision Making Techniques	C18	Lecture
Unit II	Case Study on Decision Making	C19	Case Study
Unit II	Clarification and Review	C20	Clarification Class
Unit III	Organizing: Elements and Processes	C21	Lecture
Unit III	Types of Organizations	C22	Lecture
Unit III	Delegation of Authority: Need & Challenges	C23	Lecture
Unit III	Decentralization: Concepts	C24	Lecture
Unit III	Directing: Introduction, Principles & Elements	C25	Lecture
Unit III	Supervision: Traditional vs. Development Supervision	C26	Lecture
Unit III	Role Play on Supervision	C27	Role Play
Unit III	Clarification and Review	C28	Clarification Class
Unit IV	Controlling: Concept and Importance	C29	Lecture
Unit IV	Controlling Process & Types	C30	Lecture
Unit IV	Contemporary Control Issues	C31	Lecture
Unit IV	Operations Management	C32	Lecture
Unit IV	Service and Manufacturing Firms	C33	Lecture
Unit IV	Project Management Tools & Techniques	C34	Lecture
Unit IV	Coordination: Introduction	C35	Lecture
Unit IV	Coordination Objectives & Techniques	C36	Lecture
Unit IV	Group Activity on Coordination	C37	Group Activity
Unit IV	Clarification and Review	C38	Clarification Class
Unit	Management in International Area	C39	Lecture

V			
Unit V	Change and Organizational Development	C40	Lecture
Unit V	Ethics in Management	C41	Lecture
Unit V	Corporate Governance	C42	Lecture
Unit V	Social Responsibilities	C43	Lecture
Unit V	Discussion on Corporate Governance	C44	Group Discussion
Unit V	Case Study on Social Responsibilities	C45	Case Study
Unit V	Clarification and Review	C46	Clarification Class
	Contemporary Management Issues	C47	Lecture
	Key Concept Revision	C48	Lecture
	Mock Test/Quiz	C49	Quiz
	Doubt Clearing Session	C50	Clarification Class
	Final Review	C51	Lecture
	Management Challenges Activity	C52	Group Activity
	Final Exam Preparation	C53	Assignment
	Feedback and Discussion	C55	Lecture
	Wrap-up Session	C56	Lecture
	Extra Class: Management Simulation	C57	Simulation
	Extra Class: Issues Discussion	C58	Discussion
	Industry Guest Lecture	C59	Guest Lecture
	Industry Case Study Presentation	C60	Case Study
	Final Review	C61	Lecture

COM 104 – Business Organization and Environment

Unit	Particulars	Class No.	Pedagogy of Class
Unit I	Introduction and Conceptual Framework of OB	C1	Lecture
Unit I	Nature & Scope of Organizational Behavior	C2	Lecture
Unit I	The Organization and the Individual	C3	Lecture
Unit I	Personality: Determinants and Attributes	C4	Lecture
Unit I	Big Five Personality Model	C5	Lecture
Unit I	Major Personality Attributes: Locus of Control, Machiavellianism	C6	Lecture
Unit I	Self Esteem, Self Monitoring, Type A & B	C7	Lecture

	Personality, Risk Taking		
Unit I	Learning and Learning Theories: Concept, Law of Effect	C8	Lecture
Unit I	Classical Conditioning, Operant Conditioning	C9	Lecture
Unit I	Social Learning Theory and Reinforcement Theory	C10	Lecture
Unit I	OB Modification Process and its Advantages	C11	Lecture
Unit I	Attitudes: Concept, Components	C12	Lecture
Unit I	Job-Related Attitudes, Job Satisfaction & Impact on OB	C13	Lecture
Unit I	Values: Concept, Types of Values	C14	Lecture
Unit I	Robbin's Dominant Work Values, Hofstede's Values Across Cultures	C15	Lecture
Unit I	Javidan & House's G.L.O.B.E. Findings	C16	Lecture
Unit I	Perception: Definition, Factors Affecting Perception	C17	Lecture
Unit I	Perceptual Selectivity	C18	Lecture
Unit II	Motivation: Definition, Concept, and Types of Motives	C19	Lecture
Unit II	Maslow's Hierarchy of Needs Theory	C20	Lecture
Unit II	Herzberg's Two Factor Theory	C21	Lecture
Unit II	ERG Theory, Vroom's Expectancy Theory	C22	Lecture
Unit II	Equity Theory, Reinforcement Theory, Behavior Modification	C23	Lecture
Unit II	Leadership: Nature and Significance	C24	Lecture
Unit II	Trait Theory of Leadership	C25	Lecture
Unit II	Behavioral Theories of Leadership: Ohio & Michigan Studies	C26	Lecture
Unit II	Managerial Grid	C27	Lecture
Unit II	Contingency Theories: Fiedler's Model	C28	Lecture
Unit II	Hersey and Blanchard's Situational Theory	C29	Lecture
Unit II	Leader-Member Exchange Theory	C30	Lecture
Unit II	Path Goal Theory and Charismatic Leadership	C31	Lecture
Unit III	Group: Definition and Classification	C32	Lecture
Unit	Stages of Group Development	C33	Lecture

III			
Unit III	Group Structure and Processes	C34	Lecture
Unit III	Strengths and Weaknesses of Groups vs. Individuals	C35	Lecture
Unit III	Team: Concept and Team Effectiveness	C36	Lecture
Unit III	Group vs. Team, Types of Teams	C37	Lecture
Unit III	How to Convert an Individual into a Team Player	C38	Lecture
Unit III	Conflict: Transitions in Conflict Thought	C39	Lecture
Unit III	Functional vs. Dysfunctional Conflict, Conflict Process	C40	Lecture
Unit III	Conflict Management: Techniques and Negotiation Process	C41	Lecture
Unit III	Bargaining Strategies and Global Implications	C42	Lecture
Unit IV	Organization Structure: Definition and Elements	C43	Lecture
Unit IV	Common Organization Designs: Simple, Bureaucratic, Matrix	C44	Lecture
Unit IV	New Design Options: Team, Virtual, Boundaryless Structures	C45	Lecture
Unit IV	Factors Affecting Choice of Organization Designs	C46	Lecture
Unit IV	Organization Culture: Meaning, Creating, and Sustaining Culture	C47	Lecture
Unit IV	Countries and Culture, Employee Acculturation Process	C48	Lecture
Unit IV	Organizational Climate: Concept & Building a Positive Climate	C49	Lecture
Unit V	Organizational Change: Concept and Forms of Change	C50	Lecture
Unit V	Sources of Resistance to Change and Dealing with Resistance	C51	Lecture
Unit V	Lewin's Change Model and Nadler's Organizational Model	C52	Lecture
Unit V	Action Research: Steps and Change Agents	C53	Lecture
Unit V	Stress Management: Work Stress and Types of Stress	C54	Lecture
Unit V	Causes of Stress: Extra-Organizational, Organizational, Group, Individual	C55	Lecture
Unit V	Strategies to Cope with Stress: Individual and Organizational	C56	Lecture
Unit	Clarification and Review	C57	Clarification Class

V			
	Mock Test/Quiz	C58	Quiz
	Final Review and Preparation	C59	Classroom Assignment
	Discussion of Exam Results and Feedback	C60	Lecture
	Course Wrap-up and Takeaways	C61	Lecture
	Extra Class I: Organizational Behavior Case Study	C62	Case Study
	Extra Class II: Guest Lecture on OB	C63	Guest Lecture
	Extra Class III: Group Activity on Team Dynamics	C64	Group Activity

COM 105 – Functional Accounting

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction to Accounting Principles, Concepts, and Conventions	C1	Lecture
Unit 1	Introduction to Accounting Standards and Indian Accounting Standards (AS & Ind AS)	C2	Lecture
Unit 1	Accounting Process: Journal, Ledger, and Trial Balance	C3	Lecture
Unit 1	Overview of Financial Statements	C4	Lecture
Unit 1	Capital, Revenue, and Deferred Revenue Expenditure	C5	Lecture
Unit 1	Preparation of Financial Statements for Sole Proprietorship: Basic Structure	C6	Lecture
Unit 1	Preparation of Financial Statements with Additional Information	C7	Practical Exercise
Unit 1	Preparation of Financial Statements for Not-for-Profit Organizations	C8	Lecture
Unit 1	Practical Exercise: Financial Statements for Not-for-Profit Organizations	C9	Practical Exercise
Unit 1	Clarification Class I	C10	Clarification Class
Unit 2	Introduction to Depreciation, Depletion, and Amortization	C11	Lecture
Unit 2	Objectives and Methods of Depreciation: Straight Line and Diminishing Balance	C12	Lecture
Unit 2	Change of Method of Depreciation	C13	Lecture
Unit 2	Practical Exercise: Depreciation Accounting	C14	Practical Exercise
Unit 2	Inventory Valuation: Meaning and Significance	C15	Lecture
Unit	Inventory Record Systems: Periodic and	C16	Lecture

2	Perpetual		
Unit 2	Methods of Inventory Valuation: FIFO, LIFO, and Weighted Average	C17	Lecture
Unit 2	Practical Exercise: Inventory Valuation	C18	Practical Exercise
Unit 2	Relevant Accounting Standards for Depreciation and Inventory Valuation	C19	Lecture
Unit 2	Clarification Class II	C20	Clarification Class
Unit 3	Introduction to Hire Purchase Accounting	C21	Lecture
Unit 3	Calculation of Interest in Hire Purchase	C22	Lecture
Unit 3	Accounting for Partial and Full Repossession	C23	Practical Exercise
Unit 3	Profit Computation: Stock & Debtors System	C24	Lecture
Unit 3	Accounting for Leases: Concepts and Classifications	C25	Lecture
Unit 3	Practical Problems in Lease Accounting	C26	Practical Exercise
Unit 3	Accounting for Dependent Branches: Debtors and Stock & Debtors System	C27	Lecture
Unit 3	Overview of Independent Branches	C28	Lecture
Unit 3	Departmental Accounting: Concepts and Types of Departments	C29	Lecture
Unit 3	Allocation of Departmental Expenses	C30	Lecture
Unit 3	Methods of Departmental Accounting	C31	Lecture
Unit 3	Practical Exercise: Departmental Accounting	C32	Practical Exercise
Unit 3	Clarification Class III	C33	Clarification Class
Unit 4	Fundamentals of Partnership Accounts	C34	Lecture
Unit 4	Admission, Retirement, and Death of a Partner: Overview	C35	Lecture
Unit 4	Accounting for Dissolution of Partnership Firm	C36	Lecture
Unit 4	Insolvency of Partners: Introduction	C37	Lecture
Unit 4	Practical Exercise: Dissolution of Partnership Firm	C38	Practical Exercise
Unit 4	Gradual Realization of Assets and Piecemeal Payment of Liabilities	C39	Lecture

Unit 4	Clarification Class IV	C40	Clarification Class
Unit 5	Introduction to Computerized Accounting System	C41	Lecture
Unit 5	Creating a Company in Accounting Software	C42	Practical Demonstration
Unit 5	Configuring Features and Settings in Accounting Software	C43	Practical Demonstration
Unit 5	Creating Accounting Ledgers and Groups	C44	Practical Demonstration
Unit 5	Creating Stock Items and Groups	C45	Practical Demonstration
Unit 5	Vouchers Entry in Accounting Software	C46	Practical Demonstration
Unit 5	Generating Financial Reports: Cash Book, Ledger Accounts	C47	Practical Demonstration
Unit 5	Generating Financial Reports: Trial Balance, Profit and Loss Account, Balance Sheet	C48	Practical Demonstration
Unit 5	Generating Funds Flow and Cash Flow Statements	C49	Practical Demonstration
Unit 5	Selecting and Shutting a Company	C50	Practical Demonstration
Unit 5	Backup and Restore of Data in Accounting Software	C51	Practical Demonstration
Unit 5	Practical Exercises: Hands-on Practice with Accounting Software	C52	Practical Exercise
Unit 5	Clarification Class V	C53	Clarification Class
Unit 5	Mock Test and Assessment	C54	Assessment
Unit 5	Revision Class	C55	Revision
Unit 5	Final Exam Preparation	C56	Lecture
Unit 5	Final Exam	C57	Assessment
Unit 5	Review of Exam and Feedback	C58	Lecture
Unit 5	Case Study on Computerized Accounting	C59	Case Study
Unit 5	Future Trends in Accounting	C60	Lecture
Unit 5	Doubt Clearing and Open Discussion	C61	Discussion
Unit 5	Final Wrap-Up and Course Summary	C62	Lecture

COM 106 – Business Statistics

Unit	Particulars	Class No.	Pedagogy of Class
Unit I	Introduction to Statistical Data and Descriptive Statistics	C1	Lecture
Unit I	Measures of Central Tendency: Arithmetic Mean	C2	Lecture
Unit I	Measures of Central Tendency: Geometric and Harmonic Mean	C3	Lecture
Unit I	Positional Averages: Mode and Median	C4	Lecture
Unit I	Partition Values: Quartiles, Deciles, Percentiles	C5	Lecture
Unit I	Graphic Determination of Positional Averages	C6	Lecture
Unit I	Measures of Variation: Range and Quartile Deviation	C7	Lecture
Unit I	Measures of Variation: Mean Deviation and Standard Deviation	C8	Lecture
Unit I	Properties of Standard Deviation and Variance	C9	Lecture
Unit I	Moments: Calculation and Significance	C10	Lecture
Unit I	Skewness: Meaning and Measurement	C11	Lecture
Unit I	Skewness: Karl Pearson and Bowley's Measures	C12	Lecture
Unit I	Concept of Kurtosis	C13	Lecture
Unit I	Practical Exercises on Measures of Central Tendency and Variation	C14	Practical Exercise
Unit I	Clarification Class I	C15	Clarification Class
Unit II	Introduction to Correlation Analysis	C16	Lecture
Unit II	Meaning and Types of Correlation	C17	Lecture
Unit II	Correlation and Causation	C18	Lecture
Unit II	Scatter Diagrams and Pearson's Coefficient of Correlation	C19	Lecture
Unit II	Correlation and Probable Error	C20	Lecture
Unit II	Rank Correlation	C21	Lecture
Unit II	Introduction to Regression Analysis	C22	Lecture
Unit II	Principle of Least Squares and Regression Lines	C23	Lecture
Unit II	Regression Equations and Estimation	C24	Lecture
Unit II	Properties of Regression Coefficients and Relationship with Correlation	C25	Lecture

Unit III	Introduction to Index Numbers	C26	Lecture
Unit III	Construction of Index Numbers: Fixed and Chain Base	C27	Lecture
Unit III	Aggregative and Average of Relatives	C28	Lecture
Unit III	Simple and Weighted Index Numbers	C29	Lecture
Unit III	Tests of Adequacy of Index Numbers	C30	Lecture
Unit III	Base Shifting, Splicing, and Deflating	C31	Lecture
Unit III	Problems in Construction of Index Numbers	C32	Lecture
Unit III	Construction of Consumer Price Indices	C33	Lecture
Unit III	Important Share Price Indices: BSESENSEX and NSENIFTY	C34	Lecture
Unit III	Practical Exercises on Index Numbers	C35	Practical Exercise
Unit IV	Introduction to Time Series Data	C36	Lecture
Unit IV	Components of Time Series: Additive and Multiplicative Models	C37	Lecture
Unit IV	Trend Analysis	C38	Lecture
Unit IV	Fitting Trend Lines: Linear, Parabola, and Exponential	C39	Lecture
Unit IV	Conversion of Annual Trends to Quarterly/Monthly Basis	C40	Lecture
Unit IV	Moving Averages	C41	Lecture
Unit IV	Seasonal Variations: Calculation of Seasonal Indices	C42	Lecture
Unit IV	Simple Averages, Ratio-to-Trend, Ratio-to-Moving Averages Methods	C43	Lecture
Unit IV	Uses of Seasonal Indices	C44	Lecture
Unit IV	Practical Exercises on Time Series Analysis	C45	Practical Exercise
Unit V	Introduction to Probability Theory	C46	Lecture
Unit V	Approaches to Probability Calculation	C47	Lecture
Unit V	Event Probabilities and Laws of Probability	C48	Lecture
Unit V	Conditional Probability and Bayes' Theorem	C49	Lecture
Unit V	Expectation and Variance of Random Variables	C50	Lecture
Unit V	Binomial Distribution: Probability Function and Fitting	C51	Lecture
Unit V	Poisson Distribution: Probability Function and Fitting	C52	Lecture
Unit V	Normal Distribution: Probability Function and Properties	C53	Lecture
Unit V	Calculation of Probabilities in Normal Distribution	C54	Lecture
Unit V	Practical Exercises on Probability	C55	Practical Exercise

	Distributions		
Review and Assessment	Revision Class for All Units	C56	Revision
Review and Assessment	Mock Test and Assessment	C57	Assessment
Review and Assessment	Review of Mock Test and Feedback	C58	Lecture
Review and Assessment	Final Exam Preparation	C59	Lecture
Review and Assessment	Future Trends in Statistical Analysis and Data Science	C60	Lecture
Review and Assessment	Doubt Clearing and Open Discussion	C61	Discussion
Review and Assessment	Final Wrap-Up and Course Summary	C62	Lecture
Review and Assessment	Course Feedback and Wrap-Up	C63	Discussion

COM 107 – Fundamentals of Computer and IT

Unit	Particulars	Class No.	Pedagogy of Class
Unit I	Introduction to Computers: Definition and Classification of Computers	C1	Lecture
Unit I	Basic Computer Organization: Components and Functions	C2	Lecture
Unit I	Input Devices: Types and Usage	C3	Lecture
Unit I	Output Devices: Types and Usage	C4	Lecture
Unit I	Primary Memory: ROM, RAM, and Their Functions	C5	Lecture
Unit I	Secondary Memory: Types and Functions	C6	Lecture
Unit I	Binary Digit System: Bits, Bytes, and Other Units of Memory	C7	Lecture
Unit I	Software: Application Software and Operating Software	C8	Lecture
Unit I	Practical Demonstration: Basic Computer Operations and Software	C9	Practical Demonstration
Unit I	Clarification Class I	C10	Clarification Class
Unit II	Introduction to Microsoft Word: Toolbars, Menus, and Ribbons	C11	Practical Demonstration
Unit II	Text Formatting, Finding and Replacing Text	C12	Practical Demonstration

Unit II	Inserting Illustrations: Pictures, Clipart, Shapes, SmartArt, Charts	C13	Practical Demonstration
Unit II	Working with Headers, Footers, Text Boxes, and WordArt	C14	Practical Demonstration
Unit II	Page Setup, Watermark, Page Border, and Paragraph Formatting	C15	Practical Demonstration
Unit II	Grouping, Ungrouping, and Mail Merge	C16	Practical Demonstration
Unit II	Spell Check, Word Count, Zoom, Save, Save As, and Printing Documents	C17	Practical Demonstration
Unit II	Print Preview and Finalizing Documents	C18	Practical Exercise
Unit II	Clarification Class II	C19	Clarification Class
Unit III	Introduction to Microsoft Excel: Components of Excel Window Interface	C20	Practical Demonstration
Unit III	Worksheet Concept, Cell Address, and Formatting	C21	Practical Demonstration
Unit III	Cell Alignment, Conditional Formatting, and Working with Cells	C22	Practical Demonstration
Unit III	Autosum, Sorting, and Filtering Data	C23	Practical Demonstration
Unit III	Inserting Illustrations: Pictures, Clipart, Shapes, SmartArt	C24	Practical Demonstration
Unit III	Inserting and Formatting Charts	C25	Practical Demonstration
Unit III	Basic Formulas: Sum, Multiplication, Average, Max, Min, Percentage	C26	Practical Demonstration
Unit III	Spellcheck, Comments, Page Layout, and Page Break View	C27	Practical Demonstration
Unit III	Save, Save As, Printing, and Print Preview	C28	Practical Demonstration
Unit III	Practical Exercise: Excel Workbook Creation and Formatting	C29	Practical Exercise
Unit III	Clarification Class III	C30	Clarification Class
Unit IV	Introduction to Microsoft PowerPoint: Components of PowerPoint Window Interface	C31	Practical Demonstration
Unit IV	Slide Layout, Design, and Formatting	C32	Practical Demonstration
Unit IV	Arranging and Ordering Slides	C33	Practical Demonstration
Unit IV	Inserting Tables and Illustrations: Pictures, Clipart, Shapes, SmartArt, Charts	C34	Practical Demonstration
Unit IV	Working with Text Box, Header & Footer, WordArt, Movie, and Sound	C35	Practical Demonstration
Unit	Slide Animation, Transition, and Show	C36	Practical

IV	Basics		Demonstration
Unit IV	Creating Slides Handout, Slide Sorter, and Printing Handouts	C37	Practical Demonstration
Unit IV	Print Preview and Finalizing Presentations	C38	Practical Exercise
Unit IV	Clarification Class IV	C39	Clarification Class
Unit V	Introduction to Computer Networking Basics	C40	Lecture
Unit V	Network Topology: Star, Ring, Bus, Hybrid	C41	Lecture
Unit V	Overview of LAN, WAN, MAN	C42	Lecture
Unit V	Internet Surfing and Basics of Internet Browsers	C43	Lecture
Unit V	Practical Demonstration: Opening and Operating Email Accounts	C44	Practical Demonstration
Unit V	Dropbox and Instant Messaging	C45	Practical Demonstration
Unit V	Search Engines: Google, Bing, Yahoo	C46	Practical Demonstration
Unit V	Practical Exercise: Internet Browsing and Email Management	C47	Practical Exercise
Unit V	Clarification Class V	C48	Clarification Class
Unit V	Mock Test and Assessment	C49	Assessment
Unit V	Revision Class	C50	Revision
Unit V	Final Exam Preparation	C51	Lecture
Unit V	Final Exam	C52	Assessment
Unit V	Review of Exam and Feedback	C53	Lecture
Unit V	Future Trends in Networking and Internet	C54	Lecture
Unit V	Doubt Clearing and Open Discussion	C55	Discussion
Unit V	Final Wrap-Up and Course Summary	C56	Lecture

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Definition and significance of human values	C1	Lecture
Unit 1	Ethical theories and frameworks	C2	Lecture
Unit 1	Values-based decision-making	C3	Lecture
Unit 1	Ethical behaviour in business	C4	Lecture
Unit 1	Practical Class: Analyzing real-world cases of human values	C5	Practical Class
Unit 1	Interactive Session: Debates on ethical theories	C6	Activity
Unit 1	Review and Q&A session	C7	Clarification Class
Unit 2	Characteristics of ethical leaders	C8	Lecture
Unit 2	Building an ethical organizational culture	C9	Lecture
Unit 2	Ethical decision-making models	C10	Lecture
Unit 2	Corporate social responsibility and sustainability	C11	Lecture
Unit 2	Practical Class: Case studies on ethical leadership	C12	Practical Class
Unit 2	Interactive Session: Role-play on ethical decision-making	C13	Activity
Unit 2	Review and Q&A session	C14	Clarification Class
Unit 3	Ethical issues in marketing and advertising	C15	Lecture
Unit 3	Ethical challenges in finance and accounting	C16	Lecture
Unit 3	Ethical considerations in human resource management	C17	Lecture
Unit 3	Professional ethics and codes of conduct	C18	Lecture
Unit 3	Practical Class: Analyzing ethical issues in marketing	C19	Practical Class
Unit 3	Interactive Session: Developing codes of conduct	C20	Activity
Unit 3	Review and Q&A session	C21	Clarification Class
Unit 4	Identifying and analyzing ethical dilemmas	C22	Lecture
Unit 4	Stakeholder analysis and ethical implications	C23	Lecture
Unit 4	Balancing competing interests and ethical considerations	C24	Lecture

Unit 4	Ethical reasoning and judgment	C25	Lecture
Unit 4	Practical Class: Case studies on ethical dilemmas	C26	Practical Class
Unit 4	Interactive Session: Role-play on stakeholder analysis	C27	Activity
Unit 4	Review and Q&A session	C28	Clarification Class
Unit 5	Ethical challenges in a global business environment	C29	Lecture
Unit 5	Ethics in supply chain management and operations	C30	Lecture
Unit 5	Technology and ethical implications in business	C31	Lecture
Unit 5	Ethical leadership in times of crisis	C32	Lecture
Unit 5	Practical Class: Addressing global ethical challenges	C33	Practical Class
Unit 5	Interactive Session: Ethical issues in technology and crisis	C34	Activity
Unit 5	Review and Q&A session	C35	Clarification Class
Unit 5	Final Review and Practice	C36	Classroom Assignment
Unit 5	Exam Preparation and Doubt Clearing	C37	Clarification Class
Unit 5	Mock Test/Quiz	C38	Quiz
Unit 5	Evaluation and Feedback	C39	Lecture
Unit 5	Revision and Wrap-up	C40	Lecture

Semester II								
SN	**Paper Code**	**Course**		**Credits**				
		Type	**Title**					
					L	**T**	**P**	**Marks**
1	COM-201	AECC	English Language-II	2	2	0	0	50
2	COM-202	SEC	MS Office-II	3	1	0	2	100
3	COM-203	Core	Cost Accounting	3	2	1	0	100
4	COM-204	Core	Computerized Accounting System	3	2	0	1	100
5	COM-205	Core	Microeconomics	3	2	1	0	100
6	COM-206	Core	Business Ethics and Corporate Governance	3	2	1	0	100
7	COM-207	GE	Environmental Science and Sustainable Development	3	2	0	1	100
8	COM-208	VAC	Basics of Yoga and Meditation	2	2	0	0	50
			Total	**22**				**700**

L-Lecture, T-Tutorial, P-Practical

Course	Course outcomes: - After completion of these courses' students should be able to
Semester – II	
English Language -II	**CO1:** Interpret and discuss the literary elements, themes, and social context of the prose and poetry studied, demonstrating an understanding of the works by Munshi Premchand, Saadat Hasan Manto, and Rabindranath Tagore. **CO2:** Apply various writing techniques to produce clear and coherent pieces in precis writing, letter writing, email writing, and improve comprehension through reading exercises and the organization of sentences and paragraphs. **CO3:** Deliver engaging and well-structured presentations, articulate speeches, and participate effectively in group discussions, showcasing enhanced oral communication skills. **CO4:** Conduct a structured interview and analyze the data collected, applying communication skills and reflecting on the fieldwork experience to gain practical insights into the interviewing process.
MS Office - II	**CO1:** Apply advanced formatting techniques and automate document tasks in Microsoft Word to create professional documents and collaborate effectively with peers. **CO2:** Analyze and visualize complex datasets using advanced formulas, pivot tables, and charts in Microsoft Excel, and conduct financial analyses to support decision-making. **CO3:** Design and deliver dynamic presentations using Microsoft PowerPoint, incorporating multimedia elements and animations to enhance audience engagement. **CO4:** Create and manage relational databases in Microsoft Access, develop queries, and design reports and forms to facilitate data retrieval and presentation. **CO5:** Utilize collaborative tools like OneDrive and Teams within MS Office to co-author documents and manage document security and permissions effectively.
Cost Accounting	**CO1:** Define the nature and scope of Cost Accounting and differentiate it from Financial Accounting, demonstrating a fundamental understanding of cost concepts and classifications. **CO2:** Implement cost planning and control techniques such as budgeting, forecasting, and variance analysis to prepare accurate cost reports and support managerial decisions. **CO3:** Compare and contrast various cost accounting techniques, including Job Order Costing, Process Costing, and Activity-Based Costing, to analyze their impact on financial reporting and cost management. **CO4:** Assess the effectiveness of cost control measures and internal control systems, and formulate recommendations for improvements based on cost audits and emerging trends in cost accounting. **CO5:** Design cost management strategies that integrate cost reduction techniques, value analysis, and technology to address contemporary issues such as environmental and social costs.

Computerized Accounting System	**CO1:** Explain the fundamentals and advantages of computerized accounting systems over manual accounting methods. **CO2:** Use accounting software to perform various accounting tasks, including ledger management, invoicing, and inventory control. **CO3:** Prepare and analyze financial reports and statements using computerized accounting tools. **CO4:** Manage data entry, backup, and security settings within a computerized accounting system to ensure data integrity and confidentiality. **CO5:** Apply computerized accounting skills in real-world business scenarios, enhancing efficiency and accuracy in financial management.
Microeconomics	**CO1:** Explain the role and responsibilities of a microeconomist, differentiate between macroeconomics and microeconomics, and describe how economic principles guide business decisions. **CO2:** Demonstrate an understanding of demand and supply curves, including the determinants and elasticity of demand and supply, to analyze market equilibrium and forecast changes. **CO3:** Utilize utility theories to analyze consumer behavior, determine consumer equilibrium, and calculate consumer surplus. **CO4:** Apply the laws of production and cost analysis to optimize production processes and identify cost-effective input combinations for business operations. **CO5:** Assess pricing mechanisms in various market structures, including perfect competition, monopoly, monopolistic competition, and oligopoly, to formulate effective pricing strategies.
Business Ethics and Corporate Governance	**CO1:** Analyze and evaluate ethical issues in business situations. **CO2:** Demonstrate an understanding of corporate governance structures and mechanisms. **CO3:** Apply ethical decision-making frameworks to real-world business scenarios. **CO4:** Identify the role of corporate social responsibility in organizational sustainability. **CO5:** Critically assess the impact of ethical behavior and corporate governance on organizational success and stakeholder relationships.
Environmental Science and Sustainable Development	**CO1:** Explain fundamental environmental science concepts, including ecosystems, biodiversity, and natural resource management. **CO2:** Analyze sustainable development principles and apply them to real-world scenarios. **CO3:** Identify and evaluate environmental challenges and their impact on ecosystems and human societies. **CO4:** Understand and assess environmental policies and regulations, advocating for sustainable practices. **CO5:** Develop and propose sustainable solutions for environmental issues in business and everyday life.

Basics of Yoga and Meditation	**CO1:** Explain the fundamental concepts and philosophy of yoga and meditation. **CO2:** Perform basic yoga postures and breathing exercises to improve physical health. **CO3:** Practice meditation techniques to enhance mental clarity and concentration. **CO4:** Understand the mind-body connection and its significance in promoting overall well-being. **CO5:** Apply yoga and meditation techniques to manage stress and cultivate inner peace.

Mapping: Semester – II

COM-201	PO1	PO2	PO3	PO4	PO5	PO6
CO1		2		2	3	
CO2	3		2	2	3	2
CO3	2	3	1	1		3
CO4	2	2	2		3	3
CO5	3	3	3	3	3	3

COM-202	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	-	3	2	3
CO2	2	2	3	1	1	-
CO3	3	3	2	3	3	2
CO4	2	2	1	1	2	2
CO5	3	3	2	2	3	3

COM-203	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2		2
CO2	2	2	3	2	2	3
CO3	3	2	3	1	3	2
CO4	2			3	3	1
CO5		3	2	2	1	2

COM-204	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2	2	2
CO2	2	2	2	2	3	
CO3	1		2	2	3	3
CO4			2	2	3	2
CO5	3	3	3	3	3	3

COM-205	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	3	2	3
CO2	2	2	2	3	3	3
CO3	2	3	3	-	3	2
CO4	2	-	2	3	2	2
CO5	3	3	2	2	2	2

MGTM-206	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2	-	2
CO2	-	2	3	2	2	3
CO3	3	2	3	1	3	2
CO4	2	-	-	3	3	1
CO5	3	2	1	3	3	1

COM-207	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	-	3	2	3
CO2	2	2	3	1	1	-
CO3	3	3	2	3	3	2
CO4	2	2	1	1	2	2
CO5	3	3	2	2	3	3

COM-208	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2	2	2
CO2	2	2	2	2	3	
CO3	1		2	2	3	3
CO4			2	2	3	2
CO5	3	3	3	3	3	3

Lesson Plan Semester II

COM 201 – English Language – II

Unit	Particulars	Class No.	Pedagogy of Class
Unit I	**Prose and Poetry**		
Unit I	*Kafan* by Munshi Premchand: Introduction and Historical Context	C1	Lecture
Unit I	*Kafan*: Themes of Poverty and Social Injustice	C2	Lecture
Unit I	*Kafan*: Character Analysis: Main Characters and Their Motivations	C3	Lecture
Unit I	*Kafan*: Narrative Style and Technique	C4	Lecture
Unit I	*Open It* by Saadat Hasan Manto: Introduction and Historical Context	C5	Lecture
Unit I	*Open It*: Themes of Partition and Human Suffering	C6	Lecture
Unit I	*Open It*: Character Analysis and Social Commentary	C7	Lecture
Unit I	*Open It*: Narrative Style and Technique	C8	Lecture
Unit I	*Where the Mind is Without Fear* by Rabindranath Tagore: Introduction and Historical Context	C9	Lecture
Unit I	*Where the Mind is Without Fear*: Poetic Devices and Style	C10	Lecture
Unit I	*Where the Mind is Without Fear*: Analysis of Freedom and Vision	C11	Lecture
Unit I	*Where the Mind is Without Fear*: Tagore's Influence and Legacy	C12	Lecture
Unit I	Comparative Study of the Texts: Common Themes and Differences	C13	Lecture and Comparative Analysis
Unit I	Comparative Study: Literary Techniques and Styles	C14	Lecture and Comparative Analysis
Unit I	Comparative Study: Social and Political Contexts	C15	Lecture and Comparative Analysis
Unit I	Clarification Class I	C16	Clarification Class
Unit II	**Writing and Comprehension Skills**		
Unit II	Precis Writing: Techniques and Practice	C17	Lecture and Practice
Unit II	Letter Writing: Format and Types	C18	Lecture and Writing Exercise
Unit II	E-mail Writing: Professional Communication	C19	Practical Demonstration
Unit II	Reading Comprehension: Strategies for Effective Reading	C20	Lecture and Practice
Unit II	Jumbled Sentences: Techniques for Reordering	C21	Lecture and Practice
Unit II	Jumbled Paragraphs: Structuring Ideas	C22	Group Activity
Unit II	Writing Practice and Feedback Session	C23	Practice and Feedback

Unit II	Clarification Class II	C24	Clarification Class
Unit III	**Oral Communication**		
Unit III	Presentation Skills: Structuring and Delivering Effective Presentations	C25	Lecture and Demonstration
Unit III	Speech Preparation: Techniques for Persuasive Speech	C26	Lecture and Practice
Unit III	Group Discussion: Principles and Practice	C27	Group Activity
Unit III	Presentation Practice and Feedback	C28	Practical Exercise
Unit III	Speech Practice and Feedback	C29	Practical Exercise
Unit III	Group Discussion Practice and Feedback	C30	Group Activity
Unit III	Clarification Class III	C31	Clarification Class
Unit IV	**Field Work**		
Unit IV	Interview Preparation: Understanding the Process	C32	Lecture
Unit IV	Interview Techniques: Questioning and Answering Strategies	C33	Practical Demonstration
Unit IV	Mock Interviews: Practice Sessions	C34	Practical Exercise
Unit IV	Mock Interviews: Feedback and Improvement	C35	Feedback Session
Unit IV	Final Interview Practice	C36	Practical Exercise
Unit IV	Clarification Class IV	C37	Clarification Class

COM 202 – MS Office – II

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction to advanced Word features	C1	Lecture
Unit 1	Using styles and themes for consistent formatting	C2	Lecture
Unit 1	Creating and applying templates	C3	Lecture
Unit 1	Automating tasks with macros	C4	Lecture
Unit 1	Using mail merge for document creation	C5	Lecture
Unit 1	Hands-on Practice: Formatting and templates	C6	Practical Class
Unit 1	Hands-on Practice: Macros and mail merge	C7	Practical Class
Unit 1	Collaboration: Tracking changes and using comments	C8	Lecture
Unit 1	Collaboration: Comparing and combining documents	C9	Lecture
Unit 1	Hands-on Practice: Collaboration features	C10	Practical Class
Unit 1	Review and Q&A session	C11	Clarification Class
Unit 2	Advanced formulas and functions (e.g., VLOOKUP, INDEX, MATCH)	C12	Lecture

Unit 2	Conditional formatting and data validation	C13	Lecture
Unit 2	Creating and customizing charts	C14	Lecture
Unit 2	Using pivot tables and pivot charts	C15	Lecture
Unit 2	Financial functions and scenario tools	C16	Lecture
Unit 2	Hands-on Practice: Advanced formulas and functions	C17	Practical Class
Unit 2	Hands-on Practice: Conditional formatting and pivot tables	C18	Practical Class
Unit 2	Financial analysis techniques and tools	C19	Lecture
Unit 2	Review and Q&A session	C20	Clarification Class
Unit 3	Designing custom slide layouts and themes	C21	Lecture
Unit 3	Adding and formatting videos, audio, and hyperlinks	C22	Lecture
Unit 3	Using animations and transitions effectively	C23	Lecture
Unit 3	Utilizing presenter view during presentations	C24	Lecture
Unit 3	Hands-on Practice: Custom slide design and multimedia	C25	Practical Class
Unit 3	Hands-on Practice: Animations and transitions	C26	Practical Class
Unit 3	Advanced presentation techniques and tools	C27	Lecture
Unit 3	Review and Q&A session	C28	Clarification Class
Unit 4	Introduction to Microsoft Access and relational databases	C29	Lecture
Unit 4	Creating tables and defining relationships	C30	Lecture
Unit 4	Building queries to retrieve and analyze data	C31	Lecture
Unit 4	Designing and generating reports and forms	C32	Lecture
Unit 4	Hands-on Practice: Database creation and queries	C33	Practical Class
Unit 4	Hands-on Practice: Report and form design	C34	Practical Class
Unit 4	Advanced database features and management	C35	Lecture
Unit 4	Review and Q&A session	C36	Clarification Class
Unit 5	Introduction to collaborative tools in MS Office	C37	Lecture
Unit 5	Using OneDrive for file sharing and synchronization	C38	Lecture
Unit 5	Co-authoring documents and real-time collaboration	C39	Lecture
Unit 5	Collaborating using Microsoft Teams	C40	Lecture
Unit 5	Protecting documents and managing	C41	Lecture

	permissions		
Unit 5	Hands-on Practice: File sharing and co-authoring	C42	Practical Class
Unit 5	Hands-on Practice: Teams collaboration and security	C43	Practical Class
Unit 5	Review and Q&A session	C44	Clarification Class
Unit 5	Integration of collaborative tools and office applications	C45	Lecture
Unit 5	Advanced collaborative scenarios and problem-solving	C46	Lecture
Unit 5	Final Review and Practice	C47	Classroom Assignment
Unit 5	Exam Preparation and Doubt Clearing	C48	Clarification Class
Unit 5	Mock Test/Quiz	C49	Quiz
Unit 5	Evaluation and Feedback	C50	Lecture
Unit 5	Revision and Wrap-up	C51	Lecture
Unit 5	Group Discussion on Advanced MS Office Features	C52	Group Discussion

COM 203 – Cost Accounting

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction to Cost Accounting		
Unit 1	Definition and Scope of Cost Accounting	C1	Lecture
Unit 1	Nature and Objectives of Cost Accounting	C2	Lecture
Unit 1	Cost Accounting vs. Financial Accounting	C3	Lecture
Unit 1	Cost Concepts: Fixed Costs	C4	Lecture
Unit 1	Cost Concepts: Variable Costs	C5	Lecture
Unit 1	Cost Concepts: Semi-Variable Costs	C6	Lecture
Unit 1	Cost Concepts: Direct vs. Indirect Costs	C7	Lecture
Unit 1	Cost Concepts: Product vs. Period Costs	C8	Lecture
Unit 1	Overview of Cost Accounting Systems	C9	Lecture
Unit 1	Job Order Costing: Introduction and Procedure	C10	Lecture
Unit 1	Job Order Costing: Cost Sheet Preparation	C11	Lecture
Unit 1	Job Order Costing: Job Costing Procedure	C12	Lecture
Unit 1	Process Costing: Concept and Flow of Costs	C13	Lecture
Unit 1	Process Costing: FIFO vs. Weighted Average	C14	Lecture
Unit 1	Process Costing: Practical Exercises	C15	Practice
Unit 1	Activity-Based Costing (ABC): Concept and Implementation	C16	Lecture
Unit 1	Activity-Based Costing (ABC): Comparison with Traditional Costing	C17	Lecture
Unit 1	Clarification and Review of Unit 1	C18	Clarification Class
Unit 2	Cost Planning and Control		

Unit 2	Cost Planning: Budgeting and Forecasting	C19	Lecture
Unit 2	Types of Budgets: Flexible, Fixed, etc.	C20	Lecture
Unit 2	Cost Control Techniques: Standard Costing	C21	Lecture
Unit 2	Standard Costing: Calculation and Implementation	C22	Lecture
Unit 2	Variance Analysis: Material Variances	C23	Lecture
Unit 2	Variance Analysis: Labor Variances	C24	Lecture
Unit 2	Variance Analysis: Overhead Variances	C25	Lecture
Unit 2	Budgetary Control: Techniques and Implementation	C26	Lecture
Unit 2	Budgetary Control: Practical Exercises	C27	Practice
Unit 2	Cost Reports: Preparation and Interpretation	C28	Lecture
Unit 2	Using Cost Reports for Decision-Making	C29	Lecture
Unit 2	Case Studies: Cost Planning and Control Examples	C30	Case Study Analysis
Unit 2	Clarification and Review of Unit 2	C31	Clarification Class
Unit 3	Cost Accounting Techniques		
Unit 3	Job Order Costing: Advanced Procedures	C32	Lecture
Unit 3	Process Costing: Detailed Flow of Costs	C33	Lecture
Unit 3	Activity-Based Costing (ABC): Implementation	C34	Lecture
Unit 3	Comparing ABC and Traditional Costing	C35	Lecture
Unit 3	Clarification and Review of Unit 3	C36	Clarification Class
Unit 4	Cost Analysis for Decision Making		
Unit 4	Cost-Volume-Profit Analysis: Break-Even Analysis	C37	Lecture
Unit 4	Cost-Volume-Profit Analysis: Margin of Safety	C38	Lecture
Unit 4	Profit Planning: Contribution Margin Analysis	C39	Lecture
Unit 4	Profitability Analysis: Techniques and Implementation	C40	Lecture
Unit 4	Relevant Costing: Incremental Costs and Decision Making	C41	Lecture
Unit 4	Make or Buy Decisions: Analysis and Techniques	C42	Lecture
Unit 4	Pricing Decisions: Factors and Considerations	C43	Lecture
Unit 4	Clarification and Review of Unit 4	C44	Clarification Class
Unit 5	Cost Accounting and Management		
Unit 5	Cost Audit and Internal Controls: Purpose and Scope	C45	Lecture
Unit 5	Internal Control Systems: Design and Implementation	C46	Lecture
Unit 5	Cost Management Strategies: Cost Reduction Techniques	C47	Lecture
Unit 5	Cost Management Strategies: Cost Control	C48	Lecture

	Techniques		
Unit 5	Value Analysis and Cost Management: Concepts and Techniques	C49	Lecture
Unit 5	Emerging Trends: Role of Technology in Cost Accounting	C50	Lecture
Unit 5	Emerging Trends: Environmental and Social Costs	C51	Lecture
Unit 5	Review of Key Topics and Case Studies	C52	Case Study Analysis
Unit 5	Final Clarification and Wrap-Up	C53	Clarification Class
Unit 5	Additional Practice and Q&A	C54	Practice/ Q&A
Unit 5	Comprehensive Review and Exam Preparation	C55	Review Class

COM 204 – Computerized Accounting System

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction to Computerized Accounting	C1	Lecture
Unit 1	Difference Between Manual and Computerized Accounting	C2	Lecture
Unit 1	Benefits and Challenges of Computerized Accounting Systems	C3	Lecture
Unit 1	Introduction to Popular Accounting Software (e.g., Tally, QuickBooks)	C4	Lecture
Unit 1	Installation and Setup of Accounting Software	C5	Practical Demonstration
Unit 1	Chart of Accounts Creation	C6	Practical Demonstration
Unit 1	Ledgers and Journal Entries	C7	Practical Demonstration
Unit 1	Handling Receipts and Payments	C8	Practical Demonstration
Unit 1	Practical Exercises on Basic Functions of Accounting Software	C9	Practical Exercise
Unit 1	Clarification Class I	C10	Clarification Class
Unit 2	Core Features of Accounting Software	C11	Lecture
Unit 2	Creating and Managing Company Data	C12	Practical Demonstration
Unit 2	Managing Customer and Vendor Accounts	C13	Practical Demonstration
Unit 2	Recording Sales and Purchase Transactions	C14	Practical Demonstration
Unit 2	Inventory Management: Setting Up Inventory Items	C15	Practical Demonstration
Unit 2	Recording Stock Movements	C16	Practical Demonstration
Unit 2	Inventory Reports and Analysis	C17	Practical Demonstration
Unit 2	Invoicing and Billing: Creating and	C18	Practical

	Customizing Invoices		Demonstration
Unit 2	Managing Accounts Receivable and Payable	C19	Practical Demonstration
Unit 2	Generating Billing Reports	C20	Practical Demonstration
Unit 2	Practical Exercises on Core Features of Accounting Software	C21	Practical Exercise
Unit 2	Clarification Class II	C22	Clarification Class
Unit 3	Report Generation: Preparing Financial Statements	C23	Practical Demonstration
Unit 3	Customizing Financial Reports	C24	Practical Demonstration
Unit 3	Budgeting and Forecasting: Setting Up Budgets	C25	Practical Demonstration
Unit 3	Analyzing Budget vs. Actual Performance	C26	Practical Demonstration
Unit 3	Data Analysis Tools: Using Software Tools for Data Analysis	C27	Practical Demonstration
Unit 3	Creating Charts and Graphs for Financial Data Presentation	C28	Practical Demonstration
Unit 3	Practical Exercises on Financial Reporting and Analysis	C29	Practical Exercise
Unit 3	Clarification Class III	C30	Clarification Class
Unit 4	Data Entry and Maintenance: Efficient Data Entry Techniques	C31	Practical Demonstration
Unit 4	Managing and Updating Records	C32	Practical Demonstration
Unit 4	Backup and Recovery: Setting Up Data Backup and Recovery Processes	C33	Practical Demonstration
Unit 4	Ensuring Data Integrity and Reliability	C34	Practical Demonstration
Unit 4	Security Features: User Access Controls and Permissions	C35	Practical Demonstration
Unit 4	Ensuring Data Confidentiality and Protection Against Fraud	C36	Practical Demonstration
Unit 4	Practical Exercises on Data Management and Security	C37	Practical Exercise
Unit 4	Clarification Class IV	C38	Clarification Class
Unit 5	Case Studies: Real-Life Business Scenarios Using Computerized Accounting	C39	Lecture
Unit 5	Challenges and Solutions in Implementing Accounting Software	C40	Lecture
Unit 5	Software Customization: Customizing Reports and Forms	C41	Practical Demonstration
Unit 5	Adapting Software Features to Specific Business Needs	C42	Practical Demonstration
Unit 5	Industry Trends: Emerging Trends in Computerized Accounting	C43	Lecture
Unit 5	Integration of Accounting Software	C44	Lecture

	with Other Business Systems		
Unit 5	Practical Exercises on Software Customization and Industry Trends	C45	Practical Exercise
Unit 5	Clarification Class V	C46	Clarification Class
Review and Assessment	Revision Class for All Units	C47	Revision
Review and Assessment	Mock Test and Assessment	C48	Assessment
Review and Assessment	Review of Mock Test and Feedback	C49	Lecture
Review and Assessment	Final Exam Preparation	C50	Lecture
Review and Assessment	Future Trends in Computerized Accounting and Technology	C51	Lecture
Review and Assessment	Doubt Clearing and Open Discussion	C52	Discussion
Review and Assessment	Final Wrap-Up and Course Summary	C53	Lecture
Review and Assessment	Course Feedback and Wrap-Up	C54	Discussion

COM 205 – Microeconomics

Unit	Particulars	Class No.	Pedagogy of Class
Unit I	Introduction to Micro Economics: Concepts	C1	Lecture
Unit I	Nature and Scope of Business Economics	C2	Lecture
Unit I	Basic Economics Concepts: Scarcity	C3	Lecture
Unit I	Basic Economics Concepts: Opportunity Cost	C4	Lecture
Unit I	Basic Economics Concepts: Marginal Analysis	C5	Lecture
Unit I	Role and Responsibilities of a Business Economist	C6	Lecture
Unit I	Nature and Types of Business Decisions	C7	Lecture
Unit I	Macro and Microeconomics Overview	C8	Lecture
Unit I	Basic Problems of an Economy	C9	Lecture
Unit I	The Role of Economics in Business Decision-Making	C10	Lecture
Unit I	Clarification and Review	C11	Clarification Class
Unit II	Different Concepts of Demand	C12	Lecture
Unit II	Demand Curve and Determinants of Demand	C13	Lecture
Unit II	Law of Demand	C14	Lecture
Unit II	Demand Forecasting Methods	C15	Lecture
Unit II	Market Equilibrium	C16	Lecture
Unit II	Concept of Elasticity	C17	Lecture
Unit II	Elasticity of Demand	C18	Lecture

Unit II	Concept of Supply	C19	Lecture
Unit II	Supply Curve and Conditions of Supply	C20	Lecture
Unit II	Elasticity of Supply	C21	Lecture
Unit II	Economies of Scale and Scope	C22	Lecture
Unit II	Practice Problems and Review	C23	Classroom Assignment
Unit II	Clarification and Review	C24	Clarification Class
Unit III	Theory of Utility: Introduction	C25	Lecture
Unit III	Cardinal Utility Theory	C26	Lecture
Unit III	Ordinal Utility Theory	C27	Lecture
Unit III	Law of Diminishing Marginal Utility	C28	Lecture
Unit III	Law of Equi-Marginal Utility	C29	Lecture
Unit III	Indifference Curves	C30	Lecture
Unit III	Consumer Equilibrium	C31	Lecture
Unit III	Consumer Surplus	C32	Lecture
Unit III	Practice Problems and Review	C33	Classroom Assignment
Unit III	Clarification and Review	C34	Clarification Class
Unit IV	The Production Function: Introduction	C35	Lecture
Unit IV	Short-Run Production Function	C36	Lecture
Unit IV	Long-Run Production Function	C37	Lecture
Unit IV	Law of Diminishing Returns	C38	Lecture
Unit IV	Returns to Scale	C39	Lecture
Unit IV	Fixed and Variable Costs	C40	Lecture
Unit IV	Other Cost Concepts	C41	Lecture
Unit IV	Least Cost-Input Combination	C42	Lecture
Unit IV	Relationship Between Production and Cost	C43	Lecture
Unit IV	Practice Problems and Review	C44	Classroom Assignment
Unit IV	Clarification and Review	C45	Clarification Class
Unit V	Market Structures Overview	C46	Lecture
Unit V	Pricing in Perfect Competition: Long Run	C47	Lecture
Unit V	Pricing in Perfect Competition: Short Run	C48	Lecture
Unit V	Pricing in Monopoly Market: Long Run	C49	Lecture
Unit V	Pricing in Monopoly Market: Short Run	C50	Lecture
Unit V	Pricing in Monopolistic Competition	C51	Lecture
Unit V	Pricing in Oligopoly Market	C52	Lecture
Unit V	Pricing Strategies	C53	Lecture
Unit V	Practice Problems and Review	C54	Classroom Assignment
Unit V	Clarification and Review	C55	Clarification Class
Additional Classes	Mock Test/Quiz	C56	Quiz
	Final Review and Preparation	C57	Classroom Assignment
	Final Exam	C58	Assessment
	Discussion of Exam Results and Feedback	C59	Lecture
	Course Wrap-up and Takeaways	C60	Lecture

COM 206 – Business Ethics and Corporate Governance

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction and Concept of Ethics	C1	Lecture
Unit 1	Nature and Objectives of Ethics	C2	Lecture
Unit 1	Types of Ethics	C3	Lecture
Unit 1	Significance of Ethics	C4	Lecture
Unit 1	Ethics in Particular Fields of Application	C5	Lecture
Unit 1	Introduction to Business Ethics	C6	Lecture
Unit 1	Evolution of Business Ethics	C7	Lecture
Unit 1	Principles of Business Ethics	C8	Lecture
Unit 1	Unethical Issues in Business	C9	Lecture
Unit 1	Case Study: Business Ethics in Real-World Scenarios	C10	Case Study
Unit 1	Practice Session: Analyzing Ethical Dilemmas in Business	C11	Practice Session
Unit 1	Clarification and Review of Unit 1	C12	Clarification Class
Unit 2	Introduction to Ethical Theories	C13	Lecture
Unit 2	Egoism and Utilitarianism: Principles and Applications	C14	Lecture
Unit 2	Deontology: Principles and Applications	C15	Lecture
Unit 2	Care Ethics and Virtue Ethics: Principles and Applications	C16	Lecture
Unit 2	Religion and Ethics	C17	Lecture
Unit 2	Business and Religion	C18	Lecture
Unit 2	Ethics and Social Responsibility	C19	Lecture
Unit 2	Introduction and Nature of Corporate Social Responsibility (CSR)	C20	Lecture
Unit 2	Need for CSR	C21	Lecture
Unit 2	Current Situation of CSR in India	C22	Lecture
Unit 2	Types of Social Responsibility	C23	Lecture
Unit 2	Social Responsibilities for Economic Growth	C24	Lecture
Unit 2	Business Ethics and CSR in the New Economy	C25	Lecture
Unit 2	Ethical Climate: Concepts and Implementation	C26	Lecture
Unit 2	Case Study: CSR Practices and Impact in Indian Companies	C27	Case Study
Unit 2	Practice Session: Developing CSR Strategies for Organizations	C28	Practice Session

Unit 2	Clarification and Review of Unit 2	C29	Clarification Class
Unit 3	Ethics in Marketing: Introduction and Overview	C30	Lecture
Unit 3	Ethical Issues in Marketing Mix	C31	Lecture
Unit 3	Unethical Practices in Marketing: Case Studies	C32	Case Study
Unit 3	Ethics in Finance: Importance and Scope	C33	Lecture
Unit 3	Code of Ethics in Finance: Overview and Applications	C34	Lecture
Unit 3	Introduction to Ethics in HRM	C35	Lecture
Unit 3	Concept of Human Resource Information System (HRIS)	C36	Lecture
Unit 3	Types of HRIS	C37	Lecture
Unit 3	Ethical Issues in HRM	C38	Lecture
Unit 3	Case Study: Ethical Issues in Finance and HRM	C39	Case Study
Unit 3	Practice Session: Analyzing Ethical Issues in Marketing, Finance, and HRM	C40	Practice Session
Unit 3	Clarification and Review of Unit 3	C41	Clarification Class
Unit 4	Concept of Corporate Governance	C42	Lecture
Unit 4	Need and Importance of Corporate Governance	C43	Lecture
Unit 4	Principles of Corporate Governance	C44	Lecture
Unit 4	Present Scenario of Corporate Governance in India	C45	Lecture
Unit 4	Limitations of Corporate Governance	C46	Lecture
Unit 4	Board of Directors: Composition and Functions	C47	Lecture
Unit 4	Committees in Corporate Governance: Birla Committee	C48	Lecture
Unit 4	Committees in Corporate Governance: Naresh Chandra Committee	C49	Lecture
Unit 4	Committees in Corporate Governance: Narayan Murthy Committee	C50	Lecture
Unit 4	Committees in Corporate Governance: Cadbury Committee	C51	Lecture
Unit 4	Changes in Corporate Governance Issues as per Companies Act, 2013	C52	Lecture
Unit 4	Case Study: Corporate Governance Practices in India	C53	Case Study
Unit 4	Practice Session: Evaluating Corporate Governance Practices	C54	Practice Session
Unit 4	Clarification and Review of Unit 4	C55	Clarification Class
Unit 5	Role of SEBI in Governance	C56	Lecture
Unit 5	Extent of Compliance with Governance Codes in India	C57	Lecture
Unit 5	Governance Rating in India: Overview and Importance	C58	Lecture
Unit 5	Concept of Sustainable Development	C59	Lecture
Unit 5	Objectives and Scope of Sustainable Development	C60	Lecture

Unit 5	Evolution of Sustainable Development	C61	Lecture
Unit 5	Principles of Sustainable Development	C62	Lecture
Unit 5	Global Goals of Sustainable Development	C63	Lecture
Unit 5	Case Study: Sustainable Development Practices in Various Countries	C64	Case Study
Unit 5	Practice Session: Developing Sustainable Business Strategies	C65	Practice Session

COM 207 – Environmental Science and Sustainable Development

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Definition; Scope and importance; Need for public awareness	C1	Lecture
Unit 1	Multidisciplinary approach to environmental studies	C2	Lecture
Unit 1	Role of various disciplines in environmental studies	C3	Lecture
Unit 1	Public awareness campaigns and initiatives	C4	Case Study
Unit 1	Role of NGOs in environmental awareness	C5	Lecture
Unit 1	Role of media and communication in environmental awareness	C6	Lecture
Unit 1	Clarification and Review of Unit 1	C7	Clarification Class
Unit 2	Introduction to natural resources and associated problems	C8	Lecture
Unit 2	Forest resources: Use and overexploitation, deforestation, case studies	C9	Lecture
Unit 2	Impact of timber extraction, mining, dams on forests and tribal people	C10	Lecture
Unit 2	Water resources: Use, overutilization, conflicts, and case studies	C11	Lecture
Unit 2	Mineral resources: Use, exploitation, environmental effects, case studies	C12	Lecture
Unit 2	Food resources: World food problems, changes from agriculture, case studies	C13	Lecture
Unit 2	Energy resources: Growing needs, renewable/nonrenewable sources, case studies	C14	Lecture
Unit 2	Land resources: Land degradation, soil erosion, desertification, case studies	C15	Lecture
Unit 2	Role of an individual in conservation of natural resources	C16	Lecture
Unit 2	Equitable use of resources for sustainable lifestyles	C17	Lecture
Unit 2	Practice Session: Resource conservation and sustainable lifestyles	C18	Practice Session
Unit 2	Case Study: Resource management and its impact	C19	Case Study
Unit 2	Clarification and Review of Unit 2	C20	Clarification Class

Unit 3	Concept of an ecosystem; Structure and function of an ecosystem	C21	Lecture
Unit 3	Producers, consumers, and decomposers	C22	Lecture
Unit 3	Energy flow in the ecosystem; Ecological succession	C23	Lecture
Unit 3	Food chains, food webs, and ecological pyramids	C24	Lecture
Unit 3	Forest ecosystem: Characteristics and functions	C25	Lecture
Unit 3	Grassland ecosystem: Characteristics and functions	C26	Lecture
Unit 3	Desert ecosystem: Characteristics and functions	C27	Lecture
Unit 3	Aquatic ecosystems: Ponds, streams, lakes, rivers, ocean, estuaries	C28	Lecture
Unit 3	Case Study: Ecosystem dynamics	C29	Case Study
Unit 3	Practice Session: Ecosystem analysis	C30	Practice Session
Unit 3	Clarification and Review of Unit 3	C31	Clarification Class
Unit 4	Introduction to biodiversity: Genetic, species, ecosystem diversity	C32	Lecture
Unit 4	Biogeographical classification of India	C33	Lecture
Unit 4	Value of biodiversity: Consumptive, productive, social, ethical values	C34	Lecture
Unit 4	Biodiversity at global, national, and local levels	C35	Lecture
Unit 4	India as a megadiversity nation	C36	Lecture
Unit 4	Hotspots of biodiversity	C37	Lecture
Unit 4	Threats to biodiversity: Habitat loss, poaching, conflicts	C38	Lecture
Unit 4	Endangered and endemic species of India	C39	Lecture
Unit 4	Conservation of biodiversity: Insitu and Exsitu methods	C40	Lecture
Unit 4	Case Study: Biodiversity conservation initiatives	C41	Case Study
Unit 4	Practice Session: Biodiversity conservation methods	C42	Practice Session
Unit 4	Clarification and Review of Unit 4	C43	Clarification Class
Unit 5	Definition; Causes, effects, and control measures of Air pollution	C44	Lecture
Unit 5	Water pollution: Causes, effects, and control measures	C45	Lecture
Unit 5	Soil pollution: Causes, effects, and control measures	C46	Lecture
Unit 5	Marine pollution: Causes, effects, and control measures	C47	Lecture
Unit 5	Noise pollution: Causes, effects, and control measures	C48	Lecture
Unit 5	Thermal pollution: Causes, effects, and control measures	C49	Lecture
Unit 5	Nuclear pollution: Causes, effects, and	C50	Lecture

	control measures		
Unit 5	Solid waste management: Causes, effects, and control measures	C51	Lecture
Unit 5	Role of an individual in prevention of pollution	C52	Lecture
Unit 5	Pollution case studies	C53	Case Study
Unit 5	Disaster management: Floods, earthquakes, cyclones, landslides	C54	Lecture
Unit 5	Practice Session: Pollution prevention techniques	C55	Practice Session
Unit 5	Case Study: Disaster management practices	C56	Case Study
Unit 5	Clarification and Review of Unit 5	C57	Clarification Class
Additional	Mock Test/Quiz	C58	Quiz
Additional	Final Review and Preparation	C59	Classroom Assignment
Additional	Discussion on key topics and Q&A session	C60	Discussion
Additional	Student presentations on environmental topics	C61	Presentation
Additional	Practical demonstration: Resource conservation and management	C62	Practical Session
Additional	Project work: Environmental case studies	C63	Project Work
Additional	Group discussion: Environmental policies and public awareness	C64	Group Discussion
Additional	Final Review and Wrap-up	C65	Review Session

COM 208 – Basics of Yoga and Meditation

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction to Yoga: Origins and Evolution	C1	Lecture
Unit 1	The Philosophy and Principles of Yoga	C2	Lecture
Unit 1	Overview of Yoga Styles: Hatha, Vinyasa, Ashtanga, Iyengar, and Kundalini	C3	Lecture
Unit 1	Physical, Mental, and Emotional Benefits of Yoga	C4	Lecture
Unit 1	Yoga as a Holistic Approach to Health and Wellness	C5	Lecture
Unit 1	Practical Session: Introduction to Basic Yoga Practices	C6	Practical Demonstration
Unit 1	Clarification Class I	C7	Clarification Class
Unit 2	Standing Postures: Tadasana (Mountain Pose), Vrikshasana (Tree Pose)	C8	Practical Demonstration
Unit 2	Seated Postures: Sukhasana (Easy Pose), Padmasana (Lotus Pose)	C9	Practical Demonstration
Unit 2	Balancing Postures: Vrksasana (Tree Pose), Garudasana (Eagle Pose)	C10	Practical Demonstration

Unit 2	Supine and Prone Postures: Bhujangasana (Cobra Pose), Shavasana (Corpse Pose)	C11	Practical Demonstration
Unit 2	Importance of Proper Alignment and Safety in Yoga Practice	C12	Lecture
Unit 2	Modifications and Use of Props	C13	Practical Demonstration
Unit 2	Practical Session: Comprehensive Practice of Basic Yoga Postures	C14	Practical Exercise
Unit 2	Clarification Class II	C15	Clarification Class
Unit 3	Introduction to Pranayama: Role of Breath in Yoga Practice	C16	Lecture
Unit 3	Benefits of Pranayama for Physical and Mental Health	C17	Lecture
Unit 3	Basic Breathing Techniques: Anulom Vilom (Alternate Nostril Breathing)	C18	Practical Demonstration
Unit 3	Kapalbhati (Skull Shining Breath)	C19	Practical Demonstration
Unit 3	Bhramari (Bee Breath)	C20	Practical Demonstration
Unit 3	Practical Session: Applying Pranayama Techniques	C21	Practical Exercise
Unit 3	Clarification Class III	C22	Clarification Class
Unit 4	Concept and Purpose of Meditation: Definition and Objectives	C23	Lecture
Unit 4	Differences Between Meditation and Relaxation	C24	Lecture
Unit 4	Types of Meditation: Mindfulness, Guided Visualization, Mantra Meditation	C25	Lecture
Unit 4	Benefits of Meditation: Mental Clarity, Focus, and Emotional Balance	C26	Lecture
Unit 4	Reducing Stress and Anxiety Through Meditation	C27	Practical Demonstration
Unit 4	Practical Session: Meditation Techniques and Practices	C28	Practical Exercise
Unit 4	Clarification Class IV	C29	Clarification Class
Unit 5	Developing a Personal Practice: Establishing a Yoga and Meditation Routine	C30	Lecture
Unit 5	Setting Intentions and Goals for Practice	C31	Lecture
Unit 5	Incorporating Mindfulness into Daily Activities	C32	Lecture
Unit 5	Using Yoga and Meditation for Stress Management	C33	Practical Demonstration
Unit 5	Cultivating Inner Peace and Emotional Resilience	C34	Practical Demonstration
Unit 5	Practical Session: Integrating Yoga and Meditation into Daily Life	C35	Practical Exercise

Unit 5	Review of Personal Practice and Goal Setting	C36	Practical Exercise
Unit 5	Clarification Class V	C37	Clarification Class
Review and Assessment	Revision Class for All Units	C38	Revision
Review and Assessment	Mock Test and Assessment	C39	Assessment
Review and Assessment	Review of Mock Test and Feedback	C40	Lecture

Semester III								
SN	**Paper Code**	**Course**		**Credits**				
		Type	**Title**					
					L	**T**	**P**	**Marks**
1	COM-301	Core	Corporate Finance	3	2	1	0	100
2	COM-302	Core	Advance Accounting	3	2	1	0	100
3	COM-303	Core	Management Accounting for Business Decision	3	2	1	0	100
4	COM-304	Core	Auditing	3	2	1	0	100
5	COM-305	DSE	Financial Markets and Institutions	3	2	1	0	100
6	COM-306	DSE	Marketing Management	3	2	1	0	100
7	COM-307	GE	Principles of Banking	2	1	0	1	100
8	COM-308	VAC	Happiness and Mental Well Being	1	1	0	0	50
9	COM-309	AECC	Soft Skill	1	1	0	0	50
			Total	**22**				**800**

L-Lecture, T-Tutorial, P-Practical

Course	Course outcomes: - After completion of these courses' students should be able to
Semester – III	
Corporate Finance	**CO1:** Understand the objectives and scope of financial management and the principle of time value of money. **CO2:** Analyze and evaluate the valuation of bonds, preference shares, and equity, and apply capital budgeting techniques such as NPV and IRR. **CO3:** Analyze and evaluate the valuation of bonds, preference shares, and equity, and apply capital budgeting techniques such as NPV and IRR. **CO4:** Calculate and interpret risk and return for individual securities and understand capital market theory. **CO5:** Manage working capital, including cash, inventory, and receivables, and comprehend leverage and dividend policy models like Grahm-Dodd, Walter, Gordon, and MM models.
Advance Accounting	**CO1:** Develop an understanding of the accounting processes for the issue, forfeiture, reissue, and redemption of share capital and debentures **CO2:** Prepare accurate and comprehensive profit and loss accounts and balance sheets for corporate entities. **CO3:** Develop the ability to prepare and analyze cash flow statements in accordance with Indian Accounting Standards. **CO4:** Understand and apply the accounting treatments for amalgamation and liquidation of companies as per Accounting Standard 14 (ICAI). **CO5:** Prepare consolidated balance sheets for holding companies in compliance with Accounting Standard 21 (ICAI).
Management Accounting for Business Decision	**CO1:** Understand and apply the principles of accounting for share capital and debentures, including the processes of issue, forfeiture, and reissue of shares, as well as redemption of debentures. **CO2:** Understand, analyze & prepare the profit and loss account and balance sheet for corporate entities, excluding the calculation of managerial remuneration and disposal of company profits. **CO3:** Implement the accounting treatments for amalgamation and internal reconstruction of companies as per Accounting Standard 14 **CO4:** Develop the ability to prepare a consolidated balance sheet for holding companies, adhering to the relevant provisions of Accounting Standard 21. **CO5:** Evaluate and prepare the financial statement of banking companies, applying prudential norms and creating cash flow statement as per Indian Accounting Standards.

Auditing	**CO1:** Differentiate between various aspects of auditing, including internal check and internal control, and understand the role and responsibilities of company auditors under the Companies Act 2013. **CO2:** Understand special features of cost audit, tax audit, and management audit, and evaluate recent trends and standards in auditing. **CO3:** Comprehend the theories, models, and reforms of corporate governance and analyze major corporate scandals to identify governance issues. **CO4:** Recognize the importance of business ethics, understand corporate ethics programs, and evaluate the impact of ethical behavior on corporate performance. **CO5:** Understand the concept of CSR, its relationship with corporate sustainability, and the provisions and standards related to CSR under the Companies Act 2013.
Financial Markets and Institutions	**CO1**: Understand the nature and role of the financial system, including its components and weaknesses, and the impact of government intervention. **CO2**: Analyze and evaluate the instruments and mechanisms of money and capital markets, and understand the role of SEBI. **CO3:** Evaluate and create strategies for financial services like factoring, leasing, and mergers & acquisitions, and comprehend the conceptual aspects of these services. **CO4:** Understand the basic concepts and regulatory frameworks of insurance and mutual funds, and analyze their roles in the financial system. **CO5:** Apply and analyze the concepts relevant to banking activities, products, and functions in both retail and corporate banking.
Marketing Management	**CO1:** Learn the basic concepts and principles of marketing and to develop their conceptual skill to be able to manage marketing operations of a business firm. **CO2:** Understand the complexities involved in various targeting and positioning decisions. **CO3:** Take effective decisions for launching new products and to understand the implications of different pricing strategies. **C04:** Develop the skills to design the promotion-mix strategies **C05:** Familiarize about the current trends in marketing to take proactive measures while taking marketing decisions

Principles of Banking	**CO1:** Explain the structure and function of the Indian financial system, including the roles of SEBI and the risk management processes involved. **CO2:** Analyze banker-customer relationships and understand the processes involved in the payment, collection, and management of negotiable instruments. **CO3:** Discuss the impact of technology on banking operations and will be able to evaluate different digital payment systems and their security considerations. **CO4:** Understand the regulatory frameworks governing the banking industry, including the Banking Regulation Act of 1949, KYC, AML guidelines, and BASEL norms. **CO5:** Apply concepts of electronic banking in practical scenarios, demonstrating knowledge of home, mobile, and internet banking, as well as the use of various electronic payment methods.
Happiness and Mental Well Being	**CO1**: To understand the concept of mindfulness, practice mindfulness techniques, and develop self-care routines **CO2**: Apply positive psychology interventions for enhancing happiness and well-being and identify strategies for developing a positive mindset and cultivating positive emotions **CO3**: Enhance self-awareness and emotional self-regulation skills and apply emotional intelligence techniques in personal and professional contexts **CO4**: Apply stress management techniques for coping with stress effectively and develop resilience skills to maintain mental well-being **CO5**: Understand the concept of mindfulness, practice mindfulness techniques for stress reduction and increased self-awareness, and develop self-care routines for maintaining mental and emotional well-being.
Soft Skill	**CO1:** Understand the elements, importance, and process of communication, and demonstrate the ability to use phonetic symbols and word formation. **CO2:** Differentiate between verbal and non-verbal communication, understand formal and informal channels, and develop effective listening and speaking skills **CO3:** Identify and overcome barriers to communication, enhance professional and interpersonal communication, and improve spelling and pronunciation accuracy **CO4:** Apply rules of subject-verb agreement, linking words, and relative clauses, and enhance grammar through the use of synonyms and antonyms. **CO5:** Create effective resumes, business letters, e-mail messages, and demonstrate proper telephone etiquettes, and perform well in group discussions and job interviews

Mapping: Semester – III

COM-301	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2		2
CO2	3	2	3	3	2	3
CO3	2		2	2		3
CO4	2	2	2	2	2	2
CO5	3		3	3		3

COM-302	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	3		2
CO2		3	3	2	2	3
CO3	3	3	3	2	3	3
CO4	2			3	3	1
CO5	1	2	1		2	

COM-303	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2			2
CO2		2	1	3	1	
CO3				2	2	
CO4		2		1		
CO5	3	3	3	3	3	3

COM – 304	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	3	3
CO2	1	-	2	-	-	1
CO3	-	2	2	2	3	-
CO4	-	2	2	2	-	3
CO5	-	2	2	2	-	3

COM-305	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	2	3
CO2	-	3	3	2	1	-
CO3	1	1	2	3	3	-
CO4	1	1	2	1	-	2
CO5	2	2	3	1	-	2

COM-306	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2		2
CO2	2	2	3	2	2	3
CO3	3	2	3	1	3	2
CO4	2			3	3	1
CO5		3	2	2	1	2

COM-307	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	3		2
CO2		3	3	2	2	3

CO3	3	3	3	2	3	3
CO4	2			3	3	1
CO5	1	2	1		2	

COM – 308	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	3	3
CO2	1	-	2	-	-	1
CO3	-	2	2	2	3	-
CO4	-	2	2	2	-	3
CO5	-	2	2	2	-	3

COM-309	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2			2
CO2		2	1	3	1	
CO3				2	2	
CO4		2		1		
CO5	3	3	3	3	3	3

Lesson Plans Semester III

COM 301 – Corporate Finance

Unit	Particulars	Class No.	Pedagogy of Class
Unit I	Introduction to Corporate Finance:	C1	Lecture

	Meaning, Objectives, and Scope		
Unit I	Conflicts in Profit vs. Wealth or Value Maximization Principle	C2	Lecture
Unit I	Time Value of Money: Concept and Applications	C3	Lecture
Unit I	Time Value of Money: Practical Exercises on Discounting and Compounding	C4	Practical Exercise
Unit I	Time Value of Money: Advanced Applications	C5	Practical Exercise
Unit I	Real-Life Applications of Time Value of Money	C6	Case Study/Practical
Unit I	Clarification Class I	C7	Clarification Class
Unit II	Valuation of Securities: Definitions and Types of Securities	C8	Lecture
Unit II	Valuation of Bonds: Yield Types and Calculations	C9	Lecture
Unit II	Valuation of Preference Shares: Methodologies	C10	Lecture
Unit II	Valuation of Equity: Techniques and Approaches	C11	Lecture
Unit II	Capital Budgeting Techniques: Net Present Value (NPV) Method	C12	Lecture
Unit II	Capital Budgeting Techniques: Internal Rate of Return (IRR) Method	C13	Lecture
Unit II	Cost of Capital: Equity and Debt	C14	Lecture
Unit II	Practical Session: Valuation Exercises and Capital Budgeting	C15	Practical Exercise
Unit II	Advanced Valuation Techniques and Case Studies	C16	Practical Exercise
Unit II	Clarification Class II	C17	Clarification Class
Unit III	Cost of Capital: Cost of Individual Sources (Debentures, Preference Shares, Equity)	C18	Lecture
Unit III	Cost of Term Loans and Weighted Average Cost of Capital (WACC)	C19	Lecture
Unit III	Theory of Capital Structure: Traditional Approach	C20	Lecture
Unit III	Theory of Capital Structure: Net Income and Net Operating Income Approaches	C21	Lecture
Unit III	Theory of Capital Structure: MM Approach	C22	Lecture
Unit III	Practical Session: Calculating Cost of Capital and Analyzing Capital Structure	C23	Practical Exercise
Unit III	Advanced Capital Structure Theories and Applications	C24	Practical Exercise
Unit III	Clarification Class III	C25	Clarification Class
Unit IV	Risk and Return: Calculating Risk and Return for Individual Securities	C26	Lecture

Unit IV	Beta Estimation and Its Importance	C27	Lecture
Unit IV	Overview of Capital Market Theory	C28	Lecture
Unit IV	Characteristic Line and Securities Market Line: Concepts and Calculations	C29	Lecture
Unit IV	Practical Session: Risk and Return Calculations and Beta Estimation	C30	Practical Exercise
Unit IV	Case Studies on Risk and Return Analysis	C31	Practical Exercise
Unit IV	Clarification Class IV	C32	Clarification Class
Unit V	Short-Term Financing: Management of Working Capital	C33	Lecture
Unit V	Cash Management: Techniques and Best Practices	C34	Lecture
Unit V	Inventory Management: Approaches and Techniques	C35	Lecture
Unit V	Receivables Management: Methods and Strategies	C36	Lecture
Unit V	Working Capital Leverage and Its Implications	C37	Lecture
Unit V	Leverage: Operating, Financial, and Composite Leverage	C38	Lecture
Unit V	Dividend Policy: Grahm-Dodd Model, Walter Model, Gordon Model, MM Model	C39	Lecture
Unit V	Practical Session: Analyzing Short-Term Financing and Leverage	C40	Practical Exercise
Unit V	Advanced Dividend Policy Models and Their Applications	C41	Practical Exercise
Unit V	Clarification Class V	C42	Clarification Class
Review and Assessment	Revision Class for All Units	C43	Revision
Review and Assessment	Mock Test and Assessment	C44	Assessment
Review and Assessment	Review of Mock Test and Feedback	C45	Lecture
Review and Assessment	Final Exam Preparation	C46	Lecture
Review and Assessment	Final Exam	C47	Assessment
Review and Assessment	Review of Final Exam and Feedback	C48	Lecture
Review and Assessment	Future Trends in Corporate Finance and Emerging Topics	C49	Lecture
Review and Assessment	Doubt Clearing and Open Discussion	C50	Discussion
Review and Assessment	Final Wrap-Up and Course Summary	C51	Lecture

COM 302 – Advance Accounting

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction to Share Capital &	C1	Lecture

	Debentures		
Unit 1	Issue of shares: Concept and process of book building	C2	Lecture
Unit 1	Forfeiture and reissue of forfeited shares	C3	Lecture
Unit 1	Issue of rights and bonus shares	C4	Lecture
Unit 1	Buy back of shares	C5	Lecture
Unit 1	Redemption of preference shares	C6	Lecture
Unit 1	Issued and Redemption of Debentures	C7	Lecture
Unit 1	Practical Class: Issue, forfeiture, and reissue of shares	C8	Practical Class
Unit 1	Practical Class: Redemption of preference shares and debentures	C9	Practical Class
Unit 1	Case Study: Complex share capital transactions	C10	Case Study
Unit 1	Review and Q&A session	C11	Clarification Class
Unit 2	Preparation of Profit and Loss Account	C12	Lecture
Unit 2	Preparation of Balance Sheet for corporate entities	C13	Lecture
Unit 2	Disposal of company profits	C14	Lecture
Unit 2	Valuation of Goodwill: Concepts and calculations	C15	Lecture
Unit 2	Valuation of Shares: Concepts and calculations	C16	Lecture
Unit 2	Practical Class: Preparation of profit and loss account	C17	Practical Class
Unit 2	Practical Class: Balance sheet preparation and valuation problems	C18	Practical Class
Unit 2	Case Study: Profit allocation and distribution scenarios	C19	Case Study
Unit 2	Review and Q&A session	C20	Clarification Class
Unit 3	Concepts of Amalgamation of Companies	C21	Lecture
Unit 3	Accounting Treatment of Amalgamation as per AS-14	C22	Lecture
Unit 3	Internal Reconstruction: Concepts and accounting treatment	C23	Lecture
Unit 3	Excluding scheme of reconstruction: Detailed case studies	C24	Lecture
Unit 3	Practical Class: Amalgamation accounting problems	C25	Practical Class
Unit 3	Practical Class: Internal reconstruction case studies	C26	Practical Class
Unit 3	Case Study: Amalgamation of companies and reconstruction	C27	Case Study
Unit 3	Review and Q&A session	C28	Clarification Class
Unit 4	Introduction to Accounts of Holding Companies/Parent Companies	C29	Lecture
Unit 4	Preparation of consolidated balance	C30	Lecture

	sheet with one subsidiary		
Unit 4	Relevant provisions of AS-21 (ICAI)	C31	Lecture
Unit 4	Practical Class: Preparation of consolidated balance sheets	C32	Practical Class
Unit 4	Practical Class: Adjustments and disclosures in consolidation	C33	Practical Class
Unit 4	Case Study: Complex consolidation scenarios	C34	Case Study
Unit 4	Review and Q&A session	C35	Clarification Class
Unit 5	Differences between balance sheets of banking and non-banking companies	C36	Lecture
Unit 5	Prudential norms for banking companies	C37	Lecture
Unit 5	Asset structure of a commercial bank	C38	Lecture
Unit 5	Non-performing assets (NPA)	C39	Lecture
Unit 5	Concept of funds and preparation of cash flow statement	C40	Lecture
Unit 5	Preparation of cash flow statement as per Ind-AS	C41	Lecture
Unit 5	Practical Class: Differences between banking and non-banking companies	C42	Practical Class
Unit 5	Practical Class: Preparation of cash flow statements	C43	Practical Class
Unit 5	Case Study: Analyzing bank financial statements and NPAs	C44	Case Study
Unit 5	Review and Q&A session	C45	Clarification Class
Unit 5	Final Review and Practice	C46	Classroom Assignment
Unit 5	Exam Preparation and Doubt Clearing	C47	Clarification Class
Unit 5	Mock Test/Quiz	C48	Quiz
Unit 5	Evaluation and Feedback	C49	Lecture
Unit 5	Revision and Wrap-up	C50	Lecture
Unit 5	Group Discussion on Advanced Accounting Topics	C51	Group Discussion
Unit 5	Final Exam	C52	Assessment

COM 303 - Management Accounting for Business Decision

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Issue of Shares: Concept & Process	C1	Lecture
Unit 1	Forfeiture and Reissue of Forfeited Shares	C2	Lecture
Unit 1	Concept & Process of Book Building	C3	Lecture
Unit 1	Issue of Rights and Bonus Shares	C4	Lecture
Unit 1	Buy Back of Shares	C5	Lecture
Unit 1	Redemption of Preference Shares	C6	Lecture
Unit 1	Issue and Redemption of Debentures	C7	Lecture
Unit 1	Review and Practice: Share Capital and Debentures	C8	Classroom Assignment
Unit 1	Clarification and Review of Unit 1	C9	Clarification Class

Unit 2	Preparation of Profit and Loss Account	C10	Lecture
Unit 2	Preparation of Balance Sheet of Corporate Entities	C11	Lecture
Unit 2	Valuation of Goodwill: Concepts and Calculation	C12	Lecture
Unit 2	Valuation of Shares: Concepts and Calculation	C13	Lecture
Unit 2	Review and Practice: Final Accounts	C14	Classroom Assignment
Unit 2	Clarification and Review of Unit 2	C15	Clarification Class
Unit 3	Amalgamation of Companies: Concepts	C16	Lecture
Unit 3	Accounting Treatment as per Accounting Standard 14	C17	Lecture
Unit 3	Internal Reconstruction: Concepts and Treatment	C18	Lecture
Unit 3	Review and Practice: Amalgamation and Reconstruction	C19	Classroom Assignment
Unit 3	Clarification and Review of Unit 3	C20	Clarification Class
Unit 4	Preparation of Consolidated Balance Sheet: One Subsidiary	C21	Lecture
Unit 4	Relevant Provisions of Accounting Standard 21	C22	Lecture
Unit 4	Review and Practice: Accounts of Holding Companies	C23	Classroom Assignment
Unit 4	Clarification and Review of Unit 4	C24	Clarification Class
Unit 5	Difference Between Balance Sheet of Banking and Non-Banking Companies	C25	Lecture
Unit 5	Prudential Norms for Banking Companies	C26	Lecture
Unit 5	Asset Structure of a Commercial Bank	C27	Lecture
Unit 5	Non-Performing Assets (NPA)	C28	Lecture
Unit 5	Cash Flow Statement: Concept of Funds	C29	Lecture
Unit 5	Preparation of Cash Flow Statement as per Ind-AS	C30	Lecture
Unit 5	Review and Practice: Accounts of Banking Companies	C31	Classroom Assignment
Unit 5	Clarification and Review of Unit 5	C32	Clarification Class
Additional	Mock Test/Quiz	C33	Quiz
	Final Review and Preparation	C34	Classroom Assignment
	Course Wrap-up and Takeaways	C35	Lecture
	Open Session for Q&A and Additional Clarifications	C36	Q&A
	Review and Revisit Key Concepts	C37	Lecture
	Application of Skills in Practical Scenarios	C38	Activity
	Final Discussion and Feedback Collection	C39	Discussion
	Detailed Case Study: Accounting for Share Capital and Debentures	C40	Lecture
	Group Discussion on Amalgamation and Internal Reconstruction	C41	Activity
	Analysis of Final Accounts Preparation	C42	Lecture
	Workshop on Consolidated Balance Sheet Preparation	C43	Activity
	Review Session: Units 1 to 5	C44	Classroom Assignment

	In-Depth Discussion on Accounts of Banking Companies	C45	Discussion
	Case Studies on Amalgamation and Reconstruction	C46	Lecture
	Review and Practice: Banking Accounts and Cash Flow	C47	Classroom Assignment
	Comparative Study of Accounting Standards and Practices	C48	Lecture
	Mock Test/Quiz on Entire Syllabus	C49	Quiz
	Final Preparations and Revision	C50	Classroom Assignment
	Additional Q&A Session	C51	Q&A
	Recap and Discussion of Key Learnings	C52	Discussion
	Review of Student Projects/Assignments	C53	Activity
	Final Feedback and Course Evaluation	C54	Discussion
	Wrap-Up and Final Thoughts	C55	Lecture

COM 304 – Auditing

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction to Auditing: Definition and Objectives	C1	Lecture
Unit 1	Basic Principles and Techniques of Auditing	C2	Lecture
Unit 1	Classification of Audit and Audit Planning	C3	Lecture
Unit 1	Internal Control: Internal Check and Internal Audit	C4	Lecture
Unit 1	Audit Procedure: Vouching and Verification of Assets & Liabilities	C5	Lecture
Unit 1	Audit of Limited Companies: Auditor Qualifications and Disqualifications	C6	Lecture
Unit 1	Appointment, Rotation, Removal, and Remuneration of Auditors	C7	Lecture
Unit 1	Auditor's Rights and Duties	C8	Lecture
Unit 1	Auditor's Report: Contents and Types	C9	Lecture
Unit 1	Liabilities of Statutory Auditors under the Companies Act 2013	C10	Lecture
Unit 1	Practical Class: Audit Procedures and Internal Controls	C11	Practical Class
Unit 1	Practical Class: Auditor's Report and Liabilities	C12	Practical Class
Unit 1	Case Study: Real-world auditing scenarios	C13	Case Study
Unit 1	Review and Q&A session	C14	Clarification Class
Unit 2	Special Features of Cost Audit	C15	Lecture
Unit 2	Special Features of Tax Audit	C16	Lecture
Unit 2	Special Features of Management Audit	C17	Lecture
Unit 2	Recent Trends in Auditing: EDP Environment	C18	Lecture
Unit 2	Auditing Standards: Overview and Application	C19	Lecture

Unit 2	Relevant Case Studies and Problems	C20	Case Study
Unit 2	Practical Class: Cost, Tax, and Management Audits	C21	Practical Class
Unit 2	Practical Class: Applying Auditing Standards	C22	Practical Class
Unit 2	Review and Q&A session	C23	Clarification Class
Unit 3	Conceptual Framework of Corporate Governance	C24	Lecture
Unit 3	Theories and Models of Corporate Governance	C25	Lecture
Unit 3	Broad Committees in Corporate Governance	C26	Lecture
Unit 3	Corporate Governance Reforms	C27	Lecture
Unit 3	Major Corporate Scandals in India and Abroad	C28	Lecture
Unit 3	Common Governance Problems Noticed in Corporate Failures	C29	Lecture
Unit 3	Codes and Standards on Corporate Governance	C30	Lecture
Unit 3	Practical Class: Analysis of Corporate Governance Scandals	C31	Practical Class
Unit 3	Review and Q&A session	C32	Clarification Class
Unit 4	Morality and Ethics in Business	C33	Lecture
Unit 4	Business Values and Ethics	C34	Lecture
Unit 4	Approaches and Practices of Business Ethics	C35	Lecture
Unit 4	Corporate Ethics and Ethics Programs	C36	Lecture
Unit 4	Codes of Ethics and Ethics Committees	C37	Lecture
Unit 4	Ethical Behaviour: Concepts and Advantages	C38	Lecture
Unit 4	Rating Agencies and Green Governance	C39	Lecture
Unit 4	Clause 49 and Listing Agreement	C40	Lecture
Unit 4	Practical Class: Implementing Ethics Programs	C41	Practical Class
Unit 4	Practical Class: Ethical Decision-Making in Business	C42	Practical Class
Unit 4	Review and Q&A session	C43	Clarification Class
Unit 5	Concept of Corporate Social Responsibility (CSR)	C44	Lecture
Unit 5	Corporate Philanthropy and Strategic CSR Planning	C45	Lecture
Unit 5	CSR and Corporate Sustainability	C46	Lecture
Unit 5	CSR and Business Ethics	C47	Lecture
Unit 5	CSR and Corporate Governance	C48	Lecture
Unit 5	CSR Provisions under the Companies Act 2013	C49	Lecture
Unit 5	CSR Committee, Models, Codes, and Standards	C50	Lecture
Unit 5	Practical Class: CSR Implementation and Reporting	C51	Practical Class

Unit 5	Practical Class: Analyzing CSR Strategies	C52	Practical Class
Unit 5	Review and Q&A session	C53	Clarification Class
Unit 5	Final Review and Practice	C54	Classroom Assignment
Unit 5	Exam Preparation and Doubt Clearing	C55	Clarification Class
Unit 5	Mock Test/Quiz	C56	Quiz
Unit 5	Evaluation and Feedback	C57	Lecture
Unit 5	Revision and Wrap-up	C58	Lecture
Unit 5	Group Discussion on Advanced Topics	C59	Group Discussion

COM 305 - Financial Markets and Institutions

Unit	Particulars	Class No.	Pedagogy of Class
Unit I	Introduction to the Financial System: Nature and Role	C1	Lecture
Unit I	Financial System and Financial Markets	C2	Lecture
Unit I	Government Intervention in the Financial System	C3	Lecture
Unit I	Informal vs. Formal Financial Systems	C4	Lecture
Unit I	Components of Formal Financial System: Institutions, Intermediaries, Markets	C5	Lecture
Unit I	Functions and Weaknesses of the Indian Financial System	C6	Lecture
Unit I	Practical Session: Analysis of Financial System Components	C7	Practical Exercise
Unit I	Case Studies on Financial System Components	C8	Practical Exercise
Unit I	Group Discussion: Recent Developments in Financial Systems	C9	Discussion
Unit I	Review and Q&A: Financial System	C10	Clarification Class
Unit II	Introduction to Financial Markets: Money Market vs. Capital Market	C11	Lecture
Unit II	Money Market Instruments: T Bills, CPs, CDs	C12	Lecture
Unit II	Capital Market: Primary vs. Secondary	C13	Lecture
Unit II	Methods of Raising Capital	C14	Lecture
Unit II	Derivative Concepts: Basics and Applications	C15	Lecture
Unit II	Role of SEBI in Financial Markets	C16	Lecture
Unit II	Practical Session: Analysis of Financial Markets Instruments	C17	Practical Exercise
Unit II	Advanced Concepts in Capital Markets and Derivatives	C18	Practical Exercise

Unit II	Case Study: Market Trends and Instruments	C19	Practical Exercise
Unit II	Review and Q&A: Financial Markets	C20	Clarification Class
Unit III	Introduction to Financial Services: Fund Based vs. Fee Based Services	C21	Lecture
Unit III	Conceptual Aspects of Factoring, Forfeiting, and Credit Rating	C22	Lecture
Unit III	Bill Discounting, Leasing, and Securitization	C23	Lecture
Unit III	Consumer Finance: Concepts and Applications	C24	Lecture
Unit III	Strategic Decisions: Factoring, Leasing, and Mergers & Acquisitions	C25	Lecture
Unit III	Practical Session: Evaluating Financial Services	C26	Practical Exercise
Unit III	Case Studies on Financial Services and Strategic Decisions	C27	Practical Exercise
Unit III	Role Play: Financial Services Consultation	C28	Practical Exercise
Unit III	Review and Q&A: Financial Services	C29	Clarification Class
Unit IV	Introduction to Insurance: Basic Concepts and Types	C30	Lecture
Unit IV	Introduction to Mutual Funds: Basic Concepts and Types	C31	Lecture
Unit IV	Role of IRDA in Insurance	C32	Lecture
Unit IV	Role of AMFI in Mutual Funds	C33	Lecture
Unit IV	Practical Session: Understanding Insurance and Mutual Fund Products	C34	Practical Exercise
Unit IV	Case Studies on Insurance and Mutual Funds	C35	Practical Exercise
Unit IV	Group Discussion: Recent Trends in Insurance and Mutual Funds	C36	Discussion
Unit IV	Review and Q&A: Insurance and Mutual Funds	C37	Clarification Class
Unit V	Introduction to Banking: Overview of Banking Activities	C38	Lecture
Unit V	Retail Banking: Concepts, Forms, and Products	C39	Lecture
Unit V	Corporate Banking: Meaning, Nature, Functions, and Products	C40	Lecture
Unit V	Practical Session: Analysis of Retail and Corporate Banking Products	C41	Practical Exercise
Unit V	Advanced Topics in Banking	C42	Practical Exercise
Unit V	Case Studies on Banking Practices and Products	C43	Practical Exercise
Unit V	Group Discussion: Innovations in Banking	C44	Discussion
Unit V	Review and Q&A: Banking	C45	Clarification Class
Review and Assessment	Revision Class for All Units	C46	Revision
Review and Assessment	Mock Test and Assessment	C47	Assessment
Review and	Review of Mock Test and Feedback	C48	Lecture

Assessment			
Review and Assessment	Final Exam Preparation	C49	Lecture
Review and Assessment	Future Trends in Financial Systems and Services	C50	Lecture
Review and Assessment	Doubt Clearing and Open Discussion	C51	Discussion
Review and Assessment	Final Wrap-Up and Course Summary	C52	Lecture

COM 306 – Marketing Management

Unit	Particulars	Class No.	Pedagogy of Class
Unit I	**Introduction to Marketing**		
Unit I	Marketing: Meaning, Nature, Scope, and Importance	C1	Lecture
Unit I	Marketing Philosophies	C2	Lecture
Unit I	Marketing Mix: Concept and Elements	C3	Lecture
Unit I	Marketing Environment: Concept and Need	C4	Lecture
Unit I	Micro Environmental Factors: Company and Suppliers	C5	Lecture
Unit I	Micro Environmental Factors: Marketing Intermediaries and Customers	C6	Lecture
Unit I	Micro Environmental Factors: Competitors and Publics	C7	Lecture
Unit I	Macro Environmental Factors: Demographic and Economic	C8	Lecture
Unit I	Macro Environmental Factors: Natural and Technological	C9	Lecture
Unit I	Macro Environmental Factors: Politico-Legal and Socio-Cultural	C10	Lecture
Unit I	Case Study: Analyzing Marketing Environment	C11	Case Study Analysis
Unit I	Review and Clarification of Unit I	C12	Clarification Class
Unit II	**Consumer Behaviour and Market Selection**		
Unit II	Need for Studying Consumer Behaviour	C13	Lecture
Unit II	Stages in Consumer Buying Decision Process	C14	Lecture
Unit II	Factors Influencing Consumer Buying Decisions	C15	Lecture
Unit II	Market Segmentation: Concept and Importance	C16	Lecture
Unit II	Market Segmentation: Levels and Bases	C17	Lecture
Unit II	Market Targeting: Concept and Factors	C18	Lecture
Unit II	Product Positioning: Concept and Bases	C19	Lecture
Unit II	Product Differentiation: Concept and Bases	C20	Lecture

Unit II	Case Study: Consumer Behaviour and Market Selection	C21	Case Study Analysis
Unit II	Review and Clarification of Unit II	C22	Clarification Class
Unit III	**Product and Pricing Decisions**		
Unit III	Product Concept and Classification	C23	Lecture
Unit III	Levels of Product	C24	Lecture
Unit III	Product-Mix Dimensions	C25	Lecture
Unit III	Branding: Concept, Functions, and Qualities of a Good Brand Name	C26	Lecture
Unit III	Packaging and Labeling: Concept and Functions	C27	Lecture
Unit III	Product Support Services	C28	Lecture
Unit III	New Product Development Process	C29	Lecture
Unit III	Pricing Decisions: Concept and Objectives	C30	Lecture
Unit III	Factors Affecting the Price of a Product	C31	Lecture
Unit III	Pricing Methods and Strategies	C32	Lecture
Unit III	Case Study: Product and Pricing Decisions	C33	Case Study Analysis
Unit III	Review and Clarification of Unit III	C34	Clarification Class
Unit IV	**Distribution and Promotion Decisions**		
Unit IV	Channels of Distribution: Meaning and Importance	C35	Lecture
Unit IV	Types of Distribution Channels and Their Functions	C36	Lecture
Unit IV	Factors Affecting Choice of Distribution Channel	C37	Lecture
Unit IV	Distribution Logistics: Concept and Major Decisions	C38	Lecture
Unit IV	Wholesaling and Retailing	C39	Lecture
Unit IV	Promotion: Nature and Importance	C40	Lecture
Unit IV	Promotion Mix: Advertising, Personal Selling, Sales Promotion, Public Relations, and Direct Marketing	C41	Lecture
Unit IV	Factors Influencing Promotion Mix Decisions	C42	Lecture
Unit IV	Case Study: Distribution and Promotion Decisions	C43	Case Study Analysis
Unit IV	Review and Clarification of Unit IV	C44	Clarification Class
Unit V	**Developments in Marketing**		
Unit V	Relationship Marketing	C45	Lecture
Unit V	Sustainable Marketing	C46	Lecture
Unit V	Rural Marketing	C47	Lecture
Unit V	Social Marketing	C48	Lecture
Unit V	Digital Marketing: Concepts and Techniques	C49	Lecture
Unit V	Legal Issues in Marketing: The Consumer Protection Act, 1986	C50	Lecture
Unit V	Ethical Issues in Marketing	C51	Lecture
Unit V	Case Study: Developments in Marketing	C52	Case Study Analysis
Unit V	Review and Clarification of Unit V	C53	Clarification Class
Unit V	Comprehensive Review and Exam	C54	Review Class

	Preparation		
Unit V	Additional Practice and Q&A	C55	Practice/ Q&A

COM 307 – Principles of Banking

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Definition and Functions of Banks	C1	Lecture
Unit 1	History and Evolution of Banking	C2	Lecture
Unit 1	Types of Banks: Commercial, Cooperative, Development, etc.	C3	Lecture
Unit 1	Role of Banks in the Economy	C4	Lecture
Unit 1	Review and Practice: Introduction to Banking	C5	Classroom Assignment
Unit 1	Case Study: Evolution of Banking Systems	C6	Lecture
Unit 1	Discussion: Comparative Analysis of Different Bank Types	C7	Discussion
Unit 1	Workshop: Role of Banks in Economic Development	C8	Activity
Unit 1	Clarification and Review of Unit 1	C9	Clarification Class
Unit 2	Structure of the Indian Banking System	C10	Lecture
Unit 2	Reserve Bank of India (RBI): Functions and Role	C11	Lecture
Unit 2	Public Sector Banks, Private Sector Banks, Foreign Banks, and Regional Rural Banks	C12	Lecture
Unit 2	Banking Sector Reforms and Their Impact	C13	Lecture
Unit 2	Review and Practice: Banking Structure in India	C14	Classroom Assignment
Unit 2	Case Study: Impact of Banking Reforms on Indian Economy	C15	Lecture
Unit 2	Discussion: Differences between Various Types of Banks	C16	Discussion
Unit 2	Workshop: Analyzing the RBI's Role in Financial Stability	C17	Activity
Unit 2	Clarification and Review of Unit 2	C18	Clarification Class
Unit 3	Types of Accounts: Savings, Current, Recurring, and Fixed Deposit	C19	Lecture
Unit 3	Principles of Lending: Types of Loans and Advances	C20	Lecture
Unit 3	Loan Appraisal and Credit Monitoring	C21	Lecture
Unit 3	Banking Services: Agency Services, General Utility Services, E-Banking	C22	Lecture
Unit 3	Negotiable Instruments: Cheques, Promissory Notes, Bills of Exchange	C23	Lecture
Unit 3	Review and Practice: Banking Operations	C24	Classroom Assignment
Unit 3	Case Study: Real-life Applications of Various Banking Services	C25	Lecture
Unit 3	Discussion: Challenges in Loan Appraisal and Credit Monitoring	C26	Discussion
Unit 3	Workshop: Practical Exercises with Negotiable Instruments	C27	Activity

Unit 3	Clarification and Review of Unit 3	C28	Clarification Class
Unit 4	Regulatory Framework: Banking Regulation Act, RBI Act	C29	Lecture
Unit 4	Prudential Norms: Capital Adequacy, Asset Classification, Provisioning	C30	Lecture
Unit 4	Role of Regulatory Bodies: RBI, SEBI, IRDA	C31	Lecture
Unit 4	Anti-Money Laundering (AML) and Know Your Customer (KYC) Guidelines	C32	Lecture
Unit 4	Review and Practice: Regulation and Supervision of Banks	C33	Classroom Assignment
Unit 4	Case Study: Impact of AML and KYC Regulations	C34	Lecture
Unit 4	Discussion: Challenges in Implementing Prudential Norms	C35	Discussion
Unit 4	Workshop: Understanding the Role of Regulatory Bodies	C36	Activity
Unit 4	Clarification and Review of Unit 4	C37	Clarification Class
Unit 5	Core Banking Solutions (CBS)	C38	Lecture
Unit 5	Electronic Funds Transfer (EFT), RTGS, NEFT	C39	Lecture
Unit 5	Digital Banking: Internet Banking, Mobile Banking, ATMs	C40	Lecture
Unit 5	Cybersecurity and Fraud Management in Banking	C41	Lecture
Unit 5	Review and Practice: Technology in Banking	C42	Classroom Assignment
Unit 5	Case Study: Implementation of Core Banking Solutions	C43	Lecture
Unit 5	Discussion: Challenges and Solutions in Digital Banking	C44	Discussion
Unit 5	Workshop: Practical Exercises in Cybersecurity for Banks	C45	Activity
Unit 5	Clarification and Review of Unit 5	C46	Clarification Class
Additional	Mock Test/Quiz	C47	Quiz
Additional	Final Review and Preparation	C48	Classroom Assignment
Additional	Course Wrap-up and Takeaways	C49	Lecture
Additional	Open Session for Q&A and Additional Clarifications	C50	Q&A
Additional	Review and Revisit Key Concepts	C51	Lecture
Additional	Application of Skills in Practical Scenarios	C52	Activity
Additional	Final Discussion and Feedback Collection	C53	Discussion
Additional	Detailed Case Study: Banking Operations and Technology	C54	Lecture
Additional	Group Discussion on Banking Regulations and Technology	C55	Activity
Additional	Analysis of Recent Banking Reforms and Technologies	C56	Lecture
Additional	Workshop on Practical Banking Skills	C57	Activity
Additional	Review Session: Units 1 to 5	C58	Classroom Assignment
Additional	In-Depth Discussion on Regulation and Supervision	C59	Discussion
Additional	Case Studies on Banking Technology and	C60	Lecture

	Fraud Management		
Additional	Review and Practice: Banking Technology and Security	C61	Classroom Assignment
Additional	Comparative Study of Banking Systems	C62	Lecture
Additional	Mock Test/Quiz on Entire Syllabus	C63	Quiz
Additional	Final Preparations and Revision	C64	Classroom Assignment
Additional	Additional Q&A Session	C65	Q&A

COM 308- Happiness and Mental Well Being

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction to Happiness and Mental Well-being: Definition and Significance	C1	Lecture
Unit 1	Factors Influencing Happiness and Mental Well-being	C2	Lecture
Unit 1	Relationship Between Happiness and Life Satisfaction	C3	Lecture
Unit 1	Practical Class: Assessing Personal Happiness and Well-being	C4	Practical Class
Unit 1	Case Study: Analysis of Factors Affecting Happiness	C5	Case Study
Unit 1	Review and Q&A session	C6	Clarification Class
Unit 2	Core Concepts and Theories of Positive Psychology	C7	Lecture
Unit 2	Positive Psychology Interventions for Enhancing Well-being	C8	Lecture
Unit 2	Strategies for Developing a Positive Mindset	C9	Lecture
Unit 2	Cultivating Positive Emotions	C10	Lecture
Unit 2	Practical Class: Applying Positive Psychology Interventions	C11	Practical Class
Unit 2	Practical Class: Techniques for Developing a Positive Mindset	C12	Practical Class
Unit 2	Case Study: Real-world Application of Positive Psychology	C13	Case Study
Unit 2	Review and Q&A session	C14	Clarification Class
Unit 3	Concept of Emotional Intelligence and Its Components	C15	Lecture
Unit 3	Enhancing Self-awareness and Emotional Self-regulation	C16	Lecture
Unit 3	Techniques for Applying Emotional Intelligence	C17	Lecture
Unit 3	Emotional Intelligence in Personal and Professional Contexts	C18	Lecture
Unit 3	Practical Class: Self-assessment of Emotional Intelligence	C19	Practical Class
Unit 3	Practical Class: Techniques for Emotional Self-regulation	C20	Practical Class
Unit 3	Case Study: Emotional Intelligence in Workplace Scenarios	C21	Case Study

Unit 3	Review and Q&A session	C22	Clarification Class
Unit 4	Sources and Impacts of Stress	C23	Lecture
Unit 4	Stress Management Techniques for Personal and Professional Life	C24	Lecture
Unit 4	Developing Resilience Skills	C25	Lecture
Unit 4	Practical Class: Applying Stress Management Techniques	C26	Practical Class
Unit 4	Practical Class: Building Resilience through Real-life Scenarios	C27	Practical Class
Unit 4	Case Study: Stress and Resilience in High-pressure Situations	C28	Case Study
Unit 4	Review and Q&A session	C29	Clarification Class
Unit 5	Concept of Mindfulness and Its Benefits	C30	Lecture
Unit 5	Mindfulness Techniques for Stress Reduction	C31	Lecture
Unit 5	Developing Self-care Routines and Strategies	C32	Lecture
Unit 5	Practical Class: Mindfulness Meditation Practices	C33	Practical Class
Unit 5	Practical Class: Creating and Maintaining a Self-care Routine	C34	Practical Class
Unit 5	Case Study: Implementing Mindfulness and Self-care Strategies	C35	Case Study
Unit 5	Review and Q&A session	C36	Clarification Class
Unit 5	Final Review and Practice	C37	Classroom Assignment
Unit 5	Exam Preparation and Doubt Clearing	C38	Clarification Class
Unit 5	Mock Test/Quiz	C39	Quiz
Unit 5	Evaluation and Feedback	C40	Lecture
Unit 5	Revision and Wrap-up	C41	Lecture
Unit 5	Group Discussion on Mental Well-being Strategies	C42	Group Discussion

COM 309 – Soft Skill

Unit	Particulars	Class No.	Pedagogy of Class
Unit I	Communication: Meaning, Importance, and Process	C1	Lecture
Unit I	Objectives of Communication	C2	Lecture
Unit I	Media and Types of Communication	C3	Lecture
Unit I	Phonetic Symbols and Transcriptions	C4	CT-Lab

Unit I	Word Formation	C5	CT-Lab
Unit I	Practical Class: Applying Phonetic Symbols	C6	Practical Class
Unit I	Practical Class: Word Formation Exercises	C7	Practical Class
Unit I	Review and Q&A session	C8	Clarification Class
Unit II	Verbal and Non-Verbal Communication	C9	Lecture
Unit II	Formal and Informal Channels of Communication	C10	Lecture
Unit II	Qualities of Good Communication	C11	Lecture
Unit II	Affixes	C12	CT-Lab
Unit II	Listening and Speaking Skills	C13	CT-Lab
Unit II	Practical Class: Applying Affixes	C14	Practical Class
Unit II	Practical Class: Listening and Speaking Exercises	C15	Practical Class
Unit II	Case Study: Analyzing Effective Communication Strategies	C16	Case Study
Unit II	Review and Q&A session	C17	Clarification Class
Unit III	Barriers to Communication	C18	Lecture
Unit III	Professional Communication	C19	Lecture
Unit III	Interpersonal Communication and Methods to Improve It	C20	Lecture
Unit III	Words Often Mis-spelt and Mis-pronounced	C21	CT-Lab
Unit III	One Word for Many	C22	CT-Lab
Unit III	Practical Class: Correcting Mis-spellings and Pronunciations	C23	Practical Class
Unit III	Practical Class: Exercises on One Word for Many	C24	Practical Class
Unit III	Role Play: Professional and Interpersonal Communication	C25	Activity
Unit III	Review and Q&A session	C26	Clarification Class
Unit IV	Subject-Verb Agreement (Concord)	C27	Lecture
Unit IV	Linking Words (Conjunctions)	C28	Lecture
Unit IV	Relative Clauses	C29	Lecture
Unit IV	Common Errors	C30	Lecture
Unit IV	Synonyms and Antonyms	C31	CT-Lab
Unit IV	Seminar Presentation	C32	CT-Lab
Unit IV	Practical Class: Using Linking Words and Relative Clauses	C33	Practical Class
Unit IV	Practical Class: Identifying and Correcting Common Errors	C34	Practical Class
Unit IV	Review and Q&A session	C35	Clarification Class
Unit V	Resume Writing	C36	Lecture
Unit V	Business Letter Writing: Sales, Credit, Enquiry, Order, Claim, Complaint, Job	C37	Lecture

	Applications		
Unit V	E-mail Messages	C38	Lecture
Unit V	Telephone Etiquettes	C39	Lecture
Unit V	Group Discussion	C40	CT-Lab
Unit V	Job Interview	C41	CT-Lab
Unit V	Practical Class: Writing and Reviewing Resumes	C42	Practical Class
Unit V	Practical Class: Drafting and Reviewing Business Letters	C43	Practical Class
Unit V	Practical Class: Composing Effective E-mails	C44	Practical Class
Unit V	Practical Class: Practicing Telephone Etiquettes	C45	Practical Class
Unit V	Review and Q&A session	C46	Clarification Class
Unit V	Final Review and Practice	C47	Classroom Assignment
Unit V	Exam Preparation and Doubt Clearing	C48	Clarification Class
Unit V	Mock Test/Quiz	C49	Quiz
Unit V	Evaluation and Feedback	C50	Lecture

Semester IV

SN	Paper Code	Course		Periods			Evaluation Scheme					Credits
		Type	Title	L	T	P	Sessional Exams			ETE	Total	
							MT	TA	Total			
1	COM-401	Core	Income Tax law and Practice	4	0	0	20	40	60	40	100	4
2	COM-402	Core	Company Law	4	0	0	20	40	60	40	100	4
3	COM-403	Core	Financial Management	4	0	0	20	40	60	40	100	4
4	COM-404	DSE	Investment Banking	4	0	0	20	40	60	40	100	4
5	COM-405	GE	E-Business	4	0	0	20	40	60	40	100	4
6	COM-406	VAC	Business Communication - II	2	0	0	10	20	30	20	50	2
Total											**550**	**22**

MT- MID TERM

IA-INTERNAL ASSESSMENTETE- END TERM EXAM

L-Lecture, T-Tutorial, P-Practical

Course	Course outcomes: - After completion of these courses' students should be able to
Semester – IV	
Income Tax law and Practice	**CO1:** Understand the basic concepts and provisions of Income Tax Law in India, including residential status and tax incidence. **CO2:** Calculate taxable income under different heads of income, such as salaries, house property, profits and gains of business or profession, capital gains, and other sources. **CO3:** Apply the provisions related to deductions, exemptions, and rebates to minimize tax liability legally. **CO4:** Prepare and file income tax returns for individuals, including the assessment of tax liabilities and payment of taxes. **CO5:** Analyze tax planning strategies for individuals and small businesses to optimize tax benefits while ensuring compliance with the law.
Company Law	**CO1:** Understand the fundamental principles of Company Law, including the nature, types, and formation of companies. **CO2:** Analyze the legal framework governing corporate governance, including the roles, duties, and liabilities of directors and key officers. **CO3:** Evaluate the legal procedures for raising and managing corporate capital, including issues related to shares, debentures, and dividends. **CO4:** Apply the rules and regulations concerning corporate restructuring, mergers, and winding-up processes within the legal framework. **CO5:** Examine the legal compliance requirements for companies under the Companies Act, 2013, and assess their implications for corporate management.
Financial Management	**CO1:** Understand and apply key financial management concepts, including capital budgeting, financial analysis, and working capital management. **CO2:** Evaluate financial statements and ratios to assess the financial health and performance of an organization. **CO3:** Develop and implement strategies for managing financial risk and making investment decisions. **CO4:** Analyze the cost of capital and its impact on financial decisions and corporate valuation. **CO5:** Apply financial management tools and techniques to make informed decisions regarding capital structure and dividend policies.

Investment Banking	**CO1:** Understand the roles and functions of investment banks in capital markets, including underwriting, advisory services, and trading. **CO2:** Analyze the processes and techniques involved in mergers and acquisitions, including valuation and deal structuring. **CO3:** Evaluate investment opportunities and risks using financial modeling and analysis techniques. **CO4:** Apply regulatory and compliance standards related to investment banking operations and practices. **CO5:** Develop strategies for capital raising and restructuring through various financial instruments and investment vehicles.
E-Business	**CO1:** Understand the key components and technologies of e-business, including e-commerce platforms, digital marketing, and online payment systems. **CO2:** Analyze the impact of e-business strategies on traditional business models and competitive advantage. **CO3:** Evaluate the legal, ethical, and security issues related to conducting business online. **CO4:** Develop and implement e-business strategies to enhance customer engagement and operational efficiency. **CO5:** Apply tools and techniques for measuring the performance and effectiveness of e-business initiatives.
Business Communication – II	**CO1:** Demonstrate effective written communication skills through the preparation of business reports, proposals, and formal correspondence. **CO2:** Understand and apply principles of effective oral communication, including presentations, meetings, and negotiations. **CO3:** Analyze and respond to business communication challenges, such as conflict resolution and intercultural communication. **CO4:** Apply advanced techniques in digital and social media communication for business purposes. **CO5:** Evaluate and improve communication strategies and practices within organizational contexts to enhance productivity and collaboration.

Mapping: Semester – IV

COM-401	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2		2
CO2	3	2	3	3	2	3
CO3	2		2	2		3
CO4	2	2	2	2	2	2
CO5	3		3	3		3

COM-402	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	3		2
CO2		3	3	2	2	3
CO3	3	3	3	2	3	3
CO4	2			3	3	1
CO5	1	2	1		2	

COM-403	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2		2			2
CO2		2	1	3	1	
CO3				2	2	
CO4		2		1		
CO5	3	3	3	3	3	3

COM - 404	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	2	2	3	3
CO2	1	-	2	-	-	1
CO3	-	2	2	2	3	-
CO4	-	2	2	2	-	3
CO5	-	2	2	2	-	3

COM-405	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	2	3	3	2	3
CO2	-	3	3	2	1	-
CO3	1	1	2	3	3	-
CO4	1	1	2	1	-	2
CO5	2	2	3	1	-	2

COM-406	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2		2
CO2	2	2	3	2	2	3
CO3	3	2	3	1	3	2

CO4	2			3	3	1
CO5		3	2	2	1	2

Semester IV Lesson Plans

COM 401 - Income Tax law and Practice

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Overview of Income Tax: Definition, Purpose, and Importance	C1	Lecture
Unit 1	Historical Development and Evolution of Tax Laws	C2	Lecture
Unit 1	Legal Framework: Income Tax Act Overview	C3	Lecture
Unit 1	Central Board of Direct Taxes (CBDT) and Its Role	C4	Lecture
Unit 1	Tax Authorities and Their Functions	C5	Lecture
Unit 1	Tax Residency: Concept and Scope	C6	Lecture
Unit 1	Residential Status of Individuals and Entities	C7	Lecture
Unit 1	Scope of Taxation: Residents vs. Non-residents	C8	Lecture
Unit 1	Assessment Year and Financial Year: Definitions and Differences	C9	Lecture
Unit 1	Review and Practice: Introduction to Income Tax Law	C10	Classroom Assignment
Unit 1	Case Study: Historical Evolution of Tax Laws	C11	Lecture
Unit 1	Discussion: Tax Residency and Scope of Taxation	C12	Discussion
Unit 1	Workshop: Determining Residential Status and Scope of Taxation	C13	Activity
Unit 1	Clarification and Review of Unit 1	C14	Clarification Class
Unit 2	Income from Salaries: Components and Calculation	C15	Lecture
Unit 2	Allowances, Perquisites, and Deductions in Salary Income	C16	Lecture
Unit 2	Income from House Property: Types and Computation	C17	Lecture
Unit 2	Deductions under Section 24(b) for House Property	C18	Lecture
Unit 2	Income from Business or Profession: Definition and Accounting Methods	C19	Lecture
Unit 2	Deductible Expenses and Capital Gains	C20	Lecture
Unit 2	Classification of Capital Gains: Long-term vs. Short-term	C21	Lecture
Unit 2	Exemptions under Section 54, 54EC	C22	Lecture
Unit 2	Income from Other Sources: Nature, Taxability, and Deductions	C23	Lecture
Unit 2	Review and Practice: Computation of Income	C24	Classroom Assignment

Unit 2	Case Study: Practical Computation of Income from Various Sources	C25	Lecture
Unit 2	Discussion: Tax Treatment of Salaries, House Property, and Business Income	C26	Discussion
Unit 2	Workshop: Computation of Income from Different Sources	C27	Activity
Unit 2	Clarification and Review of Unit 2	C28	Clarification Class
Unit 3	Deductions under Chapter VI-A: Key Sections (80C, 80D, 80E, etc.)	C29	Lecture
Unit 3	Exemptions under the Income Tax Act: Section 10 and Special Exemptions	C30	Lecture
Unit 3	Rebates under Section 87A and Relief under Section 89	C31	Lecture
Unit 3	Principles of Tax Planning vs. Tax Avoidance	C32	Lecture
Unit 3	Tax-Free Investments and Savings Instruments	C33	Lecture
Unit 3	Review and Practice: Deductions, Exemptions, and Tax Planning	C34	Classroom Assignment
Unit 3	Case Study: Tax Planning and Deductions	C35	Lecture
Unit 3	Discussion: Effective Tax Planning Strategies	C36	Discussion
Unit 3	Workshop: Maximizing Deductions and Exemptions	C37	Activity
Unit 3	Clarification and Review of Unit 3	C38	Clarification Class
Unit 4	Assessment Procedures: Types and Filing Returns	C39	Lecture
Unit 4	Notice and Scrutiny Procedures	C40	Lecture
Unit 4	Tax Audit: Requirements and Procedures	C41	Lecture
Unit 4	Auditor's Report and Compliance	C42	Lecture
Unit 4	Appeals and Revision: Filing Appeals and Appellate Authorities	C43	Lecture
Unit 4	Penalties and Prosecutions for Non-compliance	C44	Lecture
Unit 4	Review and Practice: Assessment Procedures and Tax Administration	C45	Classroom Assignment
Unit 4	Case Study: Tax Audit and Compliance	C46	Lecture
Unit 4	Discussion: Appeals and Penalties	C47	Discussion
Unit 4	Workshop: Navigating the Assessment and Appeal Process	C48	Activity
Unit 4	Clarification and Review of Unit 4	C49	Clarification Class
Unit 5	Tax Collection and Refunds: Methods and Procedures	C50	Lecture
Unit 5	Electronic Filing: E-filing Returns and Digital Signatures	C51	Lecture
Unit 5	Cybersecurity in Tax Administration	C52	Lecture
Unit 5	Recent Amendments and Case Laws: Overview and Implications	C53	Lecture

Unit 5	Review and Practice: Technology and Recent Changes	C54	Classroom Assignment
Unit 5	Case Study: Impact of Recent Amendments	C55	Lecture
Unit 5	Discussion: Challenges in Electronic Filing and Cybersecurity	C56	Discussion
Unit 5	Workshop: Implementing New Tax Laws and Technologies	C57	Activity
Unit 5	Clarification and Review of Unit 5	C58	Clarification Class
Additional	Mock Test/Quiz	C59	Quiz
Additional	Final Review and Preparation	C60	Classroom Assignment
Additional	Course Wrap-Up and Takeaways	C61	Lecture
Additional	Open Session for Q&A and Additional Clarifications	C62	Q&A
Additional	Review and Revisit Key Concepts	C63	Lecture
Additional	Application of Skills in Practical Scenarios	C64	Activity
Additional	Final Discussion and Feedback Collection	C65	Discussion

COM 402 - Company Law

Unit 1	Overview of Company Law: Definition, Nature, and Historical Development	C1	Lecture
Unit 1	The Companies Act, 2013: Key Provisions and Objectives	C2	Lecture
Unit 1	Types of Companies: Public, Private, OPC, and Special Types	C3	Lecture
Unit 1	Incorporation: Steps, MOA, and AOA	C4	Lecture
Unit 1	Corporate Personality and Lifting the Corporate Veil	C5	Lecture
Unit 1	Role, Functions, and Liabilities of Promoters	C6	Lecture
Unit 1	Review and Practice: Introduction to Company Law	C7	Classroom Assignment
Unit 1	Case Study: Historical Development and Key Provisions	C8	Case Study
Unit 1	Workshop: Formation and Incorporation of a Company	C9	Workshop
Unit 1	Clarification and Review of Unit 1	C10	Clarification Class
Unit 2	Share Capital: Types, Issue, and Reduction	C11	Lecture
Unit 2	Shares and Shareholders: Rights, Liabilities, Transfer, and Transmission	C12	Lecture
Unit 2	Debentures and Borrowings: Types, Differences, and Borrowing Powers	C13	Lecture
Unit 2	Membership in a Company: Methods, Rights, and Duties	C14	Lecture
Unit 2	Prospectus: Definition, Types, and Liability for Misstatements	C15	Lecture
Unit 2	Review and Practice: Capital Structure	C16	Classroom Assignment

	and Membership		
Unit 2	Case Study: Rights and Liabilities of Shareholders and Debenture Holders	C17	Case Study
Unit 2	Workshop: Preparation of Prospectus and Legal Requirements	C18	Workshop
Unit 2	Clarification and Review of Unit 2	C19	Clarification Class
Unit 3	Directors: Appointment, Qualifications, and Disqualifications	C20	Lecture
Unit 3	Board of Directors: Structure, Functions, and Meetings	C21	Lecture
Unit 3	Committees of the Board: Audit, Nomination, and Remuneration Committees	C22	Lecture
Unit 3	Corporate Governance: Principles and CSR	C23	Lecture
Unit 3	Meetings and Resolutions: Types, Notice, Quorum, and Conduct	C24	Lecture
Unit 3	Role and Duties of a Company Secretary	C25	Lecture
Unit 3	Review and Practice: Management and Administration	C26	Classroom Assignment
Unit 3	Case Study: Corporate Governance and CSR	C27	Case Study
Unit 3	Workshop: Conducting Company Meetings and Passing Resolutions	C28	Workshop
Unit 3	Clarification and Review of Unit 3	C29	Clarification Class
Unit 4	Preparation of Financial Statements: Balance Sheet and Profit & Loss Account	C30	Lecture
Unit 4	Legal Requirements for Financial Statements and Statutory Records	C31	Lecture
Unit 4	Audit and Auditors: Appointment, Rights, Duties, and Types of Audits	C32	Lecture
Unit 4	Dividends: Declaration, Payment, and Rules Governing Dividends	C33	Lecture
Unit 4	Corporate Frauds: Definition, Role of Auditors, and Legal Remedies	C34	Lecture
Unit 4	Books of Accounts and Financial Statements: Statutory Books and Disclosure Requirements	C35	Lecture
Unit 4	Review and Practice: Accounts, Audits, and Dividends	C36	Classroom Assignment
Unit 4	Case Study: Role of Auditors in Detecting Corporate Frauds	C37	Case Study
Unit 4	Workshop: Preparation and Auditing of Financial Statements	C38	Workshop
Unit 4	Clarification and Review of Unit 4	C39	Clarification Class
Unit 5	Winding Up of Companies: Modes, Procedures, and Role of Liquidators	C40	Lecture

Unit 5	Mergers and Acquisitions: Definition, Legal Process, and Role of NCLT	C41	Lecture
Unit 5	Corporate Restructuring: Concept, Methods, and Impact	C42	Lecture
Unit 5	Oppression and Mismanagement: Concept, Rights of Minority Shareholders	C43	Lecture
Unit 5	Recent Developments in Company Law: Amendments, Key Case Laws, and Emerging Trends	C44	Lecture
Unit 5	Review and Practice: Winding Up, Mergers, and Restructuring	C45	Classroom Assignment
Unit 5	Case Study: Legal Process of Mergers and Role of NCLT	C46	Case Study
Unit 5	Workshop: Handling Corporate Restructuring and Oppression Cases	C47	Workshop
Unit 5	Clarification and Review of Unit 5	C48	Clarification Class
Additional	Mock Test/Quiz	C49	Quiz
Additional	Final Review and Preparation	C50	Classroom Assignment
Additional	Course Wrap-Up and Takeaways	C51	Lecture
Additional	Open Session for Q&A and Additional Clarifications	C52	Q&A
Additional	Review and Revisit Key Concepts	C53	Lecture
Additional	Application of Skills in Practical Scenarios	C54	Activity
Additional	Final Discussion and Feedback Collection	C55	Discussion

COM 403 - Financial Management

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Overview of Financial Management: Definition, Scope, Objectives (Profit vs. Wealth Maximization)	C1	Lecture
Unit 1	Role and Functions of a Finance Manager	C2	Lecture
Unit 1	Financial Environment: Overview of Financial Markets and Institutions, Regulatory Bodies	C3	Lecture
Unit 1	Introduction to Risk and Return Concepts	C4	Lecture
Unit 1	Time Value of Money: Concept and Importance	C5	Lecture
Unit 1	Present Value and Future Value Calculations	C6	Practice Session
Unit 1	Annuities and Perpetuities	C7	Practice Session
Unit 1	Financial Planning: Concept, Importance, and Steps in Financial Planning	C8	Lecture
Unit 1	Types of Financial Plans: Short-term and Long-term	C9	Lecture
Unit 1	Review and Practice: Introduction to Financial Management	C10	Classroom Assignment

Unit 1	Case Study: Time Value of Money Applications	C11	Case Study
Unit 1	Clarification and Review of Unit 1	C12	Clarification Class
Unit 2	Capital Budgeting: Definition, Importance, and Types of Decisions	C13	Lecture
Unit 2	Techniques of Capital Budgeting: Payback Period, ARR	C14	Lecture
Unit 2	Discounted Cash Flow Methods: NPV, IRR, Profitability Index	C15	Lecture
Unit 2	Practice Session: Capital Budgeting Techniques	C16	Practice Session
Unit 2	Risk Analysis in Capital Budgeting: Sensitivity, Scenario, and Simulation	C17	Lecture
Unit 2	Decision Tree Analysis	C18	Lecture
Unit 2	Capital Rationing: Concept and Methods	C19	Lecture
Unit 2	Selection of Projects under Capital Rationing	C20	Practice Session
Unit 2	Review and Practice: Capital Budgeting and Investment Decisions	C21	Classroom Assignment
Unit 2	Case Study: Real-world Capital Budgeting Decisions	C22	Case Study
Unit 2	Clarification and Review of Unit 2	C23	Clarification Class
Unit 3	Sources of Finance: Long-term and Short-term	C24	Lecture
Unit 3	Cost of Capital: Concept, Importance, and Computation of Cost of Equity, Debt, Preference Shares	C25	Lecture
Unit 3	Weighted Average Cost of Capital (WACC)	C26	Practice Session
Unit 3	Capital Structure: Factors Influencing Decisions	C27	Lecture
Unit 3	Theories of Capital Structure: Net Income Approach, Net Operating Income Approach	C28	Lecture
Unit 3	Theories of Capital Structure: Modigliani-Miller Theorem, Trade-off, and Pecking Order Theory	C29	Lecture
Unit 3	Leverage: Types (Operating, Financial, Combined) and Impact on Shareholder Returns	C30	Lecture
Unit 3	Practice Session: Cost of Capital and Leverage Calculations	C31	Practice Session
Unit 3	Review and Practice: Financing Decisions	C32	Classroom Assignment
Unit 3	Case Study: Financing and Capital Structure Decisions	C33	Case Study
Unit 3	Clarification and Review of Unit 3	C34	Clarification Class
Unit 4	Working Capital Management: Definition, Importance, and Factors Affecting	C35	Lecture

	Requirements		
Unit 4	Working Capital Cycle and Operating Cycle	C36	Lecture
Unit 4	Cash Management: Objectives, Cash Flow Analysis, and Budgeting	C37	Lecture
Unit 4	Techniques for Managing Cash	C38	Practice Session
Unit 4	Receivables Management: Credit Policy, Terms, and Collection Policy	C39	Lecture
Unit 4	Techniques for Managing Receivables: Ageing Schedule, Average Collection Period	C40	Practice Session
Unit 4	Inventory Management: Objectives, Techniques (EOQ, ABC Analysis, JIT)	C41	Lecture
Unit 4	Impact of Inventory Management on Working Capital	C42	Lecture
Unit 4	Practice Session: Working Capital Management Techniques	C43	Practice Session
Unit 4	Review and Practice: Working Capital Management	C44	Classroom Assignment
Unit 4	Case Study: Cash and Receivables Management	C45	Case Study
Unit 4	Clarification and Review of Unit 4	C46	Clarification Class
Unit 5	Dividend Policy: Importance, Factors, and Types	C47	Lecture
Unit 5	Theories of Dividend Policy: Relevance (Walter, Gordon) and Irrelevance (Modigliani-Miller)	C48	Lecture
Unit 5	Dividend Policy in Practice	C49	Lecture
Unit 5	Financial Analysis: Techniques (Ratio, Trend, Common-size Statements)	C50	Lecture
Unit 5	Analysis of Financial Statements: Profitability, Liquidity, Solvency, and Activity Ratios	C51	Practice Session
Unit 5	Corporate Restructuring: Mergers, Acquisitions, Financial Strategies for Growth and Stability	C52	Lecture
Unit 5	Impact of Corporate Restructuring on Financial Performance	C53	Lecture
Unit 5	Review and Practice: Dividend Decisions and Financial Analysis	C54	Classroom Assignment
Unit 5	Case Study: Mergers, Acquisitions, and Financial Restructuring	C55	Case Study
Unit 5	Clarification and Review of Unit 5	C56	Clarification Class
Additional	Mock Test/Quiz	C57	Quiz
Additional	Final Review and Preparation	C58	Classroom Assignment
Additional	Course Wrap-Up and Takeaways	C59	Lecture
Additional	Open Session for Q&A and Additional Clarifications	C60	Q&A
Additional	Review and Revisit Key Concepts	C61	Lecture

Additional	Application of Skills in Practical Scenarios	C62	Activity
Additional	Final Discussion and Feedback Collection	C63	Discussion

COM 404 – Investment Banking

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Overview of Investment Banking: Definition, Scope, Evolution, Key Functions	C1	Lecture
Unit 1	Investment Banking vs. Commercial Banking: Differences and Roles	C2	Lecture
Unit 1	Key Players in the Investment Banking Industry	C3	Lecture
Unit 1	Regulatory Environment: Framework Governing Investment Banks, SEBI, RBI, International Regulators	C4	Lecture
Unit 1	Compliance and Ethical Issues in Investment Banking	C5	Lecture
Unit 1	Investment Banking Products and Services: Advisory, Underwriting, Asset Management	C6	Lecture
Unit 1	Case Study: Ethical Issues and Compliance in Investment Banking	C7	Case Study
Unit 1	Review and Practice: Introduction to Investment Banking	C8	Classroom Assignment
Unit 1	Clarification and Review of Unit 1	C9	Clarification Class
Unit 2	Capital Markets: Structure, Role of Investment Banks, ECM, DCM	C10	Lecture
Unit 2	Securities Underwriting: Definition, Importance, Types	C11	Lecture
Unit 2	Underwriting Process: IPOs, Follow-on Offerings, Private Placements	C12	Lecture
Unit 2	Initial Public Offerings (IPOs): Process, Valuation, Pricing, Allocation	C13	Lecture
Unit 2	Debt Issuance and Syndication: Role of Investment Banks, Debt Instruments	C14	Lecture
Unit 2	Practice Session: Valuation of Companies for IPOs	C15	Practice Session
Unit 2	Case Study: Real-world IPO and Underwriting Decisions	C16	Case Study
Unit 2	Clarification and Review of Unit 2	C17	Clarification Class
Unit 3	Mergers and Acquisitions (M&A): Definition, Types, Motives	C18	Lecture
Unit 3	Role of Investment Banks in M&A	C19	Lecture
Unit 3	M&A Process: Stages, Target Identification, Valuation, Negotiation	C20	Lecture
Unit 3	Due Diligence in M&A Transactions, Legal and Regulatory Considerations	C21	Lecture

Unit 3	Valuation Techniques: DCF, Comparable Company Analysis, Precedent Transactions	C22	Lecture
Unit 3	Practice Session: Valuation and Deal Structuring in M&A	C23	Practice Session
Unit 3	Post-Merger Integration: Challenges and Role of Investment Banks	C24	Lecture
Unit 3	Case Study: Successful and Unsuccessful Mergers	C25	Case Study
Unit 3	Clarification and Review of Unit 3	C26	Clarification Class
Unit 4	Private Equity and Venture Capital: Definition, Differences, Role of Investment Banks	C27	Lecture
Unit 4	Raising Capital for Startups: Stages of Funding, Role of Venture Capitalists	C28	Lecture
Unit 4	Private Equity Buyouts: LBOs, Role of Investment Banks, Exit Strategies	C29	Lecture
Unit 4	Risk and Return in Private Equity and Venture Capital: Risk Assessment and Mitigation	C30	Lecture
Unit 4	Practice Session: Leveraged Buyouts (LBOs) and Risk Assessment	C31	Practice Session
Unit 4	Case Study: Private Equity and Venture Capital Deals	C32	Case Study
Unit 4	Clarification and Review of Unit 4	C33	Clarification Class
Unit 5	Financial Advisory Services: Scope, Role of Investment Banks in Corporate Finance Advisory	C34	Lecture
Unit 5	Asset Management: Introduction, Types of Services (Mutual Funds, Hedge Funds, Pension Funds)	C35	Lecture
Unit 5	Risk Management in Investment Banking: Market Risk, Credit Risk, Operational Risk	C36	Lecture
Unit 5	Recent Trends: Impact of Technology, FinTech, Robo-Advisors, Sustainable Finance	C37	Lecture
Unit 5	Practice Session: Asset Management Strategies	C38	Practice Session
Unit 5	Case Study: Financial Advisory and Asset Management	C39	Case Study
Unit 5	Clarification and Review of Unit 5	C40	Clarification Class
Additional	Mock Test/Quiz	C41	Quiz
Additional	Final Review and Preparation	C42	Classroom Assignment
Additional	Course Wrap-Up and Takeaways	C43	Lecture
Additional	Open Session for Q&A and Additional Clarifications	C44	Q&A
Additional	Review and Revisit Key Concepts	C45	Lecture

Additional	Application of Skills in Practical Scenarios	C46	Activity
Additional	Final Discussion and Feedback Collection	C47	Discussion
Additional	Extra Sessions for In-Depth Topics (if needed)	C48	Lecture/Discussion
Additional	Revision of Key Case Studies	C49	Case Study
Additional	Final Clarifications and Exam Preparation	C50	Clarification Class

COM 405 – E-Business

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Overview of E-Business: Definition, Concept, Evolution, Difference from Traditional Business	C1	Lecture
Unit 1	Advantages and Challenges of E-Business	C2	Lecture
Unit 1	E-Business Models: Types and Functions (B2B, B2C, C2C, C2B, B2G)	C3	Lecture
Unit 1	E-Marketplaces: Types and Functions	C4	Lecture
Unit 1	Revenue Models in E-Business	C5	Lecture
Unit 1	Digital Transformation in Business: Impact and Role in Globalization	C6	Lecture
Unit 1	Case Study: Successful E-Business Models	C7	Case Study
Unit 1	Review and Practice: Introduction to E-Business	C8	Classroom Assignment
Unit 1	Clarification and Review of Unit 1	C9	Clarification Class
Unit 2	E-Business Infrastructure: Technology Overview (Internet, Intranet, Extranet)	C10	Lecture
Unit 2	E-Business Platforms and Tools	C11	Lecture
Unit 2	Cloud Computing and Its Role in E-Business	C12	Lecture
Unit 2	Web Development for E-Business: Basics of Website Design and Development	C13	Lecture
Unit 2	User Interface (UI) and User Experience (UX) in E-Business	C14	Lecture
Unit 2	Content Management Systems (CMS) for E-Business	C15	Lecture
Unit 2	Payment Systems in E-Business: Electronic Payment Systems	C16	Lecture
Unit 2	Security and Privacy Issues in Online Transactions	C17	Lecture
Unit 2	Emerging Payment Technologies: Cryptocurrencies and Blockchain	C18	Lecture
Unit 2	Practice Session: Web Development and Payment Systems	C19	Practice Session
Unit 2	Case Study: Payment Systems and	C20	Case Study

	Security		
Unit 2	Clarification and Review of Unit 2	C21	Clarification Class
Unit 3	Strategic Planning for E-Business: Developing an E-Business Strategy	C22	Lecture
Unit 3	Analyzing Market Opportunities and Threats	C23	Lecture
Unit 3	E-Business Competitive Strategies: Cost Leadership, Differentiation, and Focus	C24	Lecture
Unit 3	E-Marketing Strategies: SEO, SEM, Social Media Marketing, Email Marketing	C25	Lecture
Unit 3	Customer Relationship Management (CRM) in E-Business	C26	Lecture
Unit 3	Personalization and Targeted Marketing in E-Business	C27	Lecture
Unit 3	Supply Chain Management in E-Business: Role and Integration	C28	Lecture
Unit 3	E-Procurement and E-Logistics	C29	Lecture
Unit 3	Practice Session: E-Marketing and Supply Chain Management	C30	Practice Session
Unit 3	Case Study: E-Business Strategies and CRM	C31	Case Study
Unit 3	Clarification and Review of Unit 3	C32	Clarification Class
Unit 4	Legal Framework for E-Business: Overview of Laws and Regulations	C33	Lecture
Unit 4	Intellectual Property Rights in E-Business	C34	Lecture
Unit 4	Consumer Protection and Privacy Laws	C35	Lecture
Unit 4	Ethical Issues in E-Business: Ethical Practices and Data Protection	C36	Lecture
Unit 4	Cybercrime and Its Impact on E-Business	C37	Lecture
Unit 4	Security Measures in E-Business: Encryption, Firewalls, SSL	C38	Lecture
Unit 4	Legal Compliance in E-Business: GDPR, IT Act, etc.	C39	Lecture
Unit 4	Risk Management in E-Business	C40	Lecture
Unit 4	Case Study: Legal and Ethical Issues in E-Business	C41	Case Study
Unit 4	Clarification and Review of Unit 4	C42	Clarification Class
Unit 5	Emerging Trends in E-Business: Mobile Commerce (M-Commerce)	C43	Lecture
Unit 5	Social Commerce and Its Impact on E-Business	C44	Lecture
Unit 5	Artificial Intelligence (AI) and Machine Learning in E-Business	C45	Lecture
Unit 5	E-Business in the Global Context: Cross-Border E-Business, Localization, and Customization	C46	Lecture
Unit 5	E-Business Challenges in Developing	C47	Lecture

	Countries		
Unit 5	Innovations in E-Business: IoT, Augmented Reality (AR), and Virtual Reality (VR)	C48	Lecture
Unit 5	Sustainability and Green E-Business Practices	C49	Lecture
Unit 5	Future Challenges and Opportunities in E-Business	C50	Lecture
Unit 5	Practice Session: Emerging Trends and Innovations	C51	Practice Session
Unit 5	Case Study: Future Trends and Innovations in E-Business	C52	Case Study
Unit 5	Clarification and Review of Unit 5	C53	Clarification Class
Additional	Mock Test/Quiz	C54	Quiz
Additional	Final Review and Preparation	C55	Classroom Assignment
Additional	Course Wrap-Up and Takeaways	C56	Lecture
Additional	Open Session for Q&A and Additional Clarifications	C57	Q&A
Additional	Review and Revisit Key Concepts	C58	Lecture
Additional	Application of Skills in Practical Scenarios	C59	Activity
Additional	Final Discussion and Feedback Collection	C60	Discussion

COM 406 – Business Communication - II

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Professional Business Correspondence: Advanced Techniques in Business Letters (Complaint, Adjustment, Follow-Up)	C1	Lecture
Unit 1	Writing Effective Business Proposals and Reports	C2	Lecture
Unit 1	Crafting Persuasive and Informative Business Communication	C3	Lecture
Unit 1	Email and Digital Communication: Best Practices for Professional Email Communication	C4	Lecture
Unit 1	Writing for Digital Media: Blogs, Newsletters, and Social Media Posts	C5	Lecture
Unit 1	Managing Digital Communication: Etiquette and Tools	C6	Lecture
Unit 1	Technical Documentation: Principles of Technical Writing: Manuals, User Guides, Instructional Materials	C7	Lecture
Unit 1	Structuring and Designing Technical Documents	C8	Lecture
Unit 1	Tools and Software for Technical Writing	C9	Lecture
Unit 1	Practice Session: Business Writing and Technical Documentation	C10	Practice Session

Unit 1	Case Study: Effective Business and Technical Communication	C11	Case Study
Unit 1	Clarification and Review of Unit 1	C12	Clarification Class
Unit 2	Effective Oral Communication: Principles of Effective Speaking (Clarity, Conciseness, Confidence)	C13	Lecture
Unit 2	Techniques for Engaging and Persuasive Speech	C14	Lecture
Unit 2	Handling Q&A Sessions and Discussions	C15	Lecture
Unit 2	Presentation Skills: Structuring and Designing Effective Presentations	C16	Lecture
Unit 2	Use of Visual Aids and Presentation Software (e.g., PowerPoint, Prezi)	C17	Lecture
Unit 2	Delivering Presentations with Impact: Voice Modulation, Body Language, Engagement	C18	Lecture
Unit 2	Public Speaking and Professional Speaking: Overcoming Nervousness and Building Confidence	C19	Lecture
Unit 2	Strategies for Addressing Various Audiences (Internal, External, Mixed)	C20	Lecture
Unit 2	Analyzing and Learning from Effective Speakers	C21	Lecture
Unit 2	Practice Session: Oral Communication and Presentation Skills	C22	Practice Session
Unit 2	Case Study: Effective Public Speaking and Presentations	C23	Case Study
Unit 2	Clarification and Review of Unit 2	C24	Clarification Class
Unit 3	Interpersonal Communication Skills: Building Effective Relationships through Communication	C25	Lecture
Unit 3	Techniques for Active Listening and Empathy	C26	Lecture
Unit 3	Conflict Resolution and Negotiation Skills	C27	Lecture
Unit 3	Team Communication: Importance of Communication in Teamwork	C28	Lecture
Unit 3	Strategies for Effective Team Meetings and Collaboration	C29	Lecture
Unit 3	Roles and Responsibilities in Team Communication	C30	Lecture
Unit 3	Cross-Cultural Communication: Understanding Cultural Differences and Their Impact on Communication	C31	Lecture
Unit 3	Strategies for Effective Cross-Cultural Communication	C32	Lecture
Unit 3	Managing Communication in Diverse Work Environments	C33	Lecture
Unit 3	Practice Session: Interpersonal and Team Communication	C34	Practice Session

Unit 3	Case Study: Effective Communication in Teams and Cross-Cultural Situations	C35	Case Study
Unit 3	Clarification and Review of Unit 3	C36	Clarification Class
Unit 4	Strategic Communication Planning: Developing Communication Strategies for Business Goals	C37	Lecture
Unit 4	Crafting Communication Plans for Different Stakeholders	C38	Lecture
Unit 4	Measuring the Effectiveness of Communication Strategies	C39	Lecture
Unit 4	Crisis Communication: Principles and Management	C40	Lecture
Unit 4	Developing a Crisis Communication Plan	C41	Lecture
Unit 4	Case Studies of Crisis Communication in Businesses	C42	Case Study
Unit 4	Brand Communication and Corporate Image: Building and Maintaining a Positive Brand Image	C43	Lecture
Unit 4	Strategies for Corporate Communication and Public Relations	C44	Lecture
Unit 4	Managing Communication During Organizational Change	C45	Lecture
Unit 4	Practice Session: Strategic and Crisis Communication	C46	Practice Session
Unit 4	Clarification and Review of Unit 4	C47	Clarification Class
Unit 5	Social Media Communication: Strategies and Management	C48	Lecture
Unit 5	Managing Social Media Presence and Brand Image	C49	Lecture
Unit 5	Measuring Social Media Impact and Engagement	C50	Lecture
Unit 5	Virtual Communication and Remote Work: Tools and Techniques for Effective Virtual Communication	C51	Lecture
Unit 5	Best Practices for Remote Team Communication and Collaboration	C52	Lecture
Unit 5	Addressing Challenges of Remote Work Communication	C53	Lecture
Unit 5	Emerging Trends in Business Communication: AI, Automation, and Future Trends	C54	Lecture
Unit 5	Adapting to Changes in Communication Technologies and Platforms	C55	Lecture
Unit 5	Practice Session: Digital Communication and Social Media	C56	Practice Session
Unit 5	Case Study: Effective Digital and Remote Communication	C57	Case Study
Unit 5	Clarification and Review of Unit 5	C58	Clarification Class
Additional	Mock Test/Quiz	C59	Quiz

Additional	Final Review and Preparation	C60	Classroom Assignment

Semester V												
SN	**Paper Code**	**Course**		**Periods**			**Evaluation Scheme**					**Credits**
		Type	**Title**	**L**	**T**	**P**	**Sessional Exams**			**ETE**	**Total**	
							MT	**TA**	**Total**			
1	COM-501	AECC	Environmental Science and Sustainable Development	4	0	0	20	40	60	40	100	4
2	COM-502	Core	Management Accounting	4	0	0	20	40	60	40	100	4
3	COM-503	Core	Business Law	4	0	0	20	40	60	40	100	4
4	COM-504	DSE	International Finance	4	0	0	20	40	60	40	100	4
5	COM-505	GE	Entrepreneurial Management	4	0	0	20	40	60	40	100	4
6	COM-506	VAC	Internship	2	0	0	10	20	30	20	50	2
Total											**550**	**22**

MT- MID TERM
IA-INTERNAL ASSESSMENTETE- END TERM EXAM

L-Lecture, T-Tutorial, P-Practical

Course	Course outcomes: - After completion of these courses' students should be able to
Semester – V	
Environmental Science and Sustainable Development	**CO1:** Explain fundamental environmental science concepts, including ecosystems, biodiversity, and natural resource management. **CO2:** Analyze sustainable development principles and apply them to real-world scenarios. **CO3:** Identify and evaluate environmental challenges and their impact on ecosystems and human societies. **CO4:** Understand and assess environmental policies and regulations, advocating for sustainable practices. **CO5:** Develop and propose sustainable solutions for environmental issues in business and everyday life.
Management Accounting	**CO1**: Differentiate between cost accounting and management accounting in various business contexts. **CO2**: Perform income determination and breakeven analysis using both absorption and variable costing methods. **CO3:** Conduct cost volume profit analysis to assess financial impacts of business decisions. **CO4**: Implement standard costing techniques to monitor and control material, labor, overhead, and sales variances. **CO5**: Create and administer functional, flexible, and zero based budgets for strategic and operational purposes.
Business Law	**CO1:** Understand the general nature of contracts, differentiate between contracts and agreements, and identify agreements that are not considered contracts. **CO2:** Recognize and classify various types of contracts, and comprehend the distinctions between them. **CO3:** Assess the essential elements for the formation of a valid contract, including proposal, acceptance, and consideration, and determine the presence of these elements in given scenarios. **CO4:** Analyze the principles of free consent, contractual capacity, legality of object, and identify void agreements, applying these concepts to real-world situations. **CO5:** Understand the processes involved in the performance, discharge, and breach of contracts, and apply the appropriate remedies for breach of contract and the nuances of contingent and quasi-contracts.

International Finance	**CO1**: Understand the increasing interdependence in the global economy and the theories of various international trade. **CO2**: Analyze and compile balance of payments accounts and evaluate their importance and limitations, particularly in the Indian context. **CO3**: Identify the structure, participants, and mechanics of the foreign exchange market, and apply concepts such as arbitrage, forward rates, and parity theorems. **CO4**: Implement effective short term financial management strategies, including cash management techniques like netting and pooling, and manage exposure through offshore invoicing centers. **CO5**: Understand and analyze the formation and functions of trade blocks, and the structure and agreements of WTO, GATT, and EXIM policy, including TRIPS, TRIMS, and GATS.
Entrepreneurial Management	**CO1**: Understand the concept of entrepreneurship in the context of Indian economic scenario. **CO2**: Link the individual's capability and strength as a guiding factor towards entrepreneurial orientation. **CO3**: Understand social support system for gaining strength towards entrepreneurial preferences. **CO4**: Understand entrepreneurial process for initiating new venture creation. **CO5**: Understand various dimensions of managing a business enterprise once it is formed.
Internship	**CO1:** Apply theoretical knowledge to practical business situations and operations within a real-world organizational context. **CO2:** Develop critical thinking and problem-solving skills by analyzing business processes and identifying areas for improvement. **CO3:** Demonstrate professional communication and interpersonal skills through interactions with colleagues and supervisors in a workplace setting. **CO4:** Gain hands-on experience in specific business functions, such as accounting, finance, marketing, or management, and understand their integration within the organization. **CO5:** Prepare a detailed internship report that reflects the learning outcomes and experiences gained during the internship, and present findings effectively in a professional manner.

Mapping: Semester – V

COM-501	PO1	PO2	PO3	PO4	PO5	PO6
CO1		2		2	3	
CO2	3		2	2	3	2
CO3	2	3	1	1		3
CO4	2	2	2		3	3

COM-502	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	-	3	2	3
CO2	2	2	3	1	1	-
CO3	3	3	2	3	3	2
CO4	2	2	1	1	2	2
CO5	3	3	2	2	3	3

COM-503	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2		2
CO2	2	2	3	2	2	3
CO3	3	2	3	1	3	2
CO4	2			3	3	1
CO5		3	2	2	1	2

COM-504	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2	2	2
CO2	2	2	2	2	3	
CO3	1		2	2	3	3
CO4			2	2	3	2
CO5	3	3	3	3	3	3

COM-505	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	3	2	3
CO2	2	2	2	3	3	3
CO3	2	3	3	-	3	2
CO4	2	-	2	3	2	2
CO5	3	3	2	2	2	2

COM-506	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2	-	2
CO2	-	2	3	2	2	3
CO3	3	2	3	1	3	2
CO4	2	-	-	3	3	1
CO5	3	2	1	3	3	1

Semester V – Lesson Plans

COM 501 – Environmental Science and Sustainable Development

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Definition; Scope and importance; Need for public awareness	C1	Lecture
Unit 1	Multidisciplinary approach to environmental studies	C2	Lecture
Unit 1	Role of various disciplines in environmental studies	C3	Lecture
Unit 1	Public awareness campaigns and initiatives	C4	Case Study
Unit 1	Role of NGOs in environmental awareness	C5	Lecture
Unit 1	Role of media and communication in environmental awareness	C6	Lecture
Unit 1	Clarification and Review of Unit 1	C7	Clarification Class
Unit 2	Introduction to natural resources and associated problems	C8	Lecture
Unit 2	Forest resources: Use and overexploitation, deforestation, case studies	C9	Lecture
Unit 2	Impact of timber extraction, mining, dams on forests and tribal people	C10	Lecture
Unit 2	Water resources: Use, overutilization, conflicts, and case studies	C11	Lecture
Unit 2	Mineral resources: Use, exploitation, environmental effects, case studies	C12	Lecture
Unit 2	Food resources: World food problems, changes from agriculture, case studies	C13	Lecture
Unit 2	Energy resources: Growing needs, renewable/nonrenewable sources, case studies	C14	Lecture
Unit 2	Land resources: Land degradation, soil erosion, desertification, case studies	C15	Lecture
Unit 2	Role of an individual in conservation of natural resources	C16	Lecture
Unit 2	Equitable use of resources for sustainable lifestyles	C17	Lecture
Unit 2	Practice Session: Resource conservation and sustainable lifestyles	C18	Practice Session
Unit 2	Case Study: Resource management and its impact	C19	Case Study
Unit 2	Clarification and Review of Unit 2	C20	Clarification Class
Unit 3	Concept of an ecosystem; Structure and function of an ecosystem	C21	Lecture
Unit 3	Producers, consumers, and decomposers	C22	Lecture
Unit 3	Energy flow in the ecosystem; Ecological	C23	Lecture

	succession		
Unit 3	Food chains, food webs, and ecological pyramids	C24	Lecture
Unit 3	Forest ecosystem: Characteristics and functions	C25	Lecture
Unit 3	Grassland ecosystem: Characteristics and functions	C26	Lecture
Unit 3	Desert ecosystem: Characteristics and functions	C27	Lecture
Unit 3	Aquatic ecosystems: Ponds, streams, lakes, rivers, ocean, estuaries	C28	Lecture
Unit 3	Case Study: Ecosystem dynamics	C29	Case Study
Unit 3	Practice Session: Ecosystem analysis	C30	Practice Session
Unit 3	Clarification and Review of Unit 3	C31	Clarification Class
Unit 4	Introduction to biodiversity: Genetic, species, ecosystem diversity	C32	Lecture
Unit 4	Biogeographical classification of India	C33	Lecture
Unit 4	Value of biodiversity: Consumptive, productive, social, ethical values	C34	Lecture
Unit 4	Biodiversity at global, national, and local levels	C35	Lecture
Unit 4	India as a megadiversity nation	C36	Lecture
Unit 4	Hotspots of biodiversity	C37	Lecture
Unit 4	Threats to biodiversity: Habitat loss, poaching, conflicts	C38	Lecture
Unit 4	Endangered and endemic species of India	C39	Lecture
Unit 4	Conservation of biodiversity: Insitu and Exsitu methods	C40	Lecture
Unit 4	Case Study: Biodiversity conservation initiatives	C41	Case Study
Unit 4	Practice Session: Biodiversity conservation methods	C42	Practice Session
Unit 4	Clarification and Review of Unit 4	C43	Clarification Class
Unit 5	Definition; Causes, effects, and control measures of Air pollution	C44	Lecture
Unit 5	Water pollution: Causes, effects, and control measures	C45	Lecture
Unit 5	Soil pollution: Causes, effects, and control measures	C46	Lecture
Unit 5	Marine pollution: Causes, effects, and control measures	C47	Lecture
Unit 5	Noise pollution: Causes, effects, and control measures	C48	Lecture
Unit 5	Thermal pollution: Causes, effects, and control measures	C49	Lecture
Unit 5	Nuclear pollution: Causes, effects, and control measures	C50	Lecture
Unit 5	Solid waste management: Causes, effects,	C51	Lecture

	and control measures		
Unit 5	Role of an individual in prevention of pollution	C52	Lecture
Unit 5	Pollution case studies	C53	Case Study
Unit 5	Disaster management: Floods, earthquakes, cyclones, landslides	C54	Lecture
Unit 5	Practice Session: Pollution prevention techniques	C55	Practice Session
Unit 5	Case Study: Disaster management practices	C56	Case Study
Unit 5	Clarification and Review of Unit 5	C57	Clarification Class
Additional	Mock Test/Quiz	C58	Quiz
Additional	Final Review and Preparation	C59	Classroom Assignment
Additional	Discussion on key topics and Q&A session	C60	Discussion
Additional	Student presentations on environmental topics	C61	Presentation
Additional	Practical demonstration: Resource conservation and management	C62	Practical Session
Additional	Project work: Environmental case studies	C63	Project Work
Additional	Group discussion: Environmental policies and public awareness	C64	Group Discussion
Additional	Final Review and Wrap-up	C65	Review Session

COM 502 – Management Accounting

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Nature and Scope: Introduction to Cost Accounting and Management Accounting	C1	Lecture
Unit 1	Differences between Cost Accounting and Management Accounting	C2	Lecture
Unit 1	Cost Control: Techniques and Importance	C3	Lecture
Unit 1	Cost Reduction: Concepts, Strategies, and Applications	C4	Lecture
Unit 1	Cost Management: Scope and Emerging Trends	C5	Lecture
Unit 1	Practical Approaches to Cost Management	C6	Lecture
Unit 1	Case Study: Cost Control vs. Cost Reduction	C7	Case Study
Unit 1	Practice Session: Exercises on Cost Management	C8	Practice Session
Unit 1	Case Study: Successful Cost Reduction Strategies in Companies	C9	Case Study
Unit 1	Clarification and Review of Unit 1	C10	Clarification Class
Unit 2	Absorption vs. Variable Costing:	C11	Lecture

	Introduction and Distinctive Features		
Unit 2	Income Determination under Absorption and Variable Costing	C12	Lecture
Unit 2	Cost-Volume-Profit (CVP) Analysis: Introduction and Concepts	C13	Lecture
Unit 2	Breakeven Analysis: Algebraic and Graphic Methods	C14	Lecture
Unit 2	Contribution/Sales Ratio and Key Factor Analysis	C15	Lecture
Unit 2	Margin of Safety and Angle of Incidence	C16	Lecture
Unit 2	Determination of Cost Indifference Point	C17	Lecture
Unit 2	Case Study: Application of CVP Analysis in Business Decisions	C18	Case Study
Unit 2	Practice Session: Problems on Breakeven and Cost Indifference Point	C19	Practice Session
Unit 2	In-depth Analysis: CVP in Service Industries	C20	Lecture
Unit 2	Case Study: Breakeven Analysis in Real-World Scenarios	C21	Case Study
Unit 2	Clarification and Review of Unit 2	C22	Clarification Class
Unit 3	Standard Costing: Introduction, Meaning, and Applications	C23	Lecture
Unit 3	Variance Analysis: Meaning and Importance	C24	Lecture
Unit 3	Material Variance Analysis: Calculation and Interpretation	C25	Lecture
Unit 3	Labour Variance Analysis: Calculation and Interpretation	C26	Lecture
Unit 3	Overhead Variance Analysis: Fixed and Variable Overhead Variances	C27	Lecture
Unit 3	Sales Variance Analysis: Calculation and Application	C28	Lecture
Unit 3	Disposition of Variances and Control Ratios	C29	Lecture
Unit 3	Practice Session: Exercises on Material, Labour, and Overhead Variances	C30	Practice Session
Unit 3	Application of Variance Analysis in Modern Businesses	C31	Lecture
Unit 3	Case Study: Real-World Application of Variance Analysis	C32	Case Study
Unit 3	Clarification and Review of Unit 3	C33	Clarification Class
Unit 4	Budgeting and Budgetary Control: Introduction and Objectives	C34	Lecture
Unit 4	Types of Budgets: Functional, Fixed, and Flexible Budgets	C35	Lecture
Unit 4	Zero Base Budgeting: Concept, Advantages, and Applications	C36	Lecture

Unit 4	Programme and Performance Budgeting: Techniques and Application	C37	Lecture
Unit 4	Budget Administration: Process, Challenges, and Strategies	C38	Lecture
Unit 4	Case Study: Budgeting and Control in Large Organizations	C39	Case Study
Unit 4	Practice Session: Preparation of Functional Budgets	C40	Practice Session
Unit 4	Practical Challenges in Budget Administration	C41	Lecture
Unit 4	Case Study: Zero-Based Budgeting in Real Business Applications	C42	Case Study
Unit 4	Clarification and Review of Unit 4	C43	Clarification Class
Unit 5	Decision Making: Introduction to Costs for Decision Making	C44	Lecture
Unit 5	Variable Costing and Differential Analysis in Decision Making	C45	Lecture
Unit 5	Fixation of Selling Price: Strategies and Cost Considerations	C46	Lecture
Unit 5	Exploring New Markets: Costing and Pricing Considerations	C47	Lecture
Unit 5	Make or Buy Decisions: Cost Analysis and Strategic Considerations	C48	Lecture
Unit 5	Product Mix Decisions: Maximizing Profitability through Cost Analysis	C49	Lecture
Unit 5	Operate or Shut Down Decisions: Cost Considerations and Long-Term Impact	C50	Lecture
Unit 5	Case Study: Decision Making in a Competitive Market	C51	Case Study
Unit 5	Practice Session: Decision Making Exercises (Fixation of Price, Make or Buy, Product Mix)	C52	Practice Session
Unit 5	Advanced Decision Making: Case Scenarios	C53	Lecture
Unit 5	Clarification and Review of Unit 5	C54	Clarification Class
Additional	Mock Test/Quiz on Entire Syllabus	C55	Quiz
Additional	Final Review and Preparation for Examination	C56	Classroom Assignment

COM 503 – Business Law

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	An overview of Sections 1 to 75 covering the general nature of contract	C1	Lecture
Unit 1	Contract vs. Agreement	C2	Lecture

Unit 1	Agreements which are not contracts	C3	Lecture
Unit 1	Classification of contracts	C4	Lecture
Unit 1	Proposal: Definition and Essentials	C5	Lecture
Unit 1	Acceptance: Definition and Essentials	C6	Lecture
Unit 1	Communication and Revocation of Proposal and Acceptance	C7	Lecture
Unit 1	Consideration: Definition and Essentials	C8	Lecture
Unit 1	Case Study: Proposal & Acceptance	C9	Case Study
Unit 1	Practice Session: Drafting Contract Proposals	C10	Practice Session
Unit 1	Mock Contracts: Real-Life Scenarios	C11	Practice Session
Unit 1	Clarification and Review of Unit 1	C12	Clarification Class
Unit 2	Free consent: Coercion, Undue Influence, Fraud, Misrepresentation, and Mistake	C13	Lecture
Unit 2	Contractual capacity: Minors, Persons of Unsound Mind, Disqualified Persons	C14	Lecture
Unit 2	Legality of object and consideration	C15	Lecture
Unit 2	Void agreements: Types and Legal Consequences	C16	Lecture
Unit 2	Case Study: Free Consent and Void Agreements	C17	Case Study
Unit 2	Practice Session: Analyzing Real-Life Contracts	C18	Practice Session
Unit 2	Problem Solving: Application of Free Consent and Void Agreements	C19	Lecture
Unit 2	Clarification and Review of Unit 2	C20	Clarification Class
Unit 3	Performance of contract: Rules and Regulations	C21	Lecture
Unit 3	Discharge of contract: Modes and Legal Implications	C22	Lecture
Unit 3	Breach of contract: Types and Remedies	C23	Lecture
Unit 3	Contingent contracts: Definition, Essentials, and Legal Rules	C24	Lecture
Unit 3	Quasi contracts: Definition, Essentials, and Examples	C25	Lecture
Unit 3	Case Study: Breach of Contract and Remedies	C26	Case Study
Unit 3	Practice Session: Drafting and Analyzing Contracts	C27	Practice Session
Unit 3	Practical Exercise: Drafting Quasi Contracts and Contingent Contracts	C28	Practical Session
Unit 3	Clarification and Review of Unit 3	C29	Clarification Class
Unit 4	Formation of the contract of sale: Essentials and Legal Framework	C30	Lecture
Unit 4	Classification of goods: Existing, Future,	C31	Lecture

	and Contingent Goods		
Unit 4	Conditions and Warranties: Definitions, Differences, and Legal Rules	C32	Lecture
Unit 4	Transfer of ownership: Transfer of Title, Risk, and Delivery	C33	Lecture
Unit 4	Performance of contract of sale: Rules and Regulations	C34	Lecture
Unit 4	Unpaid seller and his rights: Right of Lien, Stoppage in Transit, Resale	C35	Lecture
Unit 4	Case Study: Contract of Sale and Rights of Unpaid Seller	C36	Case Study
Unit 4	Practice Session: Drafting a Contract of Sale	C37	Practice Session
Unit 4	Real-Life Application: Contract of Sale Disputes and Resolutions	C38	Lecture
Unit 4	Clarification and Review of Unit 4	C39	Clarification Class
Unit 5	Indemnity: Definition, Nature, and Essentials	C40	Lecture
Unit 5	Guarantee: Definition, Nature, and Essentials	C41	Lecture
Unit 5	Extent of liability under indemnity and guarantee	C42	Lecture
Unit 5	Economic function of guarantee	C43	Lecture
Unit 5	Essential features of guarantee: Essentials, Legal Implications	C44	Lecture
Unit 5	Agency: Definition, Types, and Legal Framework	C45	Lecture
Unit 5	Rights and Duties of Agent and Principal	C46	Lecture
Unit 5	Termination of Agency	C47	Lecture
Unit 5	Case Study: Indemnity and Guarantee	C48	Case Study
Unit 5	Practice Session: Drafting Indemnity and Guarantee Contracts	C49	Practice Session
Unit 5	Role-Playing Exercise: Agency Relationships and Termination	C50	Practice Session
Unit 5	Clarification and Review of Unit 5	C51	Clarification Class
Additional	Mock Test/Quiz	C52	Quiz
Additional	Final Review and Preparation	C53	Classroom Assignment
Additional	Discussion on Key Legal Cases and Q&A Session	C54	Discussion
Additional	Student Presentations on Legal Topics	C55	Presentation
Additional	Practical Demonstration: Drafting Contracts and Legal Documents	C56	Practical Session
Additional	Project Work: Real-Life Case Studies	C57	Project Work
Additional	Group Discussion: Legal Reforms and Public Awareness	C58	Group Discussion
Additional	Final Review and Wrap-up	C59	Review Session
Additional	Project Presentation: Real-Life Contract Drafting and Analysis	C60	Presentation

Additional	Closing Remarks and Certificate Distribution	C61	Conclusion Session

COM 504 – International Finance

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Nature and Scope: Introduction to Cost Accounting and Management Accounting	C1	Lecture
Unit 1	Differences between Cost Accounting and Management Accounting	C2	Lecture
Unit 1	Cost Control: Techniques and Importance	C3	Lecture
Unit 1	Cost Reduction: Concepts, Strategies, and Applications	C4	Lecture
Unit 1	Cost Management: Scope and Emerging Trends	C5	Lecture
Unit 1	Introduction to International Finance: Increasing Interdependence in the Global Economy	C1	Lecture
Unit 1	Trends in International Trade and Cross-Border Financial Flow	C2	Lecture
Unit 1	Recent Developments in Global Financial Markets: Liberalization, Integration, and Innovation	C3	Lecture
Unit 1	Challenges of International Financial Management	C4	Lecture
Unit 1	Theory of Absolute Advantage	C5	Lecture
Unit 1	Theory of Comparative Advantage	C6	Lecture
Unit 1	Heckscher-Ohlin Model	C7	Lecture
Unit 1	Imitation Gap Theory	C8	Lecture
Unit 1	Case Study: Application of Comparative Advantage in Modern Trade	C9	Case Study
Unit 1	Practice Session: Exercises on Trade Theories	C10	Practice Session
Unit 1	Current Global Trade and Finance Trends	C11	Lecture
Unit 1	Clarification and Review of Unit 1	C12	Clarification Class
Unit 2	Balance of Payments: Introduction and Components	C13	Lecture

Unit 2	Balance of Payments Compilation	C14	Lecture
Unit 2	Balance of Payments: The Indian Perspective	C15	Lecture
Unit 2	Importance and Limitations of BOP Statistics	C16	Lecture
Unit 2	BOP and its Impact on Economic Policies	C17	Lecture
Unit 2	Case Study: India's Balance of Payments	C18	Case Study
Unit 2	Practice Session: BOP Compilation and Analysis	C19	Practice Session
Unit 2	Global Perspectives on Balance of Payments	C20	Lecture
Unit 2	Clarification and Review of Unit 2	C21	Clarification Class
Unit 3	Foreign Exchange Market: Structure and Participants	C22	Lecture
Unit 3	Types of Transactions in Forex Market	C23	Lecture
Unit 3	Mechanics of Currency Dealing and Exchange Rate Quotations	C24	Lecture
Unit 3	Arbitrage and Forward Rates	C25	Lecture
Unit 3	Evolution of Exchange Control and Forex Market in India	C26	Lecture
Unit 3	Relationship between Forex and Money Market	C27	Lecture
Unit 3	Covered Interest Arbitrage and Covered Parity Theorem	C28	Lecture
Unit 3	Option Forwards and Cancellation of Forward Contracts	C29	Lecture
Unit 3	Purchasing Power Parity and Interest Rate Parity	C30	Lecture
Unit 3	Case Study: Real-World Application of Covered Interest Arbitrage	C31	Case Study
Unit 3	Practice Session: Exercises on Forex Market and Exchange Rate Determination	C32	Practice Session
Unit 3	Clarification and Review of Unit 3	C33	Clarification Class
Unit 4	Short-Term Financial Management: Introduction and Importance	C34	Lecture
Unit 4	Short-Term Funding and Investment Strategies	C35	Lecture
Unit 4	Centralized vs. Decentralized Cash Management	C36	Lecture
Unit 4	Netting and Pooling in Cash Management	C37	Lecture
Unit 4	Exposure Management in International Finance	C38	Lecture
Unit 4	Offshore Invoicing Centers: Concept and Importance	C39	Lecture
Unit 4	Case Study: Effective Cash Management Strategies	C40	Case Study

Unit 4	Practice Session: Exercises on Short-Term Financial Management	C41	Practice Session
Unit 4	Current Trends in Short-Term Funding and Investment	C42	Lecture
Unit 4	Clarification and Review of Unit 4	C43	Clarification Class
Unit 5	Introduction to Trade Blocks: Formation and Objectives	C44	Lecture
Unit 5	OPEC: Objective and Functions	C45	Lecture
Unit 5	European Community (EC): Functions and Structure	C46	Lecture
Unit 5	World Trade Organization (WTO): Structure and Agreements	C47	Lecture
Unit 5	Trade-Related Aspects of Intellectual Property Rights (TRIPS)	C48	Lecture
Unit 5	Trade-Related Aspects of Investment Measures (TRIMS)	C49	Lecture
Unit 5	General Agreement on Trade in Services (GATS)	C50	Lecture
Unit 5	Trade Negotiations under GATT	C51	Lecture
Unit 5	EXIM Policy: Historical Perspective and Objectives	C52	Lecture
Unit 5	Case Study: WTO and Global Trade Policies	C53	Case Study
Unit 5	Practice Session: Trade Blocks and EXIM Policy	C54	Practice Session
Unit 5	Clarification and Review of Unit 5	C55	Clarification Class
Additional	Mock Test/Quiz on Entire Syllabus	C56	Quiz
Additional	Final Review and Preparation for Examination	C57	Classroom Assignment

COM 505 – Entrepreneurial Management

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Definition and Concept of Entrepreneurship	C1	Lecture
Unit 1	Entrepreneurial Traits and Skills	C2	Lecture
Unit 1	Types of Entrepreneurs and Ventures	C3	Lecture
Unit 1	The Role of Entrepreneurship in Economic Development	C4	Lecture
Unit 1	Case Studies of Successful Entrepreneurs	C5	Case Study
Unit 1	Analysis of Case Studies: Key Traits and Strategies	C6	Lecture
Unit 1	Practice Session: Identifying Entrepreneurial Traits	C7	Practice Session
Unit 1	Networking and Building Entrepreneurial Connections	C8	Lecture

Unit 1	Identifying and Overcoming Entrepreneurial Challenges	C9	Lecture
Unit 1	Discussion: Current Trends in Entrepreneurship	C10	Discussion
Unit 1	Clarification and Review of Unit 1	C11	Clarification Class
Unit 2	Sources of Business Ideas	C12	Lecture
Unit 2	Techniques for Idea Generation	C13	Lecture
Unit 2	Feasibility Analysis: Tools and Techniques	C14	Lecture
Unit 2	Business Model Canvas: Overview and Application	C15	Lecture
Unit 2	Market Research and Analysis: Methods and Tools	C16	Lecture
Unit 2	Case Study: Evaluating Business Ideas	C17	Case Study
Unit 2	Practice Session: Developing a Business Model Canvas	C18	Practice Session
Unit 2	Competitive Analysis: Techniques and Tools	C19	Lecture
Unit 2	Conducting Effective Market Research	C20	Workshop
Unit 2	Discussion: Innovative Business Ideas and Their Potential	C21	Discussion
Unit 2	Clarification and Review of Unit 2	C22	Clarification Class
Unit 3	Business Plan Components: Structure and Content	C23	Lecture
Unit 3	Strategic Planning and Business Strategy	C24	Lecture
Unit 3	SWOT Analysis: Methodology and Application	C25	Lecture
Unit 3	Financial Planning and Projections: Basics and Tools	C26	Lecture
Unit 3	Risk Management and Mitigation Strategies	C27	Lecture
Unit 3	Case Study: Successful Business Plans	C28	Case Study
Unit 3	Practice Session: Creating a Business Plan	C29	Practice Session
Unit 3	Analyzing Business Plans: Common Mistakes and Best Practices	C30	Lecture
Unit 3	Developing a Strategic Plan for Business Growth	C31	Workshop
Unit 3	Discussion: Strategic Planning for Startups	C32	Discussion
Unit 3	Clarification and Review of Unit 3	C33	Clarification Class
Unit 4	Sources of Finance: Equity, Debt, and Alternative Funding	C34	Lecture
Unit 4	Crowdfunding and Angel Investors	C35	Lecture
Unit 4	Venture Capital: Understanding and Application	C36	Lecture

Unit 4	Financial Statements and Performance Evaluation: Basics	C37	Lecture
Unit 4	Cash Flow Management: Importance and Techniques	C38	Lecture
Unit 4	Case Study: Funding Strategies and Financial Management	C39	Case Study
Unit 4	Practice Session: Analyzing Financial Statements	C40	Practice Session
Unit 4	Financial Ratios and Metrics: Understanding and Application	C41	Workshop
Unit 4	Discussion: Evaluating Funding Options and Their Impact	C42	Discussion
Unit 4	Clarification and Review of Unit 4	C43	Clarification Class
Unit 5	Strategies for Business Growth and Expansion	C44	Lecture
Unit 5	Innovation Management: Techniques and Strategies	C45	Lecture
Unit 5	Scaling Strategies and Challenges: Concepts and Case Studies	C46	Lecture
Unit 5	Entrepreneurial Leadership and Management: Key Skills	C47	Lecture
Unit 5	Legal and Regulatory Considerations: Overview and Compliance	C48	Lecture
Unit 5	Case Study: Innovations and Scaling in Successful Businesses	C49	Case Study
Unit 5	Practice Session: Developing Growth and Innovation Strategies	C50	Practice Session
Unit 5	Managing Growth: Strategies for Effective Scaling	C51	Workshop
Unit 5	Discussion: Legal and Ethical Issues in Scaling	C52	Discussion
Unit 5	Clarification and Review of Unit 5	C53	Clarification Class
Additional	Mock Test/Quiz	C54	Quiz
Additional	Final Review and Preparation	C55	Classroom Assignment
Additional	Discussion on Key Entrepreneurial Cases and Q&A Session	C56	Discussion
Additional	Student Presentations on Business Plans	C57	Presentation
Additional	Practical Demonstration: Pitching Business Ideas	C58	Practical Session
Additional	Project Work: Developing and Presenting Business Models	C59	Project Work
Additional	Group Discussion: Trends in Entrepreneurship and Innovation	C60	Group Discussion
Additional	Final Review and Wrap-up	C61	Review Session
Additional	Final Exam	C62	Exam
Additional	Post-Exam Discussion and Feedback	C63	Feedback Session
Additional	Project Presentation: Comprehensive Business Plan Presentation	C64	Presentation
Additional	Closing Remarks and Certificate	C65	Conclusion Session

	Distribution		

COM 506 - Internship

Semester VI

SN	Paper Code	Course		Periods			Evaluation Scheme					Cr
		Type	Title	L	T	P	Sessional Exams			ETE	Total	
							MT	TA	Total			
1	COM-601	Core	Financial Markets and Institutions	4	0	0	20	40	60	40	100	
2	COM-602	Core	Auditing Practices	4	0	0	20	40	60	40	100	
3	COM-603	Core	Indian Economy	4	0	0	20	40	60	40	100	
4	COM-604	DSE	International Business	4	0	0	20	40	60	40	100	
5	COM-605	GEC	Business Ethics and Corporate Governance	4	0	0	20	40	60	40	100	
6	COM-606	Dissertations	Small Project Report and viva – voce	2	0	0	10	20	30	20	50	
Total											**550**	

MT- MID TERM
IA-INTERNAL ASSESSMENTETE- END TERM EXAM

L-Lecture, T-Tutorial, P-Practical

Total credit = 132

List-I: Ability Enhancement Compulsory Courses (AECC)
Hindi Language
English language-I
English language-II
Japanese Language
Environmental Science and Sustainable Development

List-II: Skill Enhancement Courses (SEC)
Constitution of India and Human Rights
HRM with reference to legal, scientific & management
Disaster management
Cyber Phenomenon & Law
Japanese Language

Health Engineering, Management & Law

List-III: Value Addition Courses (VAC)
Business Communication-I
Business Communication-II
Happiness and Mental Well Being
Data Visualization using Excel
Basics of Yoga
Digital Marketing
E-filing: Income Tax and GST
Community outreach
Internship
Apprenticeship
Research Paper/ Article Publication
Small Projects

Course	Course outcomes: - After completion of these courses' studentsshould be able to
Semester – VI	
Financial Markets and Institutions	**CO1:** Understand the nature, components, and functions of the financial system, and assess the strengths and weaknesses of the Indian financial system. **CO2:** Analyze the structure and instruments of financial markets, including money and capital markets, and evaluate the role of SEBI in regulating these markets. **CO3:** Explain and differentiate between various financial services, including fund-based and fee-based services, and evaluate strategic decisions related to factoring, leasing, and mergers & acquisitions. **CO4:** Understand the basic concepts of insurance and mutual funds, and analyze the roles of regulatory bodies like IRDA and AMFI. **CO5:** Describe the activities of banks, differentiate between retail and corporate banking, and understand the functions and products offered in both sectors.
Auditing Practices	**CO1:** Understand the objectives, importance, and types of audits, and apply ethical principles and auditing standards in practice. **CO2:** Develop audit plans by assessing audit risks, understanding client businesses, and gathering sufficient and appropriate audit evidence. **CO3:** Evaluate internal control systems and apply various audit testing techniques, including sampling methods, to assess control effectiveness. **CO4:** Prepare audit reports and documentation, ensuring proper communication of audit findings and adherence to confidentiality and retention requirements. **CO5:** Analyze special audit practices, emerging issues in auditing, and the impact of technology and sustainability on the auditing profession.
Indian Economy	**CO1:** Develop ideas of the basic characteristics of Indian economy, its potential on natural resources. **CO2:** Understand the importance, causes and impact of population growth and its distribution, translate and relate them with economic development. **CO3:** Grasp the importance of planning undertaken by the government of India, have knowledge on the various objectives, failures and achievements as the foundation of the ongoing planning and economic reforms taken by the government especially NITI Aayog. **CO4:** Get exposure towards Indian Economy with reference to Foreign Trade. **CO5:** Know about international trade and issues emerging internationally.

International Business	**CO1:** Understand the concept of globalization and its impact on international business, and analyze the complexities of conducting business across national borders. **CO2:** Explain the theories of international trade and evaluate the role of international organizations like WTO, UNCTAD, World Bank, and IMF in global trade. **CO3:** Analyze regional economic cooperation efforts and assess the international financial environment, including foreign exchange markets and investment flows. **CO4:** Identify key issues in international business operations, including production, finance, marketing, and human resources, and evaluate the impact of outsourcing, strategic alliances, and IT on global business. **CO5:** Understand and apply foreign trade promotion measures, financing options, and strategies for promoting foreign investments in and from India.
Business Ethics and Corporate Governance	**CO1:** Understand the concept, nature, and significance of ethics and business ethics, and analyze unethical issues in business practices. **CO2:** Evaluate various ethical theories and their application to business, and assess the role of Corporate Social Responsibility (CSR) in modern business practices. **CO3:** Identify and analyze ethical issues in marketing, finance, and human resource management, and apply ethical principles to address these challenges. **CO4:** Understand the principles and practices of corporate governance in India, and evaluate the impact of governance reforms and committee recommendations. **CO5:** Examine contemporary issues in governance, assess the role of SEBI, and understand the principles and objectives of sustainable development in a global context.
Small Project Report and viva – voce	**CO1:** Apply theoretical knowledge from the B.Com curriculum to real-world business scenarios through hands-on practical training. **CO2:** Develop research and data collection skills by utilizing both internal and external sources to analyze business problems. **CO3:** Enhance report writing and documentation abilities by preparing a comprehensive project report under faculty guidance. **CO4:** Demonstrate the ability to work independently and manage time effectively by completing the project within the given deadlines. **CO5:** Present and defend findings during a viva-voce examination, showcasing communication and critical thinking skills.

Mapping: Semester – VI

COM-601	PO1	PO2	PO3	PO4	PO5	PO6
CO1		2		2	3	
CO2	3		2	2	3	2
CO3	2	3	1	1		3
CO4	2	2	2		3	3

COM-602	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	1	-	3	2	3
CO2	2	2	3	1	1	-
CO3	3	3	2	3	3	2
CO4	2	2	1	1	2	2
CO5	3	3	2	2	3	3

COM-603	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2		2
CO2	2	2	3	2	2	3
CO3	3	2	3	1	3	2
CO4	2			3	3	1
CO5		3	2	2	1	2

COM-604	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2	2	2
CO2	2	2	2	2	3	
CO3	1		2	2	3	3
CO4			2	2	3	2
CO5	3	3	3	3	3	3

COM-605	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	3	3	3	2	3
CO2	2	2	2	3	3	3
CO3	2	3	3	-	3	2
CO4	2	-	2	3	2	2
CO5	3	3	2	2	2	2

COM-606	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	2	2	2	-	2
CO2	-	2	3	2	2	3
CO3	3	2	3	1	3	2
CO4	2	-	-	3	3	1
CO5	3	2	1	3	3	1

Semester VI – Lesson Plans

COM 601 - Financial Markets and Institutions

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Nature and Role of Financial System	C1	Lecture
Unit 1	Financial System and Financial Markets	C2	Lecture
Unit 1	Government Intervention in the Financial System	C3	Lecture
Unit 1	Informal vs. Formal Financial System	C4	Lecture
Unit 1	Components of Formal Financial System: Institutions, Intermediaries, Markets, and Services	C5	Lecture
Unit 1	Functions and Weaknesses of the Indian Financial System	C6	Lecture
Unit 1	Case Study: Financial System in Emerging Markets	C7	Case Study
Unit 1	Practice Session: Analysis of Financial System Components	C8	Practice Session
Unit 1	Discussion: Innovations in Financial Systems	C9	Discussion
Unit 1	Clarification and Review of Unit 1	C10	Clarification Class
Unit 2	Money Market and Capital Market	C11	Lecture
Unit 2	Money Market Instruments: T-Bills, CPs, CDs	C12	Lecture
Unit 2	Capital Market: Primary and Secondary Markets	C13	Lecture
Unit 2	Methods of Raising Capital	C14	Lecture
Unit 2	Derivative Concepts: Overview and Applications	C15	Lecture
Unit 2	Role of SEBI in Financial Markets	C16	Lecture
Unit 2	Case Study: Impact of SEBI Regulations on Markets	C17	Case Study
Unit 2	Practice Session: Analyzing Money and Capital Markets	C18	Practice Session
Unit 2	Discussion: Evolution of Financial Markets	C19	Discussion
Unit 2	Clarification and Review of Unit 2	C20	Clarification Class
Unit 3	Fund-Based vs. Fee-Based Financial Services	C21	Lecture
Unit 3	Conceptual Aspects of Factoring, Forfaiting, and Bill Discounting	C22	Lecture
Unit 3	Credit Rating: Importance and Process	C23	Lecture
Unit 3	Leasing and Securitization: Concepts and Applications	C24	Lecture

Unit 3	Consumer Finance: Types and Trends	C25	Lecture
Unit 3	Evaluation of Strategic Decisions: Factoring, Leasing, and Mergers & Acquisitions	C26	Lecture
Unit 3	Case Study: Strategic Decisions in Financial Services	C27	Case Study
Unit 3	Practice Session: Evaluating Financial Services and Strategies	C28	Practice Session
Unit 3	Discussion: Innovations in Financial Services	C29	Discussion
Unit 3	Clarification and Review of Unit 3	C30	Clarification Class
Unit 4	Basic Concepts of Insurance: Types and Principles	C31	Lecture
Unit 4	Basics of Mutual Funds: Structure and Types	C32	Lecture
Unit 4	Role of IRDA and AMFI in the Insurance and Mutual Fund Sectors	C33	Lecture
Unit 4	Comparison of Insurance and Mutual Funds	C34	Lecture
Unit 4	Case Study: Regulatory Impact on Insurance and Mutual Funds	C35	Case Study
Unit 4	Practice Session: Analyzing Insurance and Mutual Fund Products	C36	Practice Session
Unit 4	Discussion: Trends and Innovations in Insurance and Mutual Funds	C37	Discussion
Unit 4	Clarification and Review of Unit 4	C38	Clarification Class
Unit 5	Overview of Banking Activities	C39	Lecture
Unit 5	Retail Banking: Concepts, Forms, and Products	C40	Lecture
Unit 5	Corporate Banking: Meaning, Nature, Functions, and Products	C41	Lecture
Unit 5	Comparative Analysis of Retail and Corporate Banking	C42	Lecture
Unit 5	Innovations in Banking: Technology and Trends	C43	Lecture
Unit 5	Case Study: Success Stories in Retail and Corporate Banking	C44	Case Study
Unit 5	Practice Session: Evaluating Banking Products and Services	C45	Practice Session
Unit 5	Discussion: Future Directions in Banking	C46	Discussion
Unit 5	Clarification and Review of Unit 5	C47	Clarification Class
Additional	Mock Test/Quiz	C48	Quiz
Additional	Final Review and Preparation	C49	Classroom Assignment
Additional	Discussion on Key Financial Concepts and Q&A Session	C50	Discussion
Additional	Student Presentations on Financial Market Analysis	C51	Presentation
Additional	Practical Demonstration: Financial System Analysis	C52	Practical Session

Additional	Project Work: Analyzing and Presenting Financial Services	C53	Project Work
Additional	Group Discussion: Emerging Trends in Financial Systems	C54	Group Discussion
Additional	Final Review and Wrap-up	C55	Review Session
Additional	Final Exam	C56	Exam
Additional	Post-Exam Discussion and Feedback	C57	Feedback Session
Additional	Project Presentation: Comprehensive Analysis of Financial Services	C58	Presentation
Additional	Closing Remarks and Certificate Distribution	C59	Conclusion Session

COM 602 - Auditing Practices

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction to Auditing: Overview: Definition, Objectives, and Importance of Auditing	C1	Lecture
Unit 1	Roles and Responsibilities: Roles of Auditors and Stakeholders	C2	Lecture
Unit 1	Types of Audits: Financial Audit, Operational Audit, Compliance Audit	C3	Lecture
Unit 1	Auditing Standards: International Standards on Auditing (ISA) and their Significance	C4	Lecture
Unit 1	Ethics in Auditing: Ethical Principles Governing Auditors, Code of Ethics for Professional Accountants	C5	Lecture
Unit 1	Case Study: Application of Auditing Standards and Ethics	C6	Case Study
Unit 1	Practice Session: Types of Audits and Ethical Scenarios	C7	Practice Session
Unit 1	Guest Lecture: Insights from a Professional Auditor	C8	Guest Lecture
Unit 1	Debate: Ethical Dilemmas in Auditing	C9	Debate
Unit 1	Audit Cycle Overview: Phases and Key Activities	C10	Lecture
Unit 1	Review and Q&A: Recap of Unit 1, Open Questions	C11	Clarification Class
Unit 2	Audit Planning: Introduction: Steps Involved in the Audit Planning Process	C12	Lecture
Unit 2	Understanding Client's Business: Analyzing Business and Industry	C13	Lecture
Unit 2	Materiality and Audit Risk: Assessment of Materiality and Risk	C14	Lecture
Unit 2	Audit Evidence: Nature and Types of Audit Evidence	C15	Lecture
Unit 2	Techniques for Gathering Evidence: Sampling, Documentation Review,	C16	Lecture

	Inquiry		
Unit 2	Evaluating Audit Evidence: Sufficiency and Appropriateness	C17	Lecture
Unit 2	Case Study: Gathering and Evaluating Audit Evidence	C18	Case Study
Unit 2	Workshop: Creating an Audit Plan and Gathering Evidence	C19	Workshop
Unit 2	Role-Playing: Simulated Audit Planning and Evidence Collection	C20	Role-Playing
Unit 2	Review of Audit Procedures: Techniques and Best Practices	C21	Lecture
Unit 2	Review and Q&A: Recap of Unit 2, Open Questions	C22	Clarification Class
Unit 3	Internal Control Systems: Concepts: Objectives and Components	C23	Lecture
Unit 3	Internal Control Components: Control Environment, Risk Assessment, Control Activities, Information and Communication, Monitoring	C24	Lecture
Unit 3	Audit Testing: Introduction: Types of Audit Tests (Tests of Controls, Substantive Tests)	C25	Lecture
Unit 3	Techniques for Audit Testing: Methods and Techniques	C26	Lecture
Unit 3	Sampling Methods: Application in Audit Testing	C27	Lecture
Unit 3	Case Study: Internal Controls and Audit Testing	C28	Case Study
Unit 3	Workshop: Performing Audit Tests and Evaluating Controls	C29	Workshop
Unit 3	Simulation: Conducting a Mock Audit Test	C30	Simulation
Unit 3	Internal Control Weaknesses: Identification and Addressing	C31	Lecture
Unit 3	Review and Q&A: Recap of Unit 3, Open Questions	C32	Clarification Class
Unit 4	Audit Reporting: Types: Unqualified, Qualified, Adverse, Disclaimer	C33	Lecture
Unit 4	Audit Reporting: Contents and Structure: Communication of Audit Findings and Recommendations	C34	Lecture
Unit 4	Audit Documentation: Importance and Purpose	C35	Lecture
Unit 4	Audit Documentation: Contents and Form: Retention and Confidentiality	C36	Lecture
Unit 4	Case Study: Preparing and Analyzing Audit Reports	C37	Case Study
Unit 4	Workshop: Drafting and Reviewing Audit Reports	C38	Workshop
Unit 4	Guest Speaker: Insights on Effective Audit Reporting	C39	Guest Lecture

Unit 4	Role-Playing: Communicating Audit Findings to Clients	C40	Role-Playing
Unit 4	Audit Quality Assurance: Ensuring Report Accuracy and Compliance	C41	Lecture
Unit 4	Review and Q&A: Recap of Unit 4, Open Questions	C42	Clarification Class
Unit 5	Special Audits: Forensic Audit: Concepts and Techniques	C43	Lecture
Unit 5	Special Audits: Environmental Audit: Scope and Importance	C44	Lecture
Unit 5	Special Audits: Performance Audit: Objectives and Methodologies	C45	Lecture
Unit 5	Emerging Issues: Technology Impact: Data Analytics, AI in Auditing	C46	Lecture
Unit 5	Emerging Issues: Sustainability Auditing: Social Responsibility and Current Trends	C47	Lecture
Unit 5	Case Study: Special Audits and Emerging Issues	C48	Case Study
Unit 5	Workshop: Implementing Special Audit Techniques	C49	Workshop
Unit 5	Panel Discussion: Current Trends and Challenges in Auditing	C50	Panel Discussion
Unit 5	Future of Auditing: Innovations and Predictions	C51	Lecture
Unit 5	Review and Q&A: Recap of Unit 5, Open Questions	C52	Clarification Class
Additional	Mock Test/Quiz on Entire Syllabus	C53	Quiz
Additional	Final Review and Preparation: Recap of Key Concepts and Preparation for Examination	C54	Classroom Assignment
Additional	Project Presentation: Presenting Audit Projects and Findings	C55	Presentation
Additional	Internship Reflections: Lessons Learned and Career Application	C56	Discussion

COM 603 - Indian Economy

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Concept of Economic Growth and Economic Development	C1	Lecture
Unit 1	Growth vs. Development: Key Differences and Implications	C2	Lecture
Unit 1	Basic Characteristics of the Indian Economy	C3	Lecture
Unit 1	Changes in the Structure of the Indian Economy: Primary Sector	C4	Lecture
Unit 1	Changes in the Structure of the Indian Economy: Secondary Sector	C5	Lecture
Unit 1	Changes in the Structure of the Indian	C6	Lecture

	Economy: Tertiary Sector		
Unit 1	Trends in National Income in India	C7	Lecture
Unit 1	Comparative Analysis of Indian Economy with Other Developing Economies	C8	Lecture
Unit 1	Historical Perspective on Economic Growth and Development in India	C9	Lecture
Unit 1	Case Study: Economic Growth and Development in India	C10	Case Study
Unit 1	Practice Session: Analyzing Trends in National Income	C11	Practice Session
Unit 1	Discussion: Future Directions for Indian Economic Structure	C12	Discussion
Unit 1	Clarification and Review of Unit 1	C13	Clarification Class
Unit 2	Objectives of Economic Planning in India	C14	Lecture
Unit 2	NITI Aayog: Establishment, Importance, and Functions	C15	Lecture
Unit 2	Industrial Policy 1991: Overview and Impact	C16	Lecture
Unit 2	Disinvestment of Public Enterprises: Concepts and Processes	C17	Lecture
Unit 2	Comparative Analysis of Economic Policies Pre and Post 1991	C18	Lecture
Unit 2	Role of Government in Economic Planning and Policy Implementation	C19	Lecture
Unit 2	Case Study: Impact of Economic Planning on Indian Development	C20	Case Study
Unit 2	Practice Session: Evaluating Economic Planning Strategies	C21	Practice Session
Unit 2	Discussion: Reforms and Future Directions for Indian Economic Planning	C22	Discussion
Unit 2	Clarification and Review of Unit 2	C23	Clarification Class
Unit 3	Economic Problems: Poverty in India	C24	Lecture
Unit 3	Economic Problems: Inequality and Parallel Economy	C25	Lecture
Unit 3	Economic Problems: Unemployment and Concentration of Economic Power	C26	Lecture
Unit 3	Economic Problems: Balanced Regional Development	C27	Lecture
Unit 3	Economic Problems: Low Capital Formation and Industrial Sickness	C28	Lecture
Unit 3	Government Policies and Programs Addressing Economic Problems	C29	Lecture
Unit 3	Comparative Analysis: Economic Problems and Solutions in Different States of India	C30	Lecture
Unit 3	Case Study: Addressing Key Economic Problems in India	C31	Case Study
Unit 3	Practice Session: Analyzing Economic Issues and Solutions	C32	Practice Session

Unit 3	Discussion: Strategies for Resolving Economic Problems	C33	Discussion
Unit 3	Clarification and Review of Unit 3	C34	Clarification Class
Unit 4	Concept and Significance of Foreign Trade	C35	Lecture
Unit 4	Foreign Exchange Reserve and Balance of Payments	C36	Lecture
Unit 4	Balance of Trade and Current Foreign Policy	C37	Lecture
Unit 4	Foreign Exchange Management Act (FEMA): Overview and Applications	C38	Lecture
Unit 4	Impact of Global Economic Policies on Indian Foreign Trade	C39	Lecture
Unit 4	Trade Agreements and Their Impact on Indian Economy	C40	Lecture
Unit 4	Case Study: India's Foreign Trade Policies and Their Impact	C41	Case Study
Unit 4	Practice Session: Evaluating Foreign Trade and Exchange Policies	C42	Practice Session
Unit 4	Discussion: Future Trends in Indian Foreign Trade	C43	Discussion
Unit 4	Clarification and Review of Unit 4	C44	Clarification Class
Unit 5	WTO and Its Agreements: Overview and Implications for Indian Economy	C45	Lecture
Unit 5	GATT, TRIMS, and TRIPS: Concepts and Impact on Indian Economy	C46	Lecture
Unit 5	Foreign Direct Investment (FDI) and Foreign Institutional Investment (FII): Definitions and Trends	C47	Lecture
Unit 5	Emerging Issues in the Indian Economy: Opportunities and Challenges	C48	Lecture
Unit 5	Impact of Global Agreements on Indian Economic Policies	C49	Lecture
Unit 5	Analysis of Recent Trends in FDI and FII in India	C50	Lecture
Unit 5	Case Study: The Role of Global Agreements in Shaping Indian Economic Policy	C51	Case Study
Unit 5	Practice Session: Analyzing Emerging Issues and Policy Responses	C52	Practice Session
Unit 5	Discussion: Future Directions for Indian Economy in the Global Context	C53	Discussion
Unit 5	Clarification and Review of Unit 5	C54	Clarification Class
Additional	Mock Test/Quiz	C55	Quiz
Additional	Final Review and Preparation	C56	Classroom Assignment
Additional	Discussion on Key Economic Concepts and Q&A Session	C57	Discussion
Additional	Student Presentations on Indian Economic Issues	C58	Presentation
Additional	Practical Demonstration: Analyzing	C59	Practical Session

	Economic Policies and Their Impact		
Additional	Project Work: Comprehensive Analysis of Economic Planning and Development	C60	Project Work
Additional	Group Discussion: Emerging Trends in Indian Economy	C61	Group Discussion
Additional	Final Review and Wrap-up	C62	Review Session
Additional	Final Exam	C63	Exam
Additional	Post-Exam Discussion and Feedback	C64	Feedback Session
Additional	Project Presentation: Analysis of Economic Policies and Development	C65	Presentation

COM 604 - International Business

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction to International Business: Globalization: Globalization and its Growing Importance in World Economy	C1	Lecture
Unit 1	Impact of Globalization: Positive and Negative Effects on Economies and Businesses	C2	Lecture
Unit 1	International vs. Domestic Business: Complexities and Differences	C3	Lecture
Unit 1	Modes of Entry: Various Strategies for Entering International Markets	C4	Lecture
Unit 1	International Business Environment: National vs. Foreign Environments - Economic, Cultural, and Political-Legal Factors	C5	Lecture
Unit 1	Global Trading Environment: Recent Trends in World Trade in Goods and Services	C6	Lecture
Unit 1	Trends in India's Foreign Trade: Analysis and Recent Developments	C7	Lecture
Unit 1	Case Study: Impact of Globalization on a Specific Industry	C8	Case Study
Unit 1	Workshop: Comparative Analysis of Domestic vs. International Business	C9	Workshop
Unit 1	Guest Lecture: Insights from an Expert in International Trade	C10	Guest Lecture
Unit 1	Review and Q&A: Recap of Unit 1, Open Questions	C11	Clarification Class
Unit 2	Theories of International Trade: Overview of Key Theories	C12	Lecture
Unit 2	Commercial Policy Instruments: Tariff and Non-Tariff Measures	C13	Lecture
Unit 2	Balance of Payments: Components and Importance	C14	Lecture
Unit 2	International Organizations: Overview of WTO - Objectives, Principles,	C15	Lecture

	Organizational Structure		
Unit 2	Other International Organizations: UNCTAD, World Bank, IMF	C16	Lecture
Unit 2	Commodity and Trading Agreements: Key Agreements and Their Impacts	C17	Lecture
Unit 2	Case Study: Role of International Organizations in Trade Agreements	C18	Case Study
Unit 2	Workshop: Analyzing Commercial Policy Instruments and Their Effects	C19	Workshop
Unit 2	Simulation: Creating and Evaluating Balance of Payments Reports	C20	Simulation
Unit 2	Review and Q&A: Recap of Unit 2, Open Questions	C21	Clarification Class
Unit 3	Regional Economic Co-operation: Forms and Examples of Regional Groupings	C22	Lecture
Unit 3	Integration Efforts: Europe, North America, and Asia	C23	Lecture
Unit 3	International Financial Environment: Overview of International Financial System and Institutions	C24	Lecture
Unit 3	Foreign Exchange Markets: Structure, Mechanics, and Risk Management	C25	Lecture
Unit 3	Foreign Investments: Types, Flows, and Investment in Indian Perspective	C26	Lecture
Unit 3	Case Study: Regional Economic Integration and Its Impact	C27	Case Study
Unit 3	Workshop: Analysis of Foreign Exchange Markets and Investment Strategies	C28	Workshop
Unit 3	Guest Speaker: Insights from a Financial Expert on International Markets	C29	Guest Lecture
Unit 3	Role-Playing: Simulated Foreign Investment Decisions	C30	Role-Playing
Unit 3	Review and Q&A: Recap of Unit 3, Open Questions	C31	Clarification Class
Unit 4	Organizational Structure for International Business: Key Elements and Design	C32	Lecture
Unit 4	International Production Decisions: Key Issues and Strategies	C33	Lecture
Unit 4	International Finance, Marketing, and HR Decisions: Key Issues and Strategic Approaches	C34	Lecture
Unit 4	International Business Negotiations: Techniques and Strategies	C35	Lecture
Unit 4	Developments in International Business: Outsourcing and Its Potential for India	C36	Lecture
Unit 4	Strategic Alliances, Mergers, and Acquisitions: Role and Impact	C37	Lecture
Unit 4	Role of IT in International Business: Impact and Innovations	C38	Lecture
Unit 4	Ecological Considerations: Environmental	C39	Lecture

	Impact and Sustainability		
Unit 4	Case Study: Outsourcing and Strategic Alliances in Practice	C40	Case Study
Unit 4	Workshop: Planning and Executing International Business Strategies	C41	Workshop
Unit 4	Panel Discussion: Current Issues and Innovations in International Business	C42	Panel Discussion
Unit 4	Review and Q&A: Recap of Unit 4, Open Questions	C43	Clarification Class
Unit 5	Foreign Trade Promotion Measures in India: Overview and Strategies	C44	Lecture
Unit 5	Special Economic Zones (SEZs) and Export-Oriented Units (EOUs): Concepts and Benefits	C45	Lecture
Unit 5	Promoting Foreign Investments: Measures and Strategies for Investment into and from India	C46	Lecture
Unit 5	Indian Joint Ventures and Acquisitions Abroad: Case Studies and Strategies	C47	Lecture
Unit 5	Financing of Foreign Trade: Methods and Payment Terms	C48	Lecture
Unit 5	Case Study: Analysis of Indian SEZs and Foreign Investments	C49	Case Study
Unit 5	Workshop: Developing Foreign Trade Promotion Strategies	C50	Workshop
Unit 5	Guest Lecture: Insights from an Expert on Financing Foreign Trade	C51	Guest Lecture
Unit 5	Role-Playing: Negotiating and Structuring Joint Ventures	C52	Role-Playing
Unit 5	Review and Q&A: Recap of Unit 5, Open Questions	C53	Clarification Class
Additional	Mock Test/Quiz on Entire Syllabus	C54	Quiz
Additional	Final Review and Preparation: Recap of Key Concepts and Preparation for Examination	C55	Classroom Assignment
Additional	Project Presentation: Presenting Projects and Findings on International Business Topics	C56	Presentation
Additional	Internship Reflections: Lessons Learned and Career Application	C57	Discussion

COM 605 - Business Ethics and Corporate Governance

Unit	Particulars	Class No.	Pedagogy of Class
Unit 1	Introduction and Concept of Ethics	C1	Lecture
Unit 1	Nature and Objectives of Ethics	C2	Lecture
Unit 1	Types of Ethics	C3	Lecture

Unit 1	Significance of Ethics	C4	Lecture
Unit 1	Ethics in Particular Fields of Application	C5	Lecture
Unit 1	Introduction to Business Ethics	C6	Lecture
Unit 1	Evolution of Business Ethics	C7	Lecture
Unit 1	Principles of Business Ethics	C8	Lecture
Unit 1	Unethical Issues in Business	C9	Lecture
Unit 1	Case Study: Business Ethics in Real-World Scenarios	C10	Case Study
Unit 1	Practice Session: Analyzing Ethical Dilemmas in Business	C11	Practice Session
Unit 1	Clarification and Review of Unit 1	C12	Clarification Class
Unit 2	Introduction to Ethical Theories	C13	Lecture
Unit 2	Egoism and Utilitarianism: Principles and Applications	C14	Lecture
Unit 2	Deontology: Principles and Applications	C15	Lecture
Unit 2	Care Ethics and Virtue Ethics: Principles and Applications	C16	Lecture
Unit 2	Religion and Ethics	C17	Lecture
Unit 2	Business and Religion	C18	Lecture
Unit 2	Ethics and Social Responsibility	C19	Lecture
Unit 2	Introduction and Nature of Corporate Social Responsibility (CSR)	C20	Lecture
Unit 2	Need for CSR	C21	Lecture
Unit 2	Current Situation of CSR in India	C22	Lecture
Unit 2	Types of Social Responsibility	C23	Lecture
Unit 2	Social Responsibilities for Economic Growth	C24	Lecture
Unit 2	Business Ethics and CSR in the New Economy	C25	Lecture
Unit 2	Ethical Climate: Concepts and Implementation	C26	Lecture
Unit 2	Case Study: CSR Practices and Impact in Indian Companies	C27	Case Study
Unit 2	Practice Session: Developing CSR Strategies for Organizations	C28	Practice Session
Unit 2	Clarification and Review of Unit 2	C29	Clarification Class
Unit 3	Ethics in Marketing: Introduction and Overview	C30	Lecture
Unit 3	Ethical Issues in Marketing Mix	C31	Lecture
Unit 3	Unethical Practices in Marketing: Case Studies	C32	Case Study
Unit 3	Ethics in Finance: Importance and Scope	C33	Lecture

Unit 3	Code of Ethics in Finance: Overview and Applications	C34	Lecture
Unit 3	Introduction to Ethics in HRM	C35	Lecture
Unit 3	Concept of Human Resource Information System (HRIS)	C36	Lecture
Unit 3	Types of HRIS	C37	Lecture
Unit 3	Ethical Issues in HRM	C38	Lecture
Unit 3	Case Study: Ethical Issues in Finance and HRM	C39	Case Study
Unit 3	Practice Session: Analyzing Ethical Issues in Marketing, Finance, and HRM	C40	Practice Session
Unit 3	Clarification and Review of Unit 3	C41	Clarification Class
Unit 4	Concept of Corporate Governance	C42	Lecture
Unit 4	Need and Importance of Corporate Governance	C43	Lecture
Unit 4	Principles of Corporate Governance	C44	Lecture
Unit 4	Present Scenario of Corporate Governance in India	C45	Lecture
Unit 4	Limitations of Corporate Governance	C46	Lecture
Unit 4	Board of Directors: Composition and Functions	C47	Lecture
Unit 4	Committees in Corporate Governance: Birla Committee	C48	Lecture
Unit 4	Committees in Corporate Governance: Naresh Chandra Committee	C49	Lecture
Unit 4	Committees in Corporate Governance: Narayan Murthy Committee	C50	Lecture
Unit 4	Committees in Corporate Governance: Cadbury Committee	C51	Lecture
Unit 4	Changes in Corporate Governance Issues as per Companies Act, 2013	C52	Lecture
Unit 4	Case Study: Corporate Governance Practices in India	C53	Case Study
Unit 4	Practice Session: Evaluating Corporate Governance Practices	C54	Practice Session
Unit 4	Clarification and Review of Unit 4	C55	Clarification Class
Unit 5	Role of SEBI in Governance	C56	Lecture
Unit 5	Extent of Compliance with Governance Codes in India	C57	Lecture
Unit 5	Governance Rating in India: Overview and Importance	C58	Lecture
Unit 5	Concept of Sustainable Development	C59	Lecture
Unit 5	Objectives and Scope of Sustainable Development	C60	Lecture
Unit 5	Evolution of Sustainable Development	C61	Lecture
Unit 5	Principles of Sustainable Development	C62	Lecture
Unit 5	Global Goals of Sustainable Development	C63	Lecture
Unit 5	Case Study: Sustainable Development Practices in Various Countries	C64	Case Study

Unit 5	Practice Session: Developing Sustainable Business Strategies	C65	Practice Session

COM 606 – Small Project and Viva – Voce

ALABBAR SCHOOL OF MANAGEMENT
RAFFLES UNIVERSITY, NEEEMRANA

Bachelor of Business Administration (BBA 3 Years)

PROGRAMME OBJECTIVES (PO)

The objectives of BBA Programme are:

PO1: To remember the conceptual knowledge with an integrated approach to various functions of management.
PO2: To develop leadership and communication skills to become successful business leadersand managers.
PO3: To encourage and develop critical thinking, analysis and initiative ability skills.
PO4: To develop problem-solving skills through experiential learning and innovative pedagogyto ensure utilization of knowledge in professional careers.
PO5: To apply the various concepts, theories and models in the area of HR, Marketing, Finance.
PO6: To develop a positive attitude and life skills to become a multi facet personality with a sense of environmental consciousness and ethical values.

PROGRAMME LEARNING OUTCOMES (PLO)

The expected outcomes after completing the program would be:
PLO1: Management knowledge: Acquire adequate knowledge through principles, theory and models of business management, Accounting, Marketing, Finance, IT, Operations and Human Resource
PLO2: Communication: Demonstrate proficiency for Business Communication for effective and professional business management.
PLO3: Technical Knowledge: Acquire employability skills through practical exposure of IT andits usage in management.
PLO4: Investigation of Business Problems: Analyze and comprehend the applicability of management principles in solving complex business issues.
PLO5: Entrepreneurial Perspective: Develop entrepreneurial skills to become an entrepreneur.
PLO6: Environment and Sustainability: To build perspective about global environment including cultural, social and sustainability issues.
PLO7: Leadership Skills: Ability to develop group behavior and lead a team to achieve the individual, group and organizational goals.
PLO8: Ethics: Understand importance of ethics in business decision-making and inculcate the spirit of social responsibility.
PLO9: Global Perspective: Comprehend the applicability of management principles in thesituations pertaining to global business world.
PLO10: Area Specific Expertise: Apply various concepts, theories and models in the functionalareas of business like Marketing, HR and Finance in the Organizations.
PLO11: Cross-Disciplinary Integration and Strategic Perspective: Acquire and apply knowledge of economics, mathematics, statistics and production and operation management and its integration relevant to business decisions.
PLO12: Legal Knowledge: Obtain legal knowledge of various business operations for effectivedecision-making.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO1 Acquire Practical learning through summer internship, industrial visit and Business Planetc.

PSO2 Demonstrate analytical and problem-solving skills through core elective area of specialization in Finance, Human Recourse, and Marketing to solve the business issues.

PSO3 Understand and develop the new dimensions of knowledge through open electives to caterthe need of the industry.

BBA

I Year: I Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	MGTB -103	Management Process	4	0	0	60	40	100	4
2.	MGTB -104	Business Organization and Environment	4	0	0	60	40	100	4
3.	MGTB -105	Principles of Accounting	4	0	0	60	40	100	4
4.	MGTB -106	Business Mathematics	4	0	0	60	40	100	4
AECC									
5.	MGTB -101	English Language-I	2	0	0	30	20	50	2
SEC									
6.	MGTB -102	Constitution of India and Human Rights	4	0	0	60	40	100	4
GE									
7.	MGTB -107	Fundamentals Computer and IT	3	0	1	60	40	100	4
		Total	**25**	**0**	**1**	**390**	**260**	**650**	**26**

BBA-
II Semester

[Effective from the Session 2019-20]

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S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	MGTB -203	Business statistics	4	0	0	60	40	100	4
2.	MGTB -204	Cost Accounting	4	0	0	60	40	100	4
3.	MGTB -205	Organization Behavior	4	0	0	60	40	100	4
AECC									
4.	MGTB -201	English Language-II	3	0	0	30	20	50	2
SEC									
5.	MGTB -202	Environmental Studies	4	0	0	60	40	100	4
		Total	**19**	**0**	**0**	**270**	**180**	**450**	**18**

BBA-III SEMESTER

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	MGTB- 302	Business Economics	4	0	0	60	40	100	4
2.	MGTB- 303	Corporate Accounting	4	0	0	60	40	100	4
3.	MGTB- 304	Human Resource Management	4	0	0	60	40	100	4
4.	MGTB- 305	Rural Management	4	0	0	60	40	100	4
5.	MGTB- 306	Comprehensive Viva Voce	0	0	0			100	4
SEC									
6.	MGTB -301	Cyber Phenomenon & Law	3	0	0	60	40	100	4
		Total	**19**	**0**	**0**	**300**	**200**	**600**	**24**

BBA-IV Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	MGTB-402	Financial Management	3	0	0	60	40	100	4
2.	MGTB- 403	Direct Tax	4	0	0	60	40	100	4
3.	MGTB- 404	Management Accounting	4	0	0	60	40	100	4
4.	MGTB- 405	E- Business	4	0	0	60	40	100	4
5.	MGTB- 406	Business Research Methods	4	0	0	60	40	100	4
SEC									
6.	MGTB -401	Business Communication	4	0	0	60	40	100	4
		Total	**23**	**0**	**0**	**360**	**240**	**600**	**24**

BBA-V Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
CORE									
1.	MGTB -501	Marketing Management	3	0	0	60	40	100	4
2.	MGTB -502	Human Resource Planning and Development	4	0	0	60	40	100	4
3.	MGTB -505	Summer Internship & Project	4	0	0			100	4
DSE(Choose any one**)**									
4.	MGTB -503	Investment Management Entrepreneurial c. Management Advertising	4	0	0	60	40	100	4
5.	MGTB -504	International Finance Accounting Information System c. Labour Law	**4**	**0**	**0**	60	40	100	4
		Total	**22**	**0**	**0**	**240**	**160**	**500**	**20**

BBA-VI Semester

S. No.	Subject Code	Subject	L	T	P	CIE	ESE	Total	C
	CORE								
1.	MGTB- 603	International Business	4	0	0	60	40	100	4
2.	MGTB- 604	Operation Management	4	0	0	60	40	100	4
3.	MGTB- 605	Research Project Report	4	0	0			100	6
DSE(Choose any one**)**									
4.	MGTB- 601	a. Business Ethics b. Financial Market Institutions, and Services c.Industrial Relation	4	0	0	60	40	100	4
5.	MGTB- 602	Performance Management Goods and Services Tax Consumer Affairs and Customer care	4	0	0	60	40	100	4
		Total	**20**	**0**	**0**	**240**	**160**	**500**	**22**

MAPPING CO'S/PO'S
Semester -I
MGTB-101

Course Learning Outcomes	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	1	3		2	1		3	1		1		1	3	2	
CLO2	2	1		1		2		1	1	3	2	2	2		
CLO3	2			2		1		2		2	1	1			
CLO4	1			2							1	1			

MGTB-102

Course Learning Outcomes	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	1	3	2	3	3	3	2	3	3	3	2	2	3	2	1
CLO2	1	3	2	3	3	2	2	3	2	3	2	2	3	2	1
CLO3	1	3	2	3	3	2	3	3	3	3	2	2	3	2	1
CLO4	2	3	1	3	3	3	3	3	3	3	2	2	3	2	2
CLO5	1	3	2	3	3	3	2	3	3	3	2	2	3	2	1

MGTB-103

Course Learning Outcomes	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1		2			1								2		
CLO2		3		2		3							3		
CLO3		3			3		1		1		3		1		
CLO4		3		3	1						1		1		3

MGTB-104

Course Learning Outcomes	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1		2		1			1						2		
CLO2		3		2		1		3					3		
CLO3		3			3		1				2		3		1
CLO4		3		3	1						2		3		1

- **High** = 3
- **Medium** = 2
- **Low** = 1

MGTB-105

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PSO 1	PSO 2	PSO 3
CLO1	2		3		1		2	1	2	3		1	3	2	
CLO2	2	1	1	3	3	1		2	1		3		1	3	2
CLO3		1	1	3	3	1		2		2	3		1	3	
CLO4				3	3	1		2			3		1	3	

MGTB-106

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PSO 1	PSO 2	PSO 3
CLO1	1					2							1		1
CLO2		2							2				2		
CLO3			3				2								
CLO4	1					2			3			1			

MGTB-107

Course Learning Outcomes (CLO)	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9	PLO 10	PLO 11	PLO 12	PSO 1	PSO 2	PSO 3
CLO1		2		2		2	2	2			2	2			
CLO2		3		2	3	2	2	2			2	2			
CLO3	2	3		3		2	2	2	2		3	2			
CLO4	3	2		2		2	2	2	2		3	2			

Semester-II

MGTB-201: ENGLISH LANGUAGE-II

Course Learning Outcomes	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	1	1	1	1	2	1	1	1	2	1	1
CO2	2	3	1	2	2	1	1	2	2	1	1	1	2	2	1
CO3	2	3	2	3	2	2	2	2	2	2	1	1	2	2	2
CO4	1	3	2	2	1	1	2	2	2	2	1	1	2	2	2

MGTB-202: ENVIRONMENT STUDIES

Course Learning Outcomes	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	3	2	2	2	2	1	1	2	2	2
CO2	2	2	1	2	2	3	2	2	2	2	1	1	2	2	2
CO3	2	2	2	3	3	3	2	2	2	2	2	2	3	2	2

MGTB-203: BUSINESS STATISTICS

Course Learning Outcomes	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	1	2	2	2	2	2	2	3	3	2
CO2	3	2	2	3	2	1	2	2	2	2	2	2	3	3	2
CO3	3	2	2	3	2	1	2	2	2	2	2	2	3	3	2
CO4	3	2	2	3	2	1	2	2	2	2	2	2	3	3	2
CO5	3	2	2	3	2	1	2	2	2	2	2	2	3	3	2

MGTB-204: COST ACCOUNTING

Course Learning Outcomes	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	2	2	2	2	2	2	2	3	2	1
CO2	2	3	2	3	3	2	2	2	2	2	2	2	3	2	1
CO3	2	3	2	3	3	2	2	2	2	2	2	2	3	2	1
CO4	2	3	2	3	3	2	2	2	2	2	2	2	3	2	1
CO5	2	3	2	3	3	2	2	2	2	2	2	2	3	2	1

MGTB-205: ORGANIZATIONAL BEHAVIOR

Course Learning Outcomes	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	1	3	2	2	2	1	1	2	2	2
CO2	2	2	1	2	2	1	3	2	2	2	1	1	2	2	2
CO3	2	2	2	3	2	2	3	2	2	2	2	2	2	2	2
CO4	2	2	2	3	2	2	3	2	2	2	2	2	2	2	2
CO5	2	2	2	3	2	2	3	2	2	2	2	2	2	2	2

MGTB-301

Course Learning Outcomes	Program LearningOutcomes (PLOs) MGTB-301												Program Specific Outcomes(PSOs)		
	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P S O
CLO1	3	2		3			2			3		1			
CLO2	3	2		2						3		2			
CLO3	3	2		3		1	1		1	2		2			
CLO4	3	2		3		3	1		3	2		2			

H: High M: Medium L: Low

MGTB-302

Course Learning Outcomes	Program Learning Outcomes (PLOs)MGTB-302												Program Specific (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	3		3	3						3	3			3	
CLO2	3		2	3	3		3			3	3	2		3	
CLO3	3		2	3	3		3			3	3	2		3	
CLO4	3		3	3	3		3			3	3			3	

MGTB-303

Course Learning Outcomes	Program Learning Outcomes(PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1	3		3			1		1		3		3			
CLO2	3	3	3	2	1					3		3			
CLO3	2		3	2	1				1						
CLO4	2	2	3						1						

MGTB-304

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2		2	2	2		3	2	3
CO2	2	2	3	2	2	3	3	3	3	3	3	2
CO3	3	2	3	1	3	2	2		2	2	2	2
CO4	2			3	3	1	3	3	3	2	2	2
CO5	3	2	2	2		2	2	2		3	2	3

MGTB-305

Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	2	2	2	2	3	2	3	2	3	2	2
CO2	3	2	2	2	2	2	3	2	2	2	2	3
CO3	3	3	2	3	3	2	3	2	2	2	2	2
CO4	3	3	2	3	3	3	3	3	2	3	2	2
CO5	**3**	2	2	2	2	3	2	3	2	3	2	2

MGTB-401

Course Learning Outcomes	**Program Learning Outcomes (PLOs)MGTB-401**												**Program Specific Outcomes (PSOs)**		
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO10**	**PLO11**	**PLO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	2	2	1				2						1		
CLO2		2	2		2		1		2	1	1				
CLO3		1	1	2	2		2	2		1			1	2	
CLO4					1				1	1					
CLO5	2	2	1				2						1		

MGTB-402

Course LearningOutcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	2	2			3	3
CO2	2	2	2	2	3		2	2	3	3	2	3
CO3	1		2	2	3	3	3		2		2	3
CO4			2	2	3	2		2			2	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTB-403

Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	-	3	1	3	3	3	1	1	3
CO2	-	-	3	2	1	3	2	2	2	-	3	3
CO3	3	2	3	2	-	1	1	2	-	3	2	3
CO4	2	2	-	3	3	2	3	2	1	2	2	3
CO5	3	3	1	-	3	1	3	3	3	1	1	3

MGTB-404

Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	2	2	1	2	2	-	2	2
CO2	2	2	2	-	2	3	2	2	2	-	2	3
CO3	2	2	3	3	3	2	2	-	-	-	2	2
CO4	3	3	1	2	1	2	2	-	-	2	2	3
CO5	3	2	2	3	2	2	1	2	2	-	2	2

MGTB-405

Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	1	1	1	1	1	1	1
CO2	1	1	1	2	1	1	1	1	1	1	1	1
CO3	1	1	1	1	1	1	1	3	1	1	1	3
CO4	2	1	1	3	2	1	1	1	2	1	2	1
CO5	3	1	1	1	1	1	1	1	1	1	1	1

MGTB-406

Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	3	-	3	2	3	2	-	3
CO2	-	3	-	3	2	3	3	3	-	3	3	3
CO3	2	3	3	3	-	3	-	3	3	-	3	3
CO4	3	2	3	2	3	2	3	-	2	3	3	3
CO5	3	-	3	-	3	-	3	2	3	2	-	3

MGTB-501

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	3	-	3	2	3	2	-	3
CO2	-	3	-	3	2	3	3	3	-	3	3	3
CO3	2	3	3	3	-	3	-	3	3	-	3	3
CO4	3	2	3	2	3	2	3	-	2	3	3	3
CO5	3	-	3	-	3	-	3	2	3	2	-	3

MGTB-502

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	2	1	1	1	1	1	2	1	1
CO2	2	1	1	2	1	1	1	1	1	2	1	1
CO3	2	1	1	2	1	1	1	1	1	2	1	1
CO4	3	1	1	3	1	1	1	1	1	3	1	1
CO5	2	1	1	3	1	1	1	1	1	3	1	1

MGTB-503

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	3	-	3	2	3	2	-	3
CO2	-	3	-	3	2	3	3	3	-	3	3	3
CO3	2	3	3	3	-	3	-	3	3	-	3	3
CO4	3	2	3	2	3	2	3	-	2	3	3	3
CO5	2	3	2	2	2	2	-	2	2	2	2	3

MGTB-503

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	3	-	3	2	3	2	-	3
CO2	-	3	-	3	2	3	3	3	-	3	3	3
CO3	2	3	3	3	-	3	-	3	3	-	3	3
CO4	3	2	3	2	3	2	3	-	2	3	3	3
CO5	2	3	2	2	2	2	-	2	2	2	2	3

MGTB-503

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	1	1	1	1	1	1	1	1
CO2	1	3	1	3	1	1	2	1	1	1	1	1
CO3	1	1	3	1	1	1	1	1	1	1	1	1
CO4	1	1	1	2	1	1	1	1	1	1	1	1
CO5	1	1	1	1	3	1	1	1	1	1	1	1

MGTB-504

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		1						3			
CO2	2								3	1		
CO3	3								3		2	
CO4		3					3					
CO5		3		3							2	

MGTB-504

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	1	-	-	3
CO2	-	-	-	-	-	-	-	-	-	2	2	3
CO3	-	-	-	-	-		2	2	-	-	-	3
CO4	-	-	-	2	-	-	2	-	-	-	-	3
CO5	2	-	-	-	-	-	-	-	3	-	2	-

MGTB-505

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	3	3	3	2	2	2	2
CO2	-	3	3	2	1	-	1	2	1	-	2	-
CO3	1	1	2	3	3	-	2	-	-	2	3	1
CO4	1	1	2	1	-	2	3	3	2	1	1	1
CO5	2	2	3	1	-	2	3	3	2	1	2	1

BBA Semester-VI

MGTB-601

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1		2	2					
CO2		2	2						3	2	2	2
CO3		2	2	2	3	2	2	3				
CO4					1		2	2	2	2		2
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTB-601s

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	1	1	1	1	3	2	1
CO2	2	1	1	1	1	1	1	1	1	2	2	1
CO3	1	1	1	1	1	1	1	1	1	1	1	1
CO4	2	1	1	1	1	1	1	1	1	2	1	1
CO5	1	1	1	1	1	1	1	1	1	1	1	1

MGTB-601

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	1	1	1	1	1	1	3
CO2	1	2	1	1	1	1	1	1	1	1	1	3
CO3	1	3	1	2	1	1	2	1	1	1	1	1
CO4	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	1	1	1	1	1

MGTB-602

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	3	1	2	1	1	1	3	2
CO2	2	1	1	3	3	1	1	3	3	2	3	2
CO3	2	3	1	1	3	1	3	1	3	2	3	2
CO4	3	2	1	2	3	1	1	1	1	1	3	1
CO5	2	1	1	1	3	1	1	1	1	1	3	1

MGTB-602

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	3	1	2	1	3	3	3	2
CO2	2	1	1	3	3	1	1	3	3	3	3	2
CO3	3	3	1	1	3	1	3	1	3	2	3	2
CO4	3	2	1	2	3	1	1	1	1	1	3	1
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTB-602

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	3	3	1	2	1	1	3	3	2
CO2	2	3	1	3	3	1	1	3	1	3	3	2
CO3	3	3	1	3	3	1	3	1	2	2	3	2
CO4	3	3	1	3	3	1	1	1	1	1	3	1
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTB-603

Course Learning Outcomes	**Program LearningOutcomes (PLOs)**												**Program Specific Outcomes (PSOs)**		
	PLO1	**PLO2**	**PLO3**	**PLO4**	**PLO5**	**PLO6**	**PLO7**	**PLO8**	**PLO9**	**PLO1**	**PLO1**	**PLO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	3	2	2	2	3	2	3	2	3	3	2	2	3	2	2
CLO2	3	2	2	2	3	2	3	2	3	3	2	2	3	2	2
CLO3	3	2	2	2	3	2	3	2	3	3	2	2	3	2	2
CLO4	3	2	2	2	3	2	3	2	3	3	2	2	3	2	2

MGTB-604

Course Learning Outcomes	Program Learning Outcomes(PLOs)												Program Specific Outcomes (PSOs)		
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12	PSO1	PSO2	PSO3
CLO1					3				3		3	3			
CLO2	3		3	3	2				2				3		3
CLO3			2		3					3		3			2
CLO4	3		2										3		2
CLO5	2			3								3	2		

RESEARCH PROJECT REPORT
Paper MGTB-605
LTPC

BBA-SYLLABUS
BBA-I Semester

ENGLISH LANGUAGE
MGTB-101
L T P C
2 0 0 2

BBA: Semester-I
Course Objective
Teaching English to students of Management is to prepare them with an adequate knowledge of communication in English in the periphery of business world. Students should feel comfortable and easy to communicate in English with others. They have learnt some basic grammatical usage and in this upcoming semester they will learn to communicate to each other with role play conversation. The course contents will, bring a lot of changes in their soft skills and personal development which are very essential for each of them. This syllabus is only for the second semester which will help them to communicate comfortably to others with general English in business field. The following contents are enlisted for the students of BBA/B.Com in the second semester.

Course Learning Outcomes
After completing the course, the student shall be able to:

CO1: To make effective and impressive communication.
CO2: To make communication in ethical manner.
CO3: Capable to make persuasive digital communication.
CO4: Capable to make abstract & summaries of proposals.
CO5: Better presentation and communication using proper body language.

Course Contents
Unit I: Introduction to Communication
Meaning and Definition - Process - Functions - Objectives - Importance - Essentials of good communication - Communication barriers - Overcoming communication barriers

Unit II: Reported Speech
What is reported speech, where to use, how to report the speech of second person to others, words used for reported speech, etc.

Unit III: Oral Communication
Meaning, nature and scope - Principles of effective oral communication - Techniques of effective speech - Media of oral communication (Face-to-face conversation - Teleconferences - Press Conference – Meetings - Rumour -
Demonstration and Dramatization - Public address system - Group Discussion - Oral report - Closed circuit TV). The art of listening - Principles of good listening.
Jam sessions – Debates etc.

Unit IV: Business Letters
Need and functions of business letters - Planning & layout of business letter - Kinds of business letters - Essentials of effective correspondence

Drafting of business letters, Enquiries and replies - Placing and fulfilling orders - Complaints and follow-up - Sales letters -Circular letters - Application for employment and resume - Report writing - Notices, Agenda and Minutes of the Meetings – Memos – cover letters – resume/ cv drafting.

Unit V: Basic Grammar

Aids to correct writing- Tenses, Modals, Subject-verb agreement, common errors.

Suggested Readings:

Bovee, and Thill, Business Communication Essentials, Pearson Education
Shirley Taylor, Communication for Business, Pearson Education
Locker and Kaczmarek, Business Communication: Building Critical Skills, McGraw Hill Education
Herta A Murphy, Herbert W Hildebrandt, Jane P. Thomas, Effective Business Communication (SIE), McGraw Hill Education
Dona Young, Foundations of Business Communication: An Integrative Approach, McGraw Hill Education
Raymond V. Lesikar, Marie E. Flatley, Kathryn Rentz, Paula Lentz, and Neerja Pande, Business Communication: Connecting in a Digital World (SIE), McGraw Hill Education

Constitution of India and Human Rights
MGTB-102

L T P C
4 0 0 4
40 HOURS

Course Objective
To bring about aware among students about our constitution and human rights
Course Learning Outcomes
After completing the course, the student shall be able to:

CO1: Understand the emergence and evolution of Indian Constitution.
CO2: Understand the structure and composition of Indian Constitution
CO3: Understand and analyse federalism in the Indian context.
CO4: Analyse Panchayathi Raj institutions as a medium of decentralization.
CO5: Evaluate the Indian Political scenario amidst the emerging challenges.
CO6: Evaluate Indian foreign relations under cold war and post-cold war era.

Course Contents

Unit I: Indian Constitutional Philosophy (10 HOURS)
a) Features of the Constitution and Preamble
b) Fundamental Rights and Fundamental Duties
c) Directive Principles of State Policy

Unit II Union and State Executive, Legislature and Judiciary (10HOURS)
a) Union Parliament and State Legislature: Powers and Functions
b) President, Prime Minister and Council of Ministers
c) State Governor, Chief Minister and Council of Ministers
d) The Supreme Court and High Court: Powers and Functions

Unit III: Concept and Development of Human Rights (10HOURS)
a) Meaning Scope and Development of Human Rights
b) United Nations and Human Rights – UNHCR
c) UDHR 1948, ICCPR 1996 and ICESCR 1966

Unit IV: Human Rights in India (10 HOURS)
a) Protection of Human Rights Act, 1993 (NHRC and SHRC)
b) First, Second and Third Generation Human Rights
c) Judicial Activism and Human Rights

Suggested Readings:
Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
SubashKashyap, Indian Constitution, National Book TrustJ.A. Siwach, Dynamics of Indian Government & Politics
D.C. Gupta, Indian Government and Politics , Vikas Publishing House Pvt Ltd (1 July 1973)
H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)

MANAGEMENT PROCESS
MGTB-103

L T P C
4 0 0 4
40 HOURS

Course Objective

CO1) To introduce students to the core concepts and principles of management.
CO2) To provide a foundational understanding of the role and importance of management in organizations.
CO3) To teach students how to develop and implement effective planning processes and to enable students to make informed and strategic decisions by applying various decision-making techniques.
CO4) To introduce the principles of staffing, including recruitment, selection, training, and performance appraisal and to understand the importance of human resource management in achieving organizational goals.
CO5) To analyze current trends and challenges in management, such as globalization, technology, sustainability, and diversity and to encourage critical thinking and adaptability in a rapidly changing business environment.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Evaluate the global context for taking managerial actions of planning, organizing and controlling
CO2: Assess global situation, including opportunities and threats that will impact management of an organization
CO3: Integrate management principles into management practices.
CO4: Assess managerial practices and choices relative to ethical principles and standards.
CO5: Specify how the managerial tasks of planning, organizing, and controlling can be executed in a variety of circumstances.

Course Contents

Unit I: Introduction to Management(8 HOURS)

Nature of Management- Meaning, Definition, it's nature purpose, importance & Functions.
Evolution of Management Thoughts- Contribution of F.W.Taylor, Henri Fayol ,Elton Mayo , Chester Barnard & Peter Drucker to the management thought. Various approaches to management (i.e. Schools of management thought)Indian Management Thought.

Unit II: Planning and Decision Making (8 HOURS)

Planning - Meaning - Need & Importance, types levels - advantages & limitations.
Forecasting - Need & Techniques
Decision making - Types - Process of rational decision making & techniques of decision making.

Unit III: Organizing and Directing(8 HOURS)

Organizing - Elements of organizing & processes: Types of organizations, Delegation of authority - Need, difficulties in delegation – Decentralization.
Directing- Introduction, Principles and Elements of Direction; Supervision, Traditional vs. Development Supervision.

Unit IV: Controlling and Coordination (8 HOURS)

Controlling- Concept, Importance, Process & Types of Controlling, Contemporary Issues in Control, Entrepreneurs and Control. Operations Management- Importance, Service and Manufacturing Firms, Project Management Tools & Techniques.

Coordination- Coordination- Definition, Characteristics, Objectives, Techniques.

Unit V: Contemporary Management Issues (8 HOURS)
Management in the International Area.
Change and Organizational Development.
Ethics, Corporate Governance and Social Responsibilities.

Recommended book
L. M. Prasad: Principles and Practice of Management, (2016): Sultan Chand & Sons Publications,. New Delhi
V.S.P. RAO: Principles of Management text and cases

Reference books
Robbins, De Cenzo, Bhattacharya and Agarwal, (2009): Fundamentals of Management- Essential Concepts & Applications 6e, India, Pearson
Hellriegel, Jackson and Sloceum, (2008): Management- A Competency Based Approach 10e, India, South-Western Cengage Learning.
Stoner, Freeman, Gilbert, Jr., (2006), Management 6e, India, Prentice- Hall

Business Organization And Environment
MGTB-104

L T P C
4 0 0 4
40 HOURS

Course Objective

CO10 This module provides students with an elaborative understanding of organizational behavior, its key principles, concepts & theories.

CO2) The range of concepts & theories that students will be introduced includes foundation of individual behavior, groups & group dynamics, motivation, leadership, organization design, organization structure, work stress, organization culture, organization change.

CO3) By the end of the module, students will be fully equipped with the knowledge and skills required to understand & deal human behavior in the organization as individual, group member & organization as a whole.

Course Learning Outcomes

- After completing this course, the students will be able to:
- Identify and evaluate social, cultural, legal and technical factors in business environment.
- Describe the various economic system and sectors.
- Discuss economic planning and policies of Indian economy.
- Apply ethical values and social responsibilities in business.
- Explain International economic grouping and organisations.

Course Contents

Unit I: Foundations of Individual Behavior (8 Hours)

Introduction and Conceptual framework of OB- Nature & Scope of Organizational Behavior. The organization and the individual.

Personality: Determinants and Attributes, Big Five Model

Major Personality Attributes: Locus of Control, Machiavellianism, Self Esteem, Self-Monitoring, Type A & B personality, Risk taking ability.

Learning and Learning Theories: Concept, Law of Effect, Classical Conditioning, Operant Conditioning, Social Learning Theory. Reinforcement Theory and OB Modification Process and its Advantages.

Attitudes: Concept, its components and various job related attitudes, Job satisfaction and its impact on OB.

Values: Concept, types of values, Robbin's Dominant Work Values today, Hofstede's Values Across Cultures, Javidan & House's The G.L.O.B.E. Findings.

Perception: Definition, factors affecting individual perception, Perceptual Selectivity.

Unit II: Motivation and Leadership(8 Hours)

Motivation: Definition and concept, different types of motives.

Theories of motivation: Maslow's Hierarchy of Needs, Herzberg's Two Factor theory, ERG theory, Vroom's Expectancy theory, Equity theory, Reinforcement theory and Behavior Modification.

Leadership: Nature and Significance of leadership, Trait theory of leadership.

Behavioral theories of leadership- Ohio State Studies, Michigan Studies, and Managerial Grid.

Contingency theories - Fiedler's model, Hersey and Blanchard's situational theory, leader-member exchange theory, path goal theory, Charismatic leadership.

Unit III: Foundations of Group Behavior(8 Hours)

Group: Definition, Classification of Groups, stages of group development, Group Structure, Group Processes,

Strength and weakness of group over individuals.
Team: Concept of team, Group v/s Team, Team Effectiveness, Different types of teams, how to convert an individual into team player.
Conflict and Collaboration: Transitions in Conflict Thought, Functional versus Dysfunctional Conflict, Conflict Process.
Conflict Management: Techniques, Negotiation process, Bargaining strategies, Global implications.

Unit IV: Structural & Cultural Dimensions of OB(8 Hours)
Organization Structure: Definition, Elements of Organization Structure, Common Organization Designs: simple Structure, Bureaucratic Structure, Matrix Structure.
New Designs Option: Team Structure, Virtual Structure, Boundaryless Organization Structure; Factors affecting choice of different organization designs.
Organization Culture: Meaning of Organizational Culture, Creating and Sustaining Culture, Countries and Culture, Employee Acculturation Process.
Organizational Climate: Concept and How to build a more positive and employee centered climate.

Unit V: Organizational Change and Stress Management (8 Hours)
Organizational Change: Change Concept, Forms of Change, Sources of Resistance to Change, Tactics to deal with resistance.
Approaches/ Models to Managing Change: Lewin's Change Model and Nadler's Organizational Model, Action Research: Steps in action Research and Change agents.
Stress Management: Work Stress, types of stress, stages of stress, causes of stress: extra-organizational, organizational, group and individual; Strategies to cope with stress: individual strategies and organizational strategies.

Recommended Book
Robbins, Judge & Sanghi, (2009): Organizational Behavior 13e, India, Pearson, Prentice Hall

Reference Book
L. M. Prasad, (2011): Organizational Behavior, India, Sultan Chand & Sons
Hersey, Blanchard & Johnson, (2009), India, Pearson/ Prentice Hall
Keith Davis: Organizational Behavior: Human Behavior at Work, McGraw Hill Book Co

Course Learning Outcomes (CLOs): On completion of this course, the students willbe able to:

Principles of Accounting
MGTB-105
L T P C
4 0 0 4
40 HOURS

Course Objective

This course provides conceptual knowledge of financial accounting and the techniques for preparing accounts in different types of business organizations.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: understand the theoretical framework of accounting and to prepare financial statements
CO2: explain and determine depreciation and value of inventory
CO3: learn accounting for hire purchase transactions, leases, branches and departments
CO4: understand the concepts of partnership firm and prepare accounts for dissolution of a partnership firm
CO5: develop the skill of preparation of trading and profit and loss account and balance sheet using computerized accounting.

Course Contents

Unit-1: Introduction(8 HOURS)

Conceptual Framework: Accounting principle, Concepts and Conventions Introduction to Accounting Standards and Indian Accounting Standards (AS & Ind AS), Accounting Process: Journal, ledger, Trial Balance, Financial Statements (overview) Capital Expenditure (and Receipts), Revenue Expenditure (and Receipts) and Deferred Revenue Expenditure. Preparation of Financial Statements of a profit making sole proprietorship trading firm with additional information, Preparation of Financial Statements of a not for profit organisations.

Unit-2: Depreciation Accounting and Inventory Valuation(8 HOURS)

Accounting for Plant Property and Equipment & Depreciation: Meaning of Depreciation, Depletion and amortization, Objective and Methods of depreciation (Straight line, Diminishing Balance), Change of Method, Inventory Valuation: Meaning, Significance of Inventory Valuation, Inventory Record System-Periodic and Perpetual, Methods of Inventory Valuation-
FIFO, LIFO and Weighted Average
(Relevant accounting Standards as applicable)

Unit-3: Special types of Accounting(8 HOURS)

Hire Purchase Accounting: Calculation of Interest, Partial and Full Repossession, profit Computation (Stock & Debtors System only)**,** Accounting for Leases: Concept, Classification of leases (Simple practical problems)**,** Accounting for Branches (excluding foreign branches): Dependent branches ('Debtors system' and 'Stock & debtors System') and overview of Independent branches. Departmental Accounting: Concept, Type of departments, Basis of allocation of departmental expenses, Methods of departmental accounting (excluding memorandum stock and memorandum mark-up account method)
(Relevant accounting Standards as applicable)

Unit-4: Accounting for Partnership Firm(8 HOURS)
Partnership accounts: Fundamentals, Admission, Retirement and Death of a partner (only an overview)**,** Accounting for Dissolution of Partnership Firm: Dissolution of Partnership Firm including Insolvency of partners (excluding sale to a limited company), Gradual realization of assets and piecemeal payment of liabilities

Unit-5: Computerized Accounting System(8 HOURS)
Computerized Accounting System: Computerized accounts by using any popular accounting software: Creating a company; Configure and Features settings; Creating Accounting Ledgers and Groups, Creating Stock Items and Groups; Vouchers Entry; Generating Reports – Cash Book, Ledger Accounts, Trail Balance, Profit and Loss Account, Balance Sheet, Funds Flow Statement, Cash Flow Statement, Selecting and Shutting a Company; Backup and Restore of Data of a Company
Note: Latest Accounting Standards to be followed

References
Goyal, Bhushan Kumar and H.N. Tiwari, Financial Accounting , Taxmann
Kumar, Alok. Financial Accounting, Singhal Publication.
Lt Bhupinder. Financial Accounting – Concepts and Applications, Cengage
Monga, J R. Financial Accounting: concept and Applications. Mayur paper Backs, New Delhi
Sehgal, Ashok & Deepak Sehgal. Fundamentals of Financial Accounting, Taxmann
Tulsian, P C. Financial Accounting, Tata McGraw Hill New Delhi
Lal, Jawahar, Seema Srivastava & Abrol, Shivani. Financial Accounting Text and problems, Himalaya Publishing House, New Delhi.

Business Mathematics
MGTB-106
L T P C
4 0 0 4
40 HOURS

Course Objective
Business mathematics is used by commercial enterprises to record and manage business operations. Commercial organizations use mathematics in accounting, inventory management, marketing, sales forecasting, and financial analysis. Mathematics typically used in commerce includes elementary arithmetic, elementary algebra, statistics and probability. Business management can be made more effective in some cases by use of more advanced mathematics such as calculus, matrix algebra and linear programming.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: comprehend the concept of systematic processing and interpreting the information in quantitative terms to arrive at an optimum solution to business problems.
CO2: develop proficiency in using different mathematical tools (matrices, calculus, linear programming, and mathematics of finance) in solving daily life problems.
CO3: acquire competence to use computer for mathematical computations, especially with Big data.
CO4: obtain critical thinking and problem-solving aptitude.
CO5: evaluate the role played by mathematics in the world of business and economy.

Course Contents
UNIT I : Basics of Business Mathematics(8 HOURS)
Ratio and proportion
Indices
Logarithms

UNIT II : Equations (8 HOURS)
Linear – simultaneous linear equations up to three variables,
Quadratic and cubic equations in one variable,
Equations of a straight line,
Intersection of straight lines,
Graphical solution to linear equations.
Inequalities
Graphs of inequalities in two variables
Feasible & Infeasible solutions

UNIT III(8 HOURS)
Simple and Compound Interest including annuity ─ Applications
Basic concepts of Permutations and Combinations

UNIT IV(8 HOURS)
Sequence and Series – Arithmetic and geometric progressions
Sets, Functions and Relations

UNIT V(8 HOURS)
Limits and Continuity – Intuitive Approach
Basic concepts of Differential and Integral Calculus (excluding trigonometric functions)

Recommended book:
R S Agarwal, Quantitative Aptitude, S. Chand Publishing, 17th Edition, 2012

Reference books:
Abhijit Guha, Quantitative Aptitude, Tata McGraw - Hill Education, 4th Edition, 2010
P.Gupta, Quantitative Aptitude, Unique Publisher
Zameerudin, Qazi, V.K. Khanna & S.K. Bhambri, Business Mathematics, Vikas Publishing House Pvt. Ltd, New Delhi.
Mapping of CLOs with PLOs & PSOs

Fundamentals of computers
MGTB-107
L T P C
3 0 1 4
40 HOURS

Course Objective
Computers have become an integral part of work life of every individual. Today's pace of corporate functioning cannot even be thought of without computers. Keeping into mind such a necessity, this paper is introduced to help the students learn the basic skills of operating a computer and office automation.

Course Learning Outcomes
After completing the course, the student shall be able to:

CO1: Understand the concept of input and output devices of Computers and how it works.
CO2: Understand the concepts, structure, types and design of operating Systems.
CO3: Understand the concept of Data Communication, its Modes, its Forms and Data Communication Channels
CO4: Understand evolution of internet, its application and its basic services.
CO5: Recognize when to use each of the Microsoft Office programs to create professional and academic documents
CO6: Create and design a word document for general office use.
CO7: Students will have a working knowledge of paragraph formatting, macro and mail-merge in MS-Word.

Course Contents

Unit I: Introduction to Computers (8 Hours)
Computer defined, Classification of computers, Basic computer organization, Input devices, Output devices, Primary Memory (ROM, RAM), Secondary Memory, Binary digit system, Bits, Bytes, Other units of memory, Software (Application software, Operating Software).

Unit II: Microsoft Word(8 Hours)
Introduction to Toolbars, Menus, Ribbons, Text formatting, Finding and replacing text, Inserting illustrations (picture, clipart, shapes, Smartart, Chart), Headers, Footers, Text box, Word art, Symbols, Page setup, Watermark, Page border, Paragraph formatting, grouping, ungrouping, Mail merge, Spell check, Word count, Zoom, Save, Save as, Printing documents, Print preview

Unit III: Microsoft Excel(8 Hours)
Introduction to components of Excel window interface, Toolbars, Worksheet concept, Cell address, Formatting, Cell alignment, Conditional formatting, Inserting, Deleting and formatting cell, Autosum, Sorting & Filtering, Inserting illustrations (picture, clipart, Shapes, Smartart), Inserting and formatting charts, Text box, Header & Footer WordArt, Object, Symbol, page layout, Basic formulas (sum, multiplication, average, maximum, minimum, percentage), Spellcheck, Inserting & editing comment, Save, Save as, Printing, Print preview, Page break view.

Unit IV: Microsoft PowerPoint(8 Hours)
Introduction to components of PowerPoint window interface, Toolbars, Slide layout, design, Slide formatting, arranging and ordering, Inserting tables, Illustrations (Picture, Clipart, Shapes, Smartart, Chart, Text box, Header

& Footer, WordArt, Movie, Sound, Slide animation, Slide transition, Slide show basics, Slides handout, Slides sorter, Printing handouts, Print preview.

Unit V: Networking and Internet(8 Hours)

Computer networking basics, Network topology (Star, Ring, Bus, Hybrid, LAN, WAN, MAN, Internet surfing, Internet browsers (Mozilla, Internet explorer, Chrome, Opera), Opening & operating email accounts, Dropbox, Instant messaging, Search engines

Recommended Readings

Sinha, P.K. and Sinha, Priti, Computer fundamentals, BPB Publications, New Delhi, Sixth Edition, 2011.
Peter Norton, Introduction to Computers, Tata McGraw Hill, Sixth Edition, 2009.
Behrouz Forouzan, Data Communication and networking, TMH

BBA Semester-II
Business Statistics
MGTB-203
L T P C
4 0 0 4
40 HOURS

Objective

The objective of this course is to familiarize students with the basic statistical tools used to summarize and analyze quantitative information for decision making.

Course Outcomes

CLO1: Understand and apply fundamental statistical concepts, including descriptive statistics, to organize and summarize data effectively.
CLO2: Analyze data using measures of central tendency, dispersion, and correlation to interpret quantitative information for informed decision-making.
CLO3: Apply probability theory and distributions to assess risks and uncertainties in business scenarios.
CLO4: Perform hypothesis testing and regression analysis to make data-driven predictions and business decisions.
CLO5: Utilize statistical software to implement and interpret statistical analyses for solving real-world business problems.

Curriculum

Unit I (8 HOURS)
Probability: introduction, basic terminology, Types of probability, Probability rules, posterior probability.

Unit II(8 HOURS)
Probability distribution: Introduction, random variables, use of expected value in decision making, normal distribution, binomial distribution.

Unit III (8 HOURS)
Sampling and Sampling distribution: introduction, random sampling, sampling distribution, relationship between sample size and standard error.

Unit IV (8 HOURS)
Estimation: introduction, point estimate, interval estimate, confidence interval, sample size in estimation.

Unit V (8 HOURS)
Testing Hypothesis: introduction, basic concept, testing procedure, testing hypothesis, measuring the power of hypothesis test. Testing of proportion.

Reference books:

Vohra, N.D., (2009) Quantitative Techniques in Management, 4th edition, McGraw Hill Education.

Vishwanathan, P.K., (2008) Business Statistics and Applied Orientation, 1st edition, Pearson Education.

Rajagopalan, S. and Sattanathan, R., (2009) Business Statistics & Operations Research, 2nd Edition, McGraw Hill Education.

Sharma, J.K., (2009) Operations Research: Problems & Solutions, 2nd edition, Macmillan India Ltd.

Taha, Hamdy, (2008) Operations Research: An Introduction, 8th edition, Pearson Education.

Render, Barry, Stair, R.M., Hanna, M.E., and Badri, (2009) Quantitative Analysis for Management, 10th edition, Pearson Education

Richard l. Levin and Devid S. Rubin, Statics for management, Pearson

COST ACCOUNTING
MGTB-204

L	T	P	C
4	0	0	4

(40 Hours)
Objective
The subject of Management Accounting is basicaliiy Designed to equip the Student with tools for analysing financial and non financial information which will help them in decision-making planing and control.
Aim: To acquaint the students with basic concepts used in cost accounting and various methods involved in cost ascertainment systems.

Curriculum
Unit I: Introduction(8 HOURS)
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 organization.

Unit II: Cost concept(8 HOURS)
Types of cost, Cost Accumulations, cost objects , cost classifications, cost applications, cost behavior,Techniques of Costing.

Unit III: Overhead(8 HOURS)
Classification, allocation, apportionment and absorption of overhead.Under- and over-absorption. Capacity costs. Treatments of certain items in costing, like interest on capital, packing expenses, debts, research and development expenses, Bad Activity – based cost allocation.

Unit IV Methods of Costing(8 HOURS)
Unit costing, Job costing. Contract Costing. Process costing (process losses, valuation of work in progress, joint and by-products) Service costing (only transport).

Unit V:Cost -Volume -Profit Analysis(8 HOURS)
The Reletionship of cost and profit with volume, use of CVP Analysis, Marginal Costing and Absorption costing, Breakeven point, contribution marginal Approach, Use of Break even analysis.

Recommended Book
Lal, Jawahar. Cost Accounting. Tata McGraw Hill Publishing Co., New Delhi
Reference Book
Nigam, B.M. Lall and I.C. Jain. Cost Accounting: Principles and Practice. Prentice Hall of India, New Delhi.
Mittal, D.K. and Luv Mittal. Cost Accounting. Galgotia Publishing Co., New Delhi.
Arora, M.N.Cost Accounting–Principles and Practice. Vikas Publishing House, New Delhi.
Shukla, M.C., T.S. Grewal and M.P. Gupta. Cost Accounting: Text and Problems.
S. Chand & Co. Ltd., New Delhi.

ORGANIZATIONAL BEHAVIOR
MGTB-205
L T P C
4 0 0 4
40 HOURS

Course Objective

CO1.) This module provides students with an elaborative understanding of organizational behavior, its key principles, concepts & theories.
CO2.) The range of concepts & theories that students will be introduced includes foundation of individual behavior, groups & group dynamics, motivation, leadership, organization design, organization structure, work stress, organization culture, organization change.
CO3.) By the end of the module, students will be fully equipped with the knowledge and skills required to understand & deal human behavior in the organization as individual, group member & organization.

Course Learning Outcomes:

CLO1) Students will demonstrate an understanding of the factors that influence individual behavior in organizational settings, including personality, motivation, perception, and attitudes.
CLO2) They will demonstrate the ability to work effectively in teams, manage conflicts, and contribute positively to group decision-making processes.

CLO3) They will be able to assess and apply effective leadership and management practices to improve organizational performance and employee satisfaction.

CLO4) Students will analyze the concept of organizational culture and its impact on employee behavior and organizational success.

Curriculum

Unit I: Foundations of Individual Behavior (8 HOURS)

Introduction and Conceptual framework of OB- Nature & Scope of Organizational Behavior. The organization and the individual.
Personality: Determinants and Attributes, Big Five Model
Major Personality Attributes: Locus of Control, Machiavellianism, Self Esteem, Self Monitoring, Type A & B personality, Risk taking ability.
Learning and Learning Theories: Concept, Law of Effect, Classical Conditioning, Operant Conditioning, Social Learning Theory. Reinforcement Theory and OB Modification Process and its Advantages.
Attitudes: Concept, its components and various job related attitudes, Job satisfaction and its impact on OB.
Values: Concept, types of values, Robbin's Dominant Work Values today, Hofstede's Values Across Cultures, Javidan & House's The G.L.O.B.E. Findings.
Perception: Definition, factors affecting individual perception, Perceptual Selectivity.

Unit II: Motivation and Leadership(8 HOURS)

Motivation: Definition and concept, different types of motives.
Theories of motivation: Maslow's Hierarchy of Needs, Herzberg's Two Factor theory, ERG theory, Vroom's Expectancy theory, Equity theory, Reinforcement theory and Behavior Modification.
Leadership: Nature and Significance of leadership, Trait theory of leadership.
Behavioral theories of leadership- Ohio State Studies, Michigan Studies, and Managerial Grid.
Contingency theories - Fiedler's model, Hersey and Blanchard's situational theory, leader-member exchange theory, path goal theory, Charismatic leadership.

Unit III: Foundations of Group Behavior(8 HOURS)

Group: Definition, Classification of Groups, stages of group development, Group Structure, Group Processes, Strength and weakness of group over individuals.

Team: Concept of team, Group v/s Team, Team Effectiveness, Different types of teams, how to convert an individual into team player.

Conflict and Collaboration: Transitions in Conflict Thought, Functional versus Dysfunctional Conflict, Conflict Process.

Conflict Management: Techniques, Negotiation process, Bargaining strategies, Global implications.

Unit IV: Structural & Cultural Dimensions of OB(8 HOURS)

Organization Structure: Definition, Elements of Organization Structure, Common Organization Designs: simple Structure, Bureaucratic Structure, Matrix Structure.

New Designs Option: Team Structure, Virtual Structure, Boundaryless Organization Structure; Factors affecting choice of different organization designs.

Organization Culture: Meaning of Organizational Culture, Creating and Sustaining Culture, Countries and Culture, Employee Acculturation Process.

Organizational Climate: Concept and How to build a more positive and employee centered climate.

Unit V: Organizational Change and Stress Management (8 HOURS)

Organizational Change: Change Concept, Forms of Change, Sources of Resistance to Change, Tactics to deal with resistance.

Approaches/ Models to Managing Change: Lewin's Change Model and Nadler's Organizational Model, Action Research: Steps in action Research and Change agents.

Stress Management: Work Stress, types of stress, stages of stress, causes of stress: extra-organizational, organizational, group and individual; Strategies to cope with stress: individual strategies and organizational strategies.

Recommended Book

Robbins, Judge & Sanghi, (2009): Organizational Behavior 13e, India, Pearson, Prentice Hall

Reference Book

L. M. Prasad, (2011): Organizational Behavior, India, Sultan Chand & Sons
Hersey, Blanchard & Johnson, (2009), India, Pearson/ Prentice Hall
Keith Davis: Organizational Behavior
Fred Luthans: Organizational Behavior

ENVIRONMENT STUDIES
MGTB-202

L	T	P	C
4	0	0	4

(40 Hours)

Objective:

To create awareness among management students about environmental issues and equip them with the knowledge to promote sustainable practices.

Course Learning Outcomes (CLOs):

CLO1: Demonstrate understanding of the multidisciplinary nature of environmental studies and the importance of public awareness for environmental protection.

CLO2: Analyze the significance of natural resources and discuss the challenges associated with their sustainable management.

CLO3: Explain the structure and function of various ecosystems and their role in maintaining ecological balance.

CLO4: Evaluate the importance of biodiversity, identify the threats to biodiversity, and understand conservation strategies.

CLO5: Assess the causes, effects, and control measures for various types of environmental pollution and understand disaster management strategies.

Unit I: The multidisciplinary nature of environmental studies
Definition,
Scope and importance
Need for public awareness

Unit II: Natural Resources:
Renewable and non-renewable resources:
Natural resources and associated problems.
Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
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
Ecological succession
Food chains, food webs and ecological pyramids
Introduction, types, characteristic features, structure and function of the following ecosystem:
Forest ecosystem
Grassland ecosystem
Desert ecosystem
Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit IV: Biodiversity and its conservation
Introduction – Definition: genetic, species and ecosystem diversity
Biogeographical 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
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 V: Environmental Pollution
Definition
Causes, effects and control measures of:
Air pollution
Water pollution
Soil pollution
Marine pollution
Noise pollution
Thermal pollution
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
Matching of PLOs and CLOs:

BBA-III
CYBER PHENOMENON LAW
Paper MGTB-301
L T P C
3 0 0 4
(40 HOURS)

Course Objectives:
In recent times the Cyber law has emerged as medium for growth with immense potentials for solving many new and interesting challenges. Both the personal and professional worlds are extremely dependent today on the Cyber World. The world is increasingly dependent on networked information and communication technologies (ICT). However, with growing dependency, new threats to network and information security have emerged and there is ever-growing vulnerability to Cyber Crime. Thus, an effort to spread awareness of Cyber Security is the need of the hour and particularly among the law fraternity as these are the persons who must handle the cases of cybercrime.

Course Learning Outcomes
After completing the course, the student shall be able to:
CO1: Describe cyber organized crime and criminal groups that engage in cyber organized crime
CO2: Identify and discuss the structures and characteristics of organized criminal groups that engage in cyber organized crime
CO3: Identify different types of cyber organized crime
CO4: Explain and analyse the ways in which information and communication technology is used to commit cyber organized crime
CO5: Critically evaluate the measures used to counter cyber organized crime

CO5: understand the fundamentals of E-commerce and silent features of the same.

Course Contents

Unit I (8 HOURS)
Introduction to Cyber space, Need for Cyber Law. Cyber Jurisprudence at International and Indian Level. Cyber Law - International Perspectives-UN & International Telecommunication Union (ITU) Initiatives, Council of Europe - Budapest Convention on Cybercrime, Asia-Pacific Economic Cooperation (APEC), Organization for Economic Co-operation and Development (OECD), World Bank, Commonwealth of Nations

Unit II: (8 HOURS)
Constitutional & Human Rights Issues in Cyberspace-Freedom of Speech and Expression in Cyberspace. Right to Access Cyberspace – Access to Internet. Right to Privacy. Right to Data Protection

Unit III: (8 HOURS)
Cyber Crimes & Legal Framework-Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act, 2000.

Unit IV: (8 HOURS)

Cyber Torts-Cyber Defamation, Different Types of Civil Wrongs under the IT Act, 2000. Intellectual Property Issues in Cyber Space. Interface with Copyright Law. Interface with Patent Law. Trademarks & Domain Names Related issues

Unit V: (8 HOURS)

E Commerce-Concept, E-commerce-Salient Features, Online approaches like B2B, B2C & C2C.Online contracts, Click Wrap Contracts, Applicability of Indian Contract Act, 1872. Dispute Resolution in Cyberspace-Concept of Jurisdiction, Indian Context of Jurisdiction and IT Act, 2000. International Law and Jurisdictional Issues in Cyberspace. Dispute Resolutions

Textbook

Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
Justice Yatindra Singh, Cyber Laws, Universal Law Publishing Co, New Delhi, (2012).
Verma S, K, Mittal Raman, Legal Dimensions of Cyber Space, Indian Law Institute, New Delhi, (2004)

References

Jonthan Rosenoer, Cyber Law, Springer, New York, (1997).
Sudhir Naib, The Information Technology Act, 2005: A Handbook, OUP, New York, (2011)
S. R. Bhansali, Information Technology Act, 2000, University Book House Pvt. Ltd., Jaipur (2003).
Vasu Deva, Cyber Crimes and Law Enforcement, Commonwealth Publishers, New Delhi, (2003).

Note: Latest edition of readings may be used

BUSINESS ECONOMICS
Paper MGTB-302
L T P C
4 0 0 4
(40 Hours)
Course Objective
Economics is the study of how individuals and societies make rational choices when confronted with scarce resources and an uncertain environment. Economic theory aims at the construction of models which describe the economic behavior of individual units (Consumers, Firms, and Government Agencies). Microeconomics studies the economic phenomenon at the micro level i.e. at the individual level. Microeconomics studies how consumers and producers make their choices; how their decisions and choices affect the demand and supply conditions and how consumers and producers interact to settle the prices of goods and services in the market.
Course Learning Outcomes
Upon successful completion of the course a student will be able to

CO1: Understand how households (demand) and businesses (supply) interact in various market structures to determine price and quantity of a good produced.
CO2: Understand the links between household behavior and the economic models of demand.
CO3: Represent demand, in graphical form, including the downward slope of the demand curve and what shifts the demand curve.
CO3: Understand the links between production costs and the economic models of supply.
CO4: Apply the concept of opportunity cost
CO5: Analyze operations of markets under varying competitive conditions

Course Contents

Unit I (8 Hours)
Introduction to Economics:
Nature, Scope, Definition of Managerial Economics, Difference between Managerial Economics & Economics, Micro and Macro Economics Opportunity cost.
Demand and supply: Demand & supply curves, Measurement of elasticity of demand, factors affecting elasticity of demand, income elasticity of demand, cross elasticity of demand, advertising elasticity of demand.
Demand forecasting: need, objective & methods (in brief)
Unit II (8 Hours)
Consumer Behavior: Cardinal Utility Approach: Diminishing Marginal Utility, Law of Equi-Marginal Utility. Ordinal Utility Approach.
Indifference Curves, Marginal Rate of Substitution, Budget Line and Consumer Equilibrium.

Unit III (8 Hours)
Theories of Production: Meaning & concept of Production, Factors of Production, Production functions, Iso-quants, Fixed & Variable factors of production. Law of variable proportions (Short run production analysis), Law of returns to a scale (long run production analysis).
Unit IV (8 Hours)
Cost analysis & Price output decision in different market: Concept of Cost, Cost Function, Short Run Cost, Long Run Cost, Economics and Diseconomies of Scale. Explicit Cost and Implicit Cost, Profit maximization, equality of marginal cost and marginal revenue.
Unit V (8 Hours)
Pricing Under Perfect Competition, Pricing Under Monopoly, Control of Monopoly, Price

Discrimination, Pricing Under Monopolistic Competition, Pricing Under Oligopoly.

REFERENCES

1. Samuelson, P & Nordhaus, W. (2009) Economics, 18th Edition, McGraw Hill Education.
2. Dwivedi, D.N.(2008) Managerial Economics, 7th edition, Vikas Publishing House.
3 Salvatore, D. ((2006)) Managerial Economics in a Global Economy, 6th edition, Oxford UniversityPress.
4. Kreps, D.(2009). MicroEconomics for Managers, 1st edition, Viva Books Pvt. Ltd.
5. Peterson, L. and Jain ((2006)) Managerial Economics, 4th edition, Pearson Education.
6. Colander, D, C (2008) Economics, McGraw Hill Education.
7. Managerial Economics: H.L Ahuja, Sultan Chand & Sons
Note: Latest edition of readings may be used

CORPORATE ACCOUNTING
Paper MGTB-303
L T P C
4 0 0 4
(8 Hours)
Course Objective
To acquire the conceptual knowledge of corporate accounting and to understand the various techniques of preparing accounting and financial statements

Course Learning Outcomes
After completing the course, the student shall be able to:

CO1: develop an understanding of accounting for share capital and debentures
CO2: prepare financial statements of a company
CO3: understand the accounting for amalgamation
CO4: prepare consolidated balance sheet for Holding company
CO5: develop an understanding of cash flow statements

Course 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. Valuation of Goodwill and Valuation of Shares--Concepts and calculation: simple problem only

Unit 3. Amalgamation of Companies
Concepts and accounting treatment as per Accounting Standard: 14 (ICAI) (excluding intercompany holdings). Internal reconstruction: concepts and accounting treatment excluding scheme of reconstruction.

Unit 4. Accounts of Holding Companies/Parent Companies
Preparation of consolidated balance sheet with one subsidiary company; Relevant provisions of Accounting Standard: 21 (ICAI).

Unit 5. Accounting for Cash Flow Statement
Cash Flow Statement-Concept of funds, Preparation of cash flow statement as per Indian Accounting Standard (Ind-AS3 revised):
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.

References:

1. J.R. Monga, *Fudamentals of Corporate Accounting*. Mayur Paper Backs, New Delhi.
2. M.C. Shukla, T.S. Grewal, and S.C. Gupta. *Advanced Accounts*. Vol.-II. S. Chand & Co., New Delhi.
3. S.N. Maheshwari, and S. K. Maheshwari. *Corporate Accounting*. Vikas Publishing House, New Delhi.
4. Ashok Sehgal, Fundamentals of *Corporate Accounting*. Taxman Publication, New Delhi.
5. V.K. Goyal and Ruchi Goyal**,**. *Corporate Accounting*. PHI Learning.
6. Jain, S.P. and K.L. Narang. *Corporate Accounting*. Kalyani Publishers, New Delhi.
7. Bhushan Kumar Goyal, *Fundamentals of Corporate Accounting,* International Book House
8. P. C. Tulsian and Bharat Tulsian, Corporate Accounting, S.Chand
9. Compendium of Statements and Standards of Accounting. The Institute of Chartered Accountants of India, New Delhi.

Note: Latest edition of readings may be used

Teaching Learning Process

Theory/ numerical with examples

Assessment Methods

Class participation, Presentation, Viva/ test, End Semester Exam

Keywords

Shares, Financial Statements, Cash Flow, Amalgamation, Liquidation, Purchase Consideration, Holding Company

HUMAN RESOURCE MANAGEMENT
Paper MGTB-304
LTPC
4 0 0 4
(40 HOURS)

Course Objective

This module introduces the students with the key concepts, theories, tools & techniques of human resource management. The range of concepts that students will be introduced to include philosophy of HRM, human resource planning, job analysis, recruitment & selection, training & development, compensation & labor relation. By the end of the module, students will be fully equipped with the skills & techniques required to plan & manage the human resource in the organization.

Course Learning Outcomes
After completing the course, the student shall be able to:

CO1: understand basic nature and importance of human resource management.
CO2: analyze the current theory and practice of recruitment and selection.
CO3: realize the importance of performance management system in enhancing employee performance.
CO4: recommend actions based on results of the compensation analysis and design compensation schemes that are cost effective, that increase productivity of the workforce, and comply with the legal framework.
CO5: understand role of modern HRM in meeting challenges of changing business environment.

Course Contents

Unit I: (8 HOURS)
Introduction to Human Resource Management
Definition and concept of HRM and personnel Management, Importance of HRM, Activities and functions of HRM, Organization of H.R.M. department, Role of HRM Department, Limitations of HRM, Challenges before HRM.

Unit II: (8 HOURS)
Human Resource Planning (HRP)
Definition and objectives of Human Resource Planning, Process of Human Resource Planning, Factors influencing estimation of Human Resources. Concept of Recruitment, Recruitment policy, Sources of Recruitment, Selection and its procedure.

Unit III: (8 HOURS)
Performance Appraisal
Concept and objectives of Performance Appraisal, Process of Performance Appraisal, Methods of Performance Appraisal, Uses and limitations of Performance Appraisal.

Unit IV: (8 HOURS)
Training & Development
Meaning and Definition of Training; need, objectives and importance of Training, Training Methods, Evaluation of Training Programme. Concept of Management Development, Management Development Process and methods, Evaluation of Management Development Programme.

Unit V: (8 HOURS)
Wage and Salary Administration
Methods of wage payments, Employee Remuneration, factors determining the level of remuneration, Profit sharing, Fringe Benefits and Employee services, Wages & Salary Administration

Recommended book:
K. Aswathappa, (2009): Human Resource Management- Text & Cases 5e, India, McGraw Hill.

Reference books:
Dessler & Varkkey, (2010): Human Resource Management 11th ed., Prentice Hall of India.
Decenzo & Robbins, (2006): Fundamentals of Human Resource Management, Wiley.
Dipak Kr. Bhattacharyya, (2010): Human Resource Management 2e, India, Excel Books.
Bernardin, (2007): Human Resource Management- An Experimental Approach, India, TATA McGraw Hill.
Snell & Bohlander, (2008): Human Resource Management, India, South- Western Cengage Learning
Latest editions of the books may be used.

Rural Management
Paper MGTB-305
LTPC
4 0 0 4
(40 HOURS)
Course Objective
To help the students develop a general understanding of the various aspects of rural management.

Course Learning Outcomes
After completing the course, the student shall be able to:

CO1: join in NGOs, CBOs, Projects of Funding Agencies (UNDP, World Bank, JICA, DFID,CARE,CRY,USAID,Action Aid),CSR Units of Corporate/Business houses.
CO2: join in Rural Development Organizations / Institutions as Social Worker, Community Mobilizer.
CO3: set up Small Scale Industry in rural areas supported by State govt. institutions like ORMAS, DDUGKY (Aajeebika), Indian Red Cross Society, District Rural Development Agency (DRDA) or District Industry Centre (DIC) of any district.
CO4: join in State /National Livelihoods Mission under Panchayati Raj Dept / Rural Development Dept. of the State / Nation as Manager or Programme Coordinator.
CO5: start a Non- Governmental Organisation or Voluntary agency to serve for the welfare of the rural poor. Currently NGOs play a very crucial role in rural development, by organizing poor people in villages. The funds for running of such NGOs will be available from both Central and State governments on the basis of the projects and requirements of theNGOs.

Course Contents

Unit I: Introduction (8 HOURS)
Definition of Rural Area, Meaning and concept of rural development, nature and scope of rural development in India. Demographic structure of rural India; Trends in population growth, composition of rural work force.

Unit II: Rural development(8 HOURS)
Concepts, Principles and Approaches: of rural management. Indicators of development; Conceptual framework, Strategies; Rural development in India:

Unit III: Policies and Programs: (8 HOURS)
A retrospective; Policies, Programs: Techniques of planning: Detail steps in district and block level planning: Area Development Planning: Definition, purpose, Area development plans.

Unit IV: Rural Administration: (8 HOURS)
Panchayati Raj & Rural Administration, Natural Resources Development & Management,

Unit V: Rural Marketing(8 HOURS)
Rural Marketing: Rural production and products: agricultural and non-agricultural products; types of rural production and products; Market functionaries: Concept of supply chain management and Value Addition; Problems of marketing; Role of co-operative agencies in marketing of agricultural and non-agricultural product.

References:

1. Rural Management by KB Gupta, Faizia Sidiqui, and Iftikhar Alam; CBS Publication
2. Rural marketing: Challenges and opportunities. by Dinesh Kumar and Punam Gupta; SAGE text
3. Rural Development: Principles, Policies and Management by Katar Singh; SAGE text
4. Rural Marketing by Pradeep Kashyap; Pearson Publication

Note: Latest edition of readings may be used

.

Comprehensive Viva-voce
Paper MGTB-306
LTPC
0 0 0 4
Course Objective
A viva-voce of all the subjects of semester-III shall be conducted in front of a constituted committee of academicians/experts (internal and external)

Course Learning Objectives (CO):

CO1. To prepare comprehensively about the concept and overall knowledge of all courses.CO2. To gain confidence and develop interpersonal skills in the relevant field.
CO3. To acquaint the students with the overall framework of management concepts in business administration.CO4. To build professional conduct within any team activities.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. The students will be able to understand the concept of management principles and various dimensions.
CLO2. The students will be able to Develop problem solving skills by gathering and assessing appropriate managementinformation.
CLO3. The students will be able to Assess management concepts, plans and decision in business administration.CLO4. The students will be able to Analyze and build professional conduct within any team activities.

Methodology:

The confidence level, presentation and communication skills, decision-making ability and a comprehensiveunderstanding will be assessed.

The viva voce is of 100 marks and is to be conducted by the external examiners appointed by the University. A weightage of 4 credits has been given to this to highlight its importance.

BBA-SEMESTER-IV
BUSINESS COMMUNICATION
Paper MGTB-401
LTPC
4 0 0 4
(40 HOURS)
Course Objective

To develop the skills of the professional undergraduate students for proper self-expression, social communication, spoken English, correct pronunciation, voice modulation and business etiquettes.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1. Understand the basic concepts of communication and help them to transform their communication abilities.
CLO2. To develop the students to acquire necessary skills of Business Etiquettes for handling day-to-day managerial responsibilities and evaluate the facilitators of business Communication. **CLO3. To** choose their body language more correctly and impressively in accordance with anorganizational requirement and international standards
CLO4. To analyze the forms of Communication and make the students to understand the verbal and non-verbal Communication and to design impressive documents.
CLO5. The students will illustrate the correct practices of the strategies of Effective business writing

Curriculum

Unit I (8 HOURS)
Essentials of Business communication: Introduction, Basic Patterns of Business Messages: Writing process, Directness and Indirectness in new s and messages of all types, sales Massages, Persuasion.

Unit-II (8 HOURS)
Writing a Project Report: Basics, writing Reports on Field Work visits to Industries/Business Concerns etc.; Business-Negotiations.

Unit-III (8 HOURS)
E-Correspondence

Unit-IV (8 HOURS)
Spoken English for Business-communication: Presentation of Plans, Objectives; speech: Preparation, Mode of delivery presentation; Addressing the Audience. Oral Talking. Strategies to overcome Barriers in Address, speech.

Unit-V (8 HOURS)
Business Etiquettes and Public Speaking:
Business Manners. Body Language Gestures, Email and Net Etiquettes, Etiquette of the Written Word, Etiquettes on the Telephone, Handling Business Meetings; Introducing Characteristic, Model Speeches, Role Play on Selected Topics with Case Analysis and Real Life Experiences.

Reference books:

Dr.Preeti Shukla, Business Communications, Shree Mahavir Book depot., Nai Sarak, New Delhi.
A.Kumar, Effective Business Communications, Khanna Book Publishing Co..P, Ltd.
John.M.Penrose, Robert W. Rosberry, Robert J. Myers, Advanced Business Communications, Thomsan South Western.
Urmila Rai, S.M.Rai – Business Communication – Himalya Publishing House. 1. Boove, C.L., 5. Thill, J.V., and Chaturvedi, M., (2009) Business Communication Today, Pearson Education.

FINANCIAL MANAGEMENT
Paper MGTB-402
L T P C
3 0 0 4
(40 HOURS)

Course Objective

The focus in this paper would be on issues related to financial management in the Indian Corporate Sector. The contents are related to the practices observed in Indian Corporate Sector. The objective is to enable and equip the future managers with basic tools for applying financial analysis.

Course Learning Outcomes

CO1: Define the concepts, vital tools and techniques applicable forfinancial decision making by a business firm.

CO2: Explain the functions of Finance in organization and methods inmanaging funds for business

CO3: Apply the concepts of budgeting, working capital, cost of capitalincluding the choice of source of funds.

CO4: Analyse the practical problems relating to the financing of fundsincluding pricing and dividend theories.

CO5: Select the methods and techniques for analysing the data forfinancial decision making.

Curriculum

Unit I: Introduction to Financial Management (8 hours)

Meaning, objectives and scope, conflicts in profit versus wealth or value maximization principle, Time value of money.

Unit II: Investment Decisions (8 hours)

Capital budgeting techniques-Net Present Value Method, Internal Rate of Return Method. Cost of Capital-equity and debt.

Unit III: Financing Decisions (8 hours)

Leverage- operating, financial and composite leverage, Capital structure- theory and policy, Dividend policy, Asset based financing- lease and hire purchase.

Unit IV: Short term financing (8 hours)

Management of Working Capital, Cash management, Inventory Management, Receivables Management, working capital leverage.

Unit V: Risk and Return (8 hours)

Calculating risk and return for individual securities, Beta estimation, overview of capital market theory.

Recommended book:

- I. M. Pandey, (2010): Financial Management, Vikas Publishing House

Reference books:

- M Y Khan & P K Jain, Financial Management- Text, problems and cases, Tata McGraw Hills
- Dr. R. P. Rustagi (2011): Financial Management- Theory, concept and problems, Taxman Publications

DIRECT TAX
Paper MGTB-403
LTPC
4004

(40 hours)
Objective
To provide basic knowledge and equip students with application of principles and provisions Income-tax Act, 1961.
Expected learning outcome: Students will gain a working knowledge regarding computation of taxable income and tax liability pertaining to individuals/firms.

Course Learning Outcomes
CO1: What are the fundamental provisions of the concept of Direct tax planning and to equip with a reasonable knowledge of tax planning devices?

CO2: Understand the intricacies relating to the filling of various forms and returns & to understand the relevance of GST in present Indian TaxScenario.

CO3: Applying the concepts of taxation to the corporate tax planning.

CO4: Analysing the skill of independent thinking and creativity in the field of direct tax law & evaluate the impact of laws on companies and on individuals & also, to make capable to understand amendments made from time to time in Acts related to the Tax.
CO5: Measure the tax liability of an individual or organisation.
Curriculum
Unit I (8 hours)
Basic concept: Income, agricultural income, person, assessee, assessment year, previous year, gross total income, total income, maximum marginal rate of tax.
Unit II (8 hours)
Residential status Scope of total income on the basis of residential status Exempted income under section .
Unit III (8 hours)
Salaries.
Unit IV (8 hours)
Income from house property and Profits and gains of business or profession.
Unit V (8 hours)
Capital gains and Income from other sources.

Recommended Book:
Singhania, Vinod K. and Monica Singhania. Students‟ Guide to Income Tax.Taxmann Publications Pvt. Ltd., New Delhi.

Reference Books:
Ahuja, Girish and Ravi Gupta. Systematic Approach to Income Tax. Bharat Law House, Delhi.
Chandra, Mahesh., S.P. Goyal and D.C. Shukla. Income Tax Law and Practice.Pragati Prakashan, Delhi.
Pagare, Dinkar. Law and Practice of Income Tax. Sultan Chand and Sons, New Delhi.
Mehrotra, H.C. Income Tax Law. Sahitya Bhawan, Agra.
Lal, B.B. Income Tax Law and Practice. Konark Publications, New Delhi.
Singhania, Vinod K. and Kapil Singhania. Tax Computation on CD. Taxmann Publications Pvt. Ltd., New Delhi.

MANAGEMENT ACCOUNTING
Paper MGTB-404
LTPC
4004
(40 hours)
Objective
The subject of Management Accounting is basically Designed to equip the Student with tools for analyzing financial and non-financial information which will help them in decision-making planning and control.
Aim: To acquaint the students with basic concepts used in cost accounting and various methods involved in cost ascertainment systems.

Course Learning Outcomes
CLO1) Develop the ability to analyze financial data and use it for making informed decisions related to budgeting, cost control, pricing, and resource allocation within an organization.

CLO2) Acquire skills to identify and analyze different types of costs (e.g., variable, fixed, direct, indirect) and implement strategies to control and reduce these costs effectively.

CLO3) Gain proficiency in designing and using performance measurement tools and key performance indicators (KPIs) to assess an organization's financial performance and track progress towards its goals.

CLO4) Learn to create budgets, financial forecasts, and perform variance analysis, enabling effective planning, resource allocation, and adaptation to changing business conditions.

CLO5) Develop the ability to integrate management accounting information into the strategic decision-making process, including evaluating investment opportunities, assessing project financial viability, and aligning financial strategies with the organization's goals.

Curriculum
Unit I: Introduction (8 HOURS)
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 organization.

Unit II: Cost concept (8 HOURS)
Types of cost, Cost Accumulations, cost objects, cost classifications, cost applications, cost behavior, Techniques of Costing.

Unit III: Overhead (8 HOURS)
Classification, allocation, apportionment and absorption of overhead. Under- and over-absorption. Capacity costs. Treatments of certain items in costing, like interest on capital, packing expenses, debts, research and development expenses, Bad Activity – based cost allocation.

Unit IV Methods of Costing (8 HOURS)
Unit costing, Job costing. Contract Costing. Process costing (process losses, valuation of work in progress, joint and by-products) Service costing (only transport).

Unit V: Cost -Volume -Profit Analysis (8 HOURS)
The Relationship of cost and profit with volume, use of CVP Analysis, Marginal Costing and Absorption costing, Breakeven point, contribution marginal Approach, Use of Breakeven analysis.

Recommended Book
Lal, Jawahar. Cost Accounting. Tata McGraw Hill Publishing Co., New Delhi

Reference Book
Nigam, B.M. Lall and I.C. Jain. Cost Accounting: Principles and Practice. Prentice Hall of India, New Delhi.
Mittal, D.K. and Luv Mittal. Cost Accounting. Galgotia Publishing Co., New Delhi.
Arora, M.N. Cost Accounting – Principles and Practice. Vikas Publishing House, New Delhi.
Shukla, M.C., T.S. Grewal and M.P. Gupta. Cost Accounting: Text and Problems. S. Chand & Co. Ltd., New Delhi.
Maheshwari, S.N. and S.N. Mittal. Cost Accounting: Theory and Problems. Shri Mahabir Book Depot, New Delhi.
Jain , S.P. and K.L. Narang. Cost Accounting: Principles and Methods. Kalyani Publishers, Jalandhar.

E-BUSINESS
Paper MGTB-405
LTPC
4004
Objective
To enable the student to become familiar with the mechanism for conducting business transactions through electronic means
Course Learning Outcomes
CLO1) Demonstrate proficiency in online marketing strategies and tactics, including search engine optimization (SEO), social media marketing, email marketing, and pay-per-click advertising, to effectively promote products and services in the digital marketplace.

CLO2) Analyze and interpret data from web analytics tools to make informed decisions about website and online store performance, user behavior, and customer preferences, leading to optimization of the online customer experience.

CLO3) Apply principles of e-commerce security and privacy to protect sensitive customer data and ensure secure transactions, safeguarding the integrity and reputation of the e-business.

Develop and implement an effective e-business strategy, incorporating aspects such as market CLO4) research, competitive analysis, and business model innovation, to gain a competitive edge and maximize online profitability.

CLO5) Collaborate with cross-functional teams, including web developers, designers, and IT professionals, to effectively manage the technical aspects of e-business operations, ensuring a seamless and user-friendly online presence for customers

Contents
Unit 1: 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 signatures 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, Snapdeal, Alibaba, Flipkart, etc.)

Reference books:
1. Kenneth C. Laudon and Carlo Guercio Traver, *E-Commerce*, Pearson Education.
2. David Whiteley, *E-commerce: Strategy, Technology and Applications*, McGraw Hill Education
3. Bharat Bhaskar, *Electronic Commerce: Framework, Technology and Application, 4th Ed.*, McGraw Hill Education
4. PT Joseph, *E-Commerce: An Indian Perspective*, PHI Learning
5. KK Bajaj and Debjani Nag, *E-commerce*, McGraw Hill Education
6. TN Chhabra, *E-Commerce*, Dhanpat Rai & Co.
7. TN Chhabra, Hem Chand Jain, and Aruna Jain, *An Introduction to HTML*, Dhanpat Rai & Co.

BUSINESS RESEARCH METHODS
Paper MGTB-406
LTPC
4 0 0 4
(40 HOURS)
Objective
Any body of knowledge cannot develop without the underlying research. This module introduces the fundamentals of research, its process and the way in which findings of a research initiative is presented and reported. It exposes the students to the various statistical tools being used to analyze data and draw inferences.

Course Learning Outcomes
CO1: Define & Show Critical Thinking in their working.

CO2: Interpret the primary data & relate the research articles with theirresearch.

CO3: Interview respondents for data collection & organize discussions and chatshows.

CO4: Analyse the primary & secondary data and will be able to prepare ameaningful interpretation
CO5: Explain critical thinking process and decide the right course of action.

Curriculum
Unit I: (8 HOURS)
Introduction to Research
Research: Meaning, types & process. Research methods versus methodology, Research problem & Research design. Basic concepts of research- variables, hypothesis & its types, sample & population, parameter & statistic, type-I & type-II errors, one tailed and two tailed testing of hypothesis.

Unit II: (8 HOURS)
Sampling and Data Collection
Sampling: Meaning, types and techniques of sampling. Types of data: Primary & secondary data.
Methods of data collection: Interview-structured and unstructured, questionnaire & interview schedule, observation-participative and non-participative, Delphi method, focus group, depth interview and survey method.

Unit III: (8 HOURS)
Descriptive Statistics & Hypothesis Testing
Measures of central tendency- mean, median & mode, Measures of Variability- Average Deviation, Standard Deviation & Quartile Deviation, Skewness & Kurtosis. Testing of Hypothesis-I: One tailed and Two tailed Parametric Test- z-test and t-test

Unit IV: (8 HOURS)
Non-Parametric Tests
Testing of Hypothesis-II: Non Parametric Tests- Sign Test, Median Test, Chi-Square Test, Mann-Whitney U Test, Run Test for Randomness. Analysis of Variance- One Way and Two Way

Unit V: (8 HOURS)
Report writing
Steps of writing research report, Report Layout: Preliminary pages, Main text, End matter, Mechanics of writing research report, Bibliography and references format, Precautions in writing research report.

Recommended Books:

- C. R. Kothari, Research Methodology Methods and Technique

Reference Books:

R. Panneerselvam, Research methodology, PHI

BBA-SEMESTER-V
MARKETING MANAGEMENT
Paper MGTB-501
LTPC
3 0 0 4
(40 HOURS)

Course Objective
The objective of this course is to provide basic knowledge of concepts, principles, tools and techniques of marketing.

Course Learning Outcomes
After completing the course, the student shall be able to:
CO1: learn the basic concepts and principles of marketing and to develop their conceptual skill to be able to manage marketing operations of a business firm.
CO2: understand the complexities involved in various targeting and positioning decisions.
CO3: take effective decisions for launching new products and to understand the implications of different pricing strategies.
C04: develop the skills to design the promotion-mix strategies
C05: familiarize about the current trends in marketing to take proactive measures while taking marketing decisions

Course Contents
Unit I: Introduction (8 Hours)
Marketing: Meaning, Nature, Scope and Importance; Marketing Philosophies; Marketing Mix; Marketing Environment- Concept and need for studying marketing environment; Micro environmental factors- company, suppliers, marketing intermediaries, customers, competitors, publics; Macro environmental factors– demographic, economic, natural, technological, politico- legal and socio-cultural.

Unit II: **Consumer behaviour and Market Selection (8 Hours)**
Need for studying consumer behaviour; Stages in Consumer buying decision process; Factors influencing consumer buying decisions. Market Segmentation- concept, importance, levels and bases of segmenting consumer markets. Market Targeting- concept and factors affecting the choices for market targeting. Product Positioning– concept and bases. Product differentiation- concept and bases.

Unit III: Product and Pricing Decisions (8 Hours)

Concept and classification; Levels of Product; Product-mix dimensions; Branding- concept, functions and qualities of good brand name; Packaging and Labeling- concept and functions; Product support services; New product development process. Concept and objectives of pricing decisions; Factors affecting price of a product; Pricing methods; Pricing strategies.

Unit IV: Distribution and promotion Decisions (8 Hours)
Channels of distribution- meaning and importance; types of distribution channels and their functions; Factors affecting choice of distribution channel; Distribution logistics– concept, importance and major logistics decisions. Wholesaling and retailing. Nature and Importance of Promotion; Promotion mix concept and distinctive characteristics of advertising, personal selling, sales promotion, public relations, publicity and direct marketing; Factors influencing promotion mix decisions.

Unit V: Developments in Marketing (8 Hours)

Relationship Marketing; Sustainable Marketing; Rural marketing; Social marketing; Digital marketing; Legal Issues in marketing- The Consumer Protection Act, 1986; Ethical issues in marketing.

References

1. Kotler, P., Armstrong, G. and Agnihotri, P. (2018). *Principles of Marketing (17th edition)* Pearson Education. Indian edition.
2. Sharma, K., & Swati Aggarwal. (2018). Principles of Marketing. Taxmann's.
3. The Consumer Protection Act,1986.

Additional Resources

1. Etzel, M. J., Walker, B. J., Stanton, W. J., & Pandit, A. (2010). *Marketing (14th ed.)*. Mc Graw Hill.
2. Grewal, D. & Levy, M. (2017). *Marketing (5th ed.).* McGraw-Hill Education.

Note: Latest editions of the books may be used.

HUMAN RESOURCE PLANNING AND DEVELOPMENT
Paper MGTB-502
LTPC
4 0 0 4
(40 HOURS)
Course Objective

This paper has been designed keeping in mind the current need of organizations. Human resource planning has become a bigger challenge for organization due to growing globalization and emerging new trends specially because of changing environment. This paper addresses all those challenges and suggests ways to handle them efficiently. The objective of this paper is to develop a conceptual as well as a practical understanding of Human Resource Planning in organizations.

Course Learning Outcomes
After completing the course, the student shall be able to:

CO1: understand basic nature and importance of human resource management.
CO2: analyze the current theory and practice of recruitment and selection.
CO3: realize the importance of performance management system in enhancing employee performance.
CO4: recommend actions based on results of the compensation analysis and design compensation schemes that are cost effective, that increase productivity of the workforce, and comply with the legal framework.
CO5: understand role of modern HRM in meeting challenges of changing business environment.

Course Contents
Unit I
HR Planning: Conceptual framework, Definitions, Historical evolution, HR Planning levels,

Unit II
HR planning at Enterprise level, Need for systematic planning, Planning process, **Variables to be accounted for in planning process,** Operating Environment- Internal & External, Job description, Models & techniques of Manpower demand and Supply forecasting. Retention-Redeployment and Exit strategies

Unit III
Linkages with other HR business processes- Recruitment, Performance/ Productivity, Training and Development. Re-Engineering/ Organization Development etc

Unit IV
Study of HR Planning process Practices in select businesses, Ramp-up and scale down practices and tools, Research in HR Planning area, Career Planning and Succession Planning,

Unit V
Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level.

Recommended Book

1. Praveen Durai (2010), Human Resource Management, Pearson Education, South Asia
2. John Storey, Graeme Salaman, Christopher Mabey(1998): Strategic Human Resource Management: A Reader, SAGE Publications, 1998

Reference Books

1. Aloke K. Sen, Human Resource Development- Development Planing and Deployment- Asian Books
2. Christopher Mabey, Rosemary Thomson (2011): Developing Human Resources, Routledge, Taylor and francis group, New York, USA.
3. Dessler & Varkkey, (2010): Human Resource Management 11e, India, Prentice Hall
4. Richard D. Johnson, Michael J. Kavanagh, Mohan Thite (2011): Human Resource Information System 2e, SAGE Publications, 2011.

Latest editions of the books may be used.

INVESTMENT MANAGEMENT
Paper MGTB-503
LTPC
4 0 0 4
(40 Hours)
Course Objective

The focus of this paper would be on the intricacies of security markets, construction of optimal portfolios and analysis of different investment options.
The basic objective of this course is to acquaint the student with the investment decisions related to financial assets, risks and returns involved, functioning of securities market and principles of security analysis along with the theories and concepts associated with portfolio management in order to be able to judge the competitive position of firms in capital market and review the related business decisions.

Curriculum

UNIT I: Introduction To Investment And Securities Market (8 Hours)
Concept of investment-investment objectives and constraints-security and non security forms of investment, investment process. Securities markets: markets and their functions- development of stock market in India, regulation of securities market (SEBI).

UNIT II: Risk and Return (8 Hours)
Types of risk-systematic and unsystematic, security returns-ex post and ex ante returns, portfolio return, concept of Beta-risk of individual security, portfolio risk.

UNIT III: Introduction To Portfolio Management(8 Hours)
Diversification, construction of optimum portfolio- Markowitz risk return optimization, performance evaluation and revision- Sharpe's Ratio, Treynor's Ratio, Jenson's Alpha.

UNIT IV: Capital Market Theory (8 Hours)
Capital Asset Pricing Model (CAPM), application of Capital Market Line and Security Market Line, Arbitrage Pricing Theory (APT).

UNIT V: Security Analysis (8 Hours)
Fundamental analysis-economy, industry and company analysis, Technical Analysis- Efficient Market Hypothesis.

Recommended Books:
Pandian, P., Security Analysis & Portfolio Management, Vikas Publishing House.
Reference Books:
Fischer, E.D. & Jordan, R.J., Security Analysis & Portfolio Management, Pearson Education
Khan & Jain, Financial Management, Tata McGraw Hills, 2008

Entrepreneurial Management
Paper MGTB-503
LTPC
4 0 0 4
(40 Hours)
Course Objective

The purpose of this paper is to prepare a ground where the students view Entrepreneurship as a desirable and feasible career option. The paper seeks to build the necessary competencies and motivation for a career in Entrepreneurship. After studying this course, the students would be able to build on personal as well as external resources with a view to successfully launching and subsequently managing their enterprises. They would have not only a definite idea as to which support/ developmental agency to look up and for what purpose, but also the necessary know-how and wherewithal for accessing their help. They would have basic skills in operations, finance, and marketing and human resource management.

Course Learning Outcomes
After completing the course, the student shall be able to:

CO1: understand the concept of entrepreneurship in the context of Indian economic scenario.
CO2: link the individual's capability and strength as a guiding factor towards entrepreneurial orientation.
CO3: understand social support system for gaining strength towards entrepreneurial preferences. CO4: understand entrepreneurial process for initiating new venture creation.
CO5: understand various dimensions of managing a business enterprise once it is formed.

Course Content

Unit I: **Entrepreneurship (8 Hours)**

Theories of Entrepreneurship

Role and Importance of Entrepreneur in Economic Growth.

Unit II: Entrepreneurial Behaviours

Entrepreneurial Motivation, Need for Achievement Theory

Risk Taking Behavior

Innovation and Entrepreneur

Unit III: Entrepreneurial Traint

Definitions, Characteristics of Entrepreneurial Types

Functions of Entrepreneur.

Unit IV: Entrepreneurial Development in India

History, Objectives, Stages of Growth

Target Group, Programmes

Govt. Policy towards SSI's

Unit V: Project Feasibility Analysis
Business Ideas – Sources, processing; Input requirements, Sources of Financing, Technical Assistance, Marketing Assistance Preparation of Feasibility Reports, Legal Formalities and Documentation.

Recommended books:

1. McClelland, D.C. & Winter, W.G. : Motivating Economic Achievement, Free Press.
2. Pareek, U & Venkateswara Rao, T : Developing Entrepreneurship – A Handbook on Learning sSystems, Learning Systems, New Delhi.
3. Desai, A.N. : Entrepreneur and Environment, Ashish, New Delhi.
4. Druckar, Peter : Innovation and Entrepreneurship, Heinemann.
5. Chakraborty, Tridib : Introducing Entrepreneurship Development, Modern Book Agency
6. Manimala, M.J. : Entrepreneurial Policies and Strategies,TMH

ADVERTISING
Paper MGTB-503
LTPC
4 0 0 4
(40 Hours)

Course Objective:
Advertisements are a vital component of the promotion mix, which enhance the awareness of a company and its products. It helps a company build image and position a product on its target segment. This course introduces the conceptual framework and functional aspects of the field of advertising management.

The core objective of the course is to help the students understand the concepts of advertising, its types and the different functional areas of advertising management.

Course Learning Outcomes

1. Understand the fundamental principles of advertising, including its history, evolution, and its role in modern marketing strategies.
2. Develop the ability to analyze target audiences, consumer behavior, and market trends to create effective advertising campaigns.
3. Acquire proficiency in various advertising mediums and channels, such as print, digital, social media, and broadcast, and demonstrate the ability to choose the most appropriate ones for specific campaigns.
4. Learn how to craft compelling advertising messages and visuals, taking into consideration branding, storytelling, and the use of persuasive techniques.
5. Demonstrate the capability to evaluate the success of advertising campaigns through key performance indicators (KPIs) and metrics, and make data-driven decisions for optimizing future advertising efforts.

Curriculum

Unit I: Introduction to Advertising & its management

- Advertising defined, Major Indian advertising & media agencies, Integrated Marketing Communication concepts, Merits & Demerits of advertising, Advertising agencies: Roles & Functions, 5-M model of advertising management, Career options in Advertising field.

Unit II: Classification of advertisements & campaign planning

- Types of advertising
- Advertising campaign planning
- Advertising budget

Unit III: Advertising message

- AIDA model
- Message design & Development
- Print Advertisement layout
- Advertisement appeals

Unit IV: Advertising Media

- Types of advertising media: Print media, Electronic media, Internet, Outdoor and transit media, Cinema
- Media selection, Planning, Scheduling and strategy

Unit V: Advertisement effectiveness & ethical issues

- Measuring advertisement effectiveness(pre-launch methods, post launch methods)
- Ethical issues of advertising

Recommended book:

Chunawalla, S.A. and Sethia, K.C., *Foundations of Advertising Theory and Practice*, Himalaya Publishing House, Mumbai, 2009.

Reference books:

Batra, Myers, Aaker, *Advertising Management*, Prentice Hall of India, New Delhi
Mishra, M. N., *Sales Promotion and Advertising Management*, Himalaya Publishing House, Mumbai

INTERNATIONAL FINANCE
Paper MGTB-504
LTPC
4 0 0 4

Course Objective

Liberalization and Globalization of Economies in the Recent years has increased the Prominence of International Finance and Trade, which Prompted the Finance Managers to concentrate on the International Perspective as well, and it is Vital for a Student learning Finance to know the Intricacies of the Foreign Exchange Market and the Methods to Combat the Forex Risk.

Aim of this Subject is to Develop a Body of Knowledge and Skills and Make it Available to the Students to make them Successful Managers in the New Era of liberalization and Globalization.

Course Learning Outcomes

After completing the course, the student shall be able to:

CO1: Demonstrate knowledge of basic theorems of exchange rate determination, interest rates and inflation and the role of arbitrage in keeping the foreign exchange market efficient.

CO2: Apply knowledge of foreign exchange hedging to identify and manage the foreign exchange risks faced by globally active firms.

CO3: Demonstrate the ability to select global financing strategies and propose solutions that will take advantage of opportunities in the global financial markets to the benefit of relevant stakeholders.

CO4: Demonstrate the ability to deliver an effective oral presentation with appropriate visuals.

CO5: Demonstrate the ability to produce a clear and concise written report that demonstrates higher order understanding of key concepts in international finance.

Curriculum

Unit I: Introduction to International Finance and Theory of International Trade:

Increasing interdependence in the global economy, trends in international trade and cross-border financial flow, recent developments in global financial markets, liberalization, Integration and Innovation, Challenges of International Financial Management, Theory of Absolute Advantage, Theory of Comparative advantage, Heckscher-Ohlin Model, Imitation -Gap Theory.

Unit II Balance of Payments

Concept of Economic transactions, Resident, General Government institution, principles of accounting, Components of the BOP Account, factor affecting the components of the Bop account, balance of payments compilation, BoP- The Indian Perspective, Importance and limitations of BoP Statistics.

Unit III Foreign Exchange Market and Exchange rate determination.

Structure and the Participants, Types of Transactions, Mechanics of Currency dealing, exchange rate quotations, arbitrage, forward rates evolution of Exchange control and the foreign exchange market in india, relation between forex and money market, covered interest arbitrage, covered parity theorem, option forwards, cancelation of forward contracts, purchasing power parity, interest rate parity.

Unit IV: Short Term Financial Management:

Short Term Funding and Investment, Centralized vs. Decentralized Cash Management, Netting, Pooling, Exposure Management, Offshore Invoicing Centers.

Unit V: Introduction to Trade block, WTO, GATT, EXIM POLICY:
Formation of Trade Blocks, OPEC, its Objective, Function of European Community(EC), Function and Structure of WTO Agreements, trade related Aspects of Intellectual Property Rights (TRIPS), trade related aspects of Investment Measures (TRIMS), General Agreement on Trade in Services (GATS), Trade Negotiations under GATT, EXIM Policy Historical Perspective, Objective.

Reference Books:

- International Financial Management: P G APTE : The Mcgrow Hill Companies.
- International Economics: Francis Cherunilam: The Mc Graw Hill Companies.
- International Corporate Finance: JEFF MADURA:CENGAGE Learning.
- International money and Finance: Michael Melvin: Pearson Education.

Note: Latest edition of readings may be used

LABOUR LAW
Paper MGTB-504
LTPC
4 0 0 4

Course Objective
Understanding of the legal framework is important for the efficient decision-making relating to management and employees relations. The course aims to provide an understanding, application and interpretation of the various labour laws and their implications for industrial relations and labour issues.

Course Learning Outcomes
CLO1) Understand the foundational principles and concepts of labor law, including the rights and obligations of both employers and employees.
CLO2) Analyze and apply relevant labor legislation and regulations to real-world workplace situations.
CLO3) Evaluate the impact of labor laws on employment relationships, collective bargaining, and labor disputes.
CLO4) Develop effective strategies for resolving labor disputes and conflicts in compliance with labor laws.
CLO5) Demonstrate knowledge of international labor standards and their relevance to domestic labor laws and practices.

Curriculum

Unit I: Labour Legislations in a Changing Context
- The Classification of Labour Laws
- The Factories Act, 1948
- The Shop and Establishments Act, 1953
- The Contract Labour (Regulation and Abolition) Act, 1970

Unit II: Social-Security Legislations
Major Legislations
The Employees' State Insurance Act, 1948
Maternity Benefit Act, 1961
The Workmen's Compensation Act, 1923
The Payment of Gratuity Act, 1972
Employees' provident Funds and Miscellaneous Provisions Act, 1952

Unit III: Wage Legislations
The History of Wage legislations
The Payment of Wages Act, 1936
The Minimum Wages Act, 1948
The Payment of Bonus Act, 1965

Unit IV: Other Recent Significant Legislations in India

Recommended Book

- P. N. Singh, Neeraj Kumar, Employee Relations Management, Pearson.
- P.L. Malik, Handbook of Labour and Industrial Law, 5e, Eastern Book Company.

Reference Books

- H.K. Saharay, . Industrial and Labour laws of India, Universal Law Publishing.
- S. P. Jain, Industrial & labour laws.
- Arun Monappa, Industrial Relations, Tata Mc Graw Hill.

SUMMER INTERNSHIP &PROJECT
MGTB-505
LTPC
4 0 0 4

COURSE LEARNING OUTCOME
CO1: Understand the real-time working of organizations.

CO2: Demonstrate professional knowledge, skills and attitude along withthe experience needed to constitute a successful career.

CO3: Analyse career opportunities in their areas of interest.

CO4: Build aptitude for gaining supervised professional experiences.
CO5: Create a clear understanding of industry trends and advancements

BBA Semester-VI

BUSINESS ETHICS
Paper MGTB-601
LTPC
4 0 0 4
(40 HOURS)
Objectives

The basic objective of this paper is to make the students realize the importance of values and ethics in business. This course endeavors to provide a background to ethics as a prelude to learn the skills of ethical decision-making and, then, to apply those skills to the real and current challenges of the information professions.

Curriculum

Unit I: Ethics (8 Hours)
Management Process and Ethics, Ethical Decision Making, Ethical Issues, Ethos of Vadanta in Management, Relevance of Ethics and Values in Business

Unit II: Knowledge and Wisdom (8 Hours)
Meaning of Knowledge and Wisdom, Difference between Knowledge and Wisdom, Knowledge Worker versus Wisdom Worker, Concept of Knowledge Management and Wisdom management, Wisdom Based Management.
Stress Management: Meaning, Sources and Consequences of Stress, Stress Management and Detached Involvement.

Unit III: Understanding Progress, and Success - Results & Managing Transformation: (8 Hours)
Progress and Results Definition, Functions of Progress, Transformation, Need for Transformation, Process & Challenges of Transformation.
Understanding Success: Definitions of Success, Principles for Competitive Success, Prerequisites to Create Blue Print for Success. Successful Stories of Business Gurus.

Unit IV: Corporate Social Responsibility & Corporate Governance: (8 Hours)
Corporate Responsibility of Business: Employees, Consumers and Community, Corporate Governance, Code of Corporate Governance, Consumer Protection Act, Unethical issues in Business

Unit V (8 Hours)
Cases of corruption, corporate Scandals, Whistle Blowing, Insider Trading, Discrimination, Advertising, Consumer Rights etc.

Reference books:

- Fernando, A.C., (2009), Business Ethics, 1st edition, Pearson education.
- Hartman,Laura and Chatterjee, Abha, (2006), Perspectives in Business Ethics, 3rd Edition, McGraw Hill Education.
- Dr.F.C.Sharma, Business Values & Ethics – Shree Mahavir Book Depot, Nai Sarak, New Delhi.
- C.S.V Murthy – Business Ethics, Himalya Publishing House.
- Shina Parkashan – Managerial Ethics – Rajat Publications.
- C.L.Dave – Social Accounting – Renuka Publishers, Jodhpur

FINANCIAL MARKETS AND SERVICES
Paper MGTB-601
LTPC
4 0 0 4
(40 Hours)
Objectives

The focus in this paper would be on issues related to the financial markets & instruments along with different financial services and current scenario of Indian financial system & markets.

This paper provides an introduction to the financial markets products and services, markets and market participants. The objective of this course is to familiarize the student with the operations of Indian financial markets and basic concepts of different financial services along with the banking system.

Course Learning Outcomes

CLO1) Analyze various financial instruments and their characteristics, including stocks, bonds, derivatives, and commodities, to make informed investment decisions.

CLO2) Evaluate the impact of economic indicators, central bank policies, and geopolitical events on financial markets and their implications for portfolio management.

CLO3) Develop a comprehensive understanding of risk management techniques and strategies to protect and optimize investment portfolios in volatile markets.

CLO4) Demonstrate proficiency in financial analysis tools and techniques to assess the financial health and performance of corporations and investment opportunities.

CLO5) Examine the regulatory framework governing financial markets and services, including the role of government agencies, and assess their impact on market stability and investor protection.

Content

Unit I: Introduction to the Financial System (8 HOURS)

Nature and role of financial system, financial system and financial markets, government intervention in the financial system, informal and formal financial system, components of formal financial system-institutions, intermediaries, markets and services, functions and weaknesses of Indian Financial System.

Unit II: Introduction to Financial Markets (8 HOURS)

Money market and Capital market, money market instruments- T Bills, CPs & CDs. Capital Market-primary and secondary, methods of raising capital, Derivative concepts, Role of SEBI.

Unit III: Introduction to Financial services (8 HOURS)

Fund based and Fee based service. Conceptual aspect of factoring, forfeiting, credit rating, bill discounting, leasing, securitization and consumer finance. Evaluation of strategic decisions regarding factoring, leasing and merger & acquisitions.

Unit IV: Insurance and Mutual funds (8 HOURS)

Basic concepts of insurance and mutual funds, role of IRDA and AMFI

Unit V: Introduction to Banking (8 HOURS)

An overview of the different activities performed by a bank. Retail Banking: Concepts, forms and products of retail banking. Corporate Banking: meaning, nature, functions and products.

Recommended books:

- "Financial Markets and Services" E. Gordon & K. Natarajan, Himalaya Publishing House

Reference books:

- "Financial Markets, Institutions and Financial Services" Clifford Gomez, Prentice Hall of India
- “Financial Markets and Institutions-An Introduction to the Risk Management Approach” A. Saunders & M. M. Cornett. Tata McGraw Hills Publication
- “Indian Financial System” Bharti Pathak, Pearson Education.
- “Financial Institutions and Markets- structure, growth and innovations” L. M. Bhole & Jitendra Mahakud. Tata McGraw Hills Publication

INDUSTRIAL RELATIONS
Paper MGTB-601
LTPC
4 0 0 4
(40 Hours)

Objective:
To acquaint the student to develop an understanding of the industrial relations and the legal framework of industrial and labor laws. The objective of this course is to impart the students with the knowledge of laws and how law affects the industry and labor.

Course Learning Outcomes
CLO1) Analyze the historical development and evolution of industrial relations, tracing the key milestones and shifts in labor-management dynamics.
CLO2) Evaluate the impact of labor laws and regulations on workplace relations, including the ability to interpret and apply relevant legal frameworks.
CLO3) Demonstrate proficiency in negotiation and conflict resolution techniques within the context of labor disputes, fostering effective communication and problem-solving skills.
CLO4) Assess the role of labor unions and employer organizations in shaping industrial relations, including their functions, structures, and strategies.
CLO5) Examine contemporary issues in industrial relations, such as globalization, technological advancements, and diversity, and their effects on workforce dynamics and service delivery.

Curriculum
Unit I (8 Hours)
- Industrial Relations- Definition, importance and scope.
- ILO, Ministry of Labor, Commissions, National Conferences.

Unit II (8 Hours)
- Workers Participation in Management- Concept, forms of participation, benefits, of WPM.
- Trade Union Act.

Unit III (8 Hours)
- Service Conditions
- The Factories Act, 1948.
- Work Discipline, Standing Order Act.

Unit IV (8 Hours)
- Industrial Disputes- Nature, Causes, Types of conflict Resolution, Collective Bargaining.
- Industrial Dispute Act, 1946
- Strike & lockout, Lay-off and Retrenchment
- Grievance Redressal Machinery

Unit V (8 Hours)
- The Contract Labor (Regulation & Abolition Act, 1970.
- Payment of Wages Act.

Recommended Book:

- P. N. Singh, Neeraj Kumar, Employee Relations Management, Pearson.
- P.L. Malik, Handbook of Labour and Industrial Law, 5e, Eastern Book Company.

Reference Books:

- S. P. Jain, Industrial & labour laws.
- Kochan T.A. & Katz Henry 2nd, Collective Bargaining.
- P.C.Shejwalkar,S.B.Malegaonkar, Personnel Management & Industrial Relations.
- P. C. Tripathi, Industrial Relations and Personnel Management.

PERFORMANCE MANAGEMENT
Paper MGTB-602
LTPC
4 0 0 4
(40 HOURS)
Objective
To acquaint the student to develop an understanding of the performance management of employees and its implications. Study of performance management that aid in motivation, employee development and productivity improvement to meet organization goals.

Course Learning Outcomes
CLO1) Demonstrate an understanding of performance management principles and frameworks, including key concepts such as goal setting, feedback, and performance appraisal.
CLO2) Analyze and evaluate various performance management systems and tools used in organizations to measure employee performance and provide recommendations for improvement.
CLO3) Develop effective communication and feedback skills to facilitate productive performance discussions and address performance issues constructively.
CLO4) Identify and apply strategies for aligning individual and team goals with organizational objectives, fostering a culture of performance excellence.
CLO5) Create and implement performance improvement plans to enhance individual and team performance, utilizing data-driven decision-making and performance metrics.

Curriculum
Unit I
Introduction to Performance Management, Definition, nature, scope, importance, Business and sub functional Performance Management, Performance Management as a management Tool, Performance objectives and standards, Standards of Performance. Performance Domains and dimensions.

Unit II
Performance Planning Process, Contents of Performance Plan, 8 Step Model, Individual and Group Performance Planning, Role clarity and Job description.
Meaning of Performance appraisal, methods and approaches to performance appraisal, Obstacles in appraisal, Designing appraisal for better results, Performance Appraisal Interview, Potential Appraisal.

Unit III
Introduction, Definition, Purpose and Role of appraisal in Performance Management, Methods and Steps in Performance Appraisal. Why Appraisal Fail, Types of Appraisal, Approaches and Design, MBO, 360*, Potential Appraisal, Performance Review, Performance counseling/ Mentoring.Team Perform Appraisal.

Unit IV
Introduction to PMS, Importance, Features, Process of Building PMS, PMS Dimensions, Conceptual Framework. 4 pillars of PMS, PMS Prism, Strategic Performance Management, Performance and Strategy linkage, Components of SPM, SPM- Balanced Score Card, SPM and Metrix, SPM Environment teatre and Risks.

Unit V
Competency Based Performance Management System, Performance Measurement, Performance Measurement through BSC, Performance and Succession Plan/ Career Development, International Performance Management, Performance Audit, Human Resource Valuation accounting and Audit.

Recommended Book:

- D. K. Bhattacharya, Performance Management Systems and Strategies- Text book, Pearson.
- Aquinis, Performance Management, Pearson.
- Chadha, Performance Management, Macmillan.
- Armstrong, Michael, Baron, Jaico, Performance Management.
- Cardy, Performance Management, PHI.
- Kohli, Deb, Performance Management, Oxford.
- D Sharma, Performance Management, HPH.
- R.K. Sahu, Performance Management System, EB.
- TV Rao, Performance Management and Appraisal, Sage.

GOODS AND SERVICES TAX (GST)
Paper MGTB-602
LTPC
4 0 0 4
Course Objective

To provide basic knowledge and equip students with application of principles and provisions of GST, Central Excise, and Customs Laws. Expected learning outcome: Students will gain a working knowledge regarding computation of tax liability pertaining to these laws.

Course Learning Outcomes

CLO1) Demonstrate a comprehensive understanding of the GST framework, its principles, and its significance in the context of taxation and economic policies.
CLO2) Analyze the various components of GST, including Input Tax Credit (ITC), tax rates, exemptions, and threshold limits, and apply this knowledge to calculate GST liabilities and refunds accurately.
CLO3) Evaluate the impact of GST on businesses and consumers, assessing its implications on pricing, supply chains, and compliance requirements.
CLO4) Interpret and navigate the GST legal and regulatory framework, including the GST Act, rules, and procedures, to ensure compliance and minimize the risk of penalties.
CLO5) Develop effective strategies for GST compliance and optimization, enabling businesses to streamline their operations, minimize tax liabilities, and enhance their competitive advantage in the marketplace.

Curriculum

Unit I: Introduction of Indirect Tax
Historical background of Indirect Tax in India.
Introduction of GST Act in India,
Commodities not falling under GST in India and Provision of tax on the same.
Computation of tax on such commodities.

Unit II: GST
Recognize the applicability of SGST, CGST and IGST,
Define the concept of supply, Differentiate between taxable and nontaxable supply, Define the taxable event with respect to supply of goods,
Identify the place of supply so as to decide the applicability of the tax, Define what is meant by the location of supplier of goods.

Unit III: GST
List down the registration process for single or separate business, Goods and Services Tax (GST) Accounts Assistant, Note down the details to be furnished during the registration, Differentiate between taxable person verses registered person,
Understand the benefits of registration, Register an Assessee under GST Independently.
Identify instances for eligibility of input credit, Identify set-offs under GST wherever applicable.
Identify in detail carry over credit, capital goods credit, embedded credits etc, Differentiate between consideration and valuation.

Unit IV: Customs laws

Maintain the different types of ledgers, Prepare different types of periodic returns to be filed, File Returns Online, List the different types of payment, due dates, modes of payment with rules and collection of tax, penalties etc.,

Differentiate on TDS versus, Calculate the amount of tax payable, Make the payment online.

Basic concepts of customs law, Territorial waters, high seas

Types of custom duties

Basic, Countervailing & Anti- Dumping Duty, Safeguard Duty,

Valuation of Custom Duty.

Unit V: Customs Procedures

Import and Export Procedures, Baggage, Exemptions

Provision related to Prohibited goods, Notified goods, Special goods, illegal importation/exportation of goods .

Search, Seizer, and Arrest; Offences; Penalties; Confiscation and Prosecution.

Reference books:

- GST Law Manual 4th Edition (November 18, 2017) Paperback – 2017 by R. K. Jain
- GST Tariff (Set of 2 Volumes) with GST Rate Reckoner Paperback – 2017 by Taxmann (Author)
- GST Acts with Rules & Forms(Incorporating Notifications Issued till 17-11-2017) (Bare Act) Paperback – 2017 by Taxmann (Author)
- V.S. Datey. Indirect Tax Law and practice, Taxmann Publications Pvt. Ltd., Delhi, Latest edition
- S. S. Gupta. Service Tax -How to meet your obligation Taxmann Publications Pvt. Ltd., Delhi, Latest edition.

CONSUMER AFFAIRS AND CUSTOMER CARE
Paper MGTB-602
LTPC
4 0 0 4

Course Objective:

This paper seeks to familarise the students with Basics of consumer affairs and behaviours their rights as a consumer, the social framework of consumer rights and legal framework of protecting consumer rights. The firm needs to know who buys their product. How they buy? When and where they buy? Why they buy? How they respond to marketing stimuli. What is Consumer Behavior about? How, why, where and when consumers make purchase decisions? Considers who influences the decisions? What is Consumer Behavior about?

It also provides an understanding of the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards.
All these are important questions, which are to be known to the students and companies so that they can design, and implement marketing strategies to satisfy the customers.

Course Learning Outcomes

CLO1) Students will demonstrate an understanding of consumer rights and responsibilities in various industries and legal frameworks.
CLO2) Learners will develop effective communication and interpersonal skills to engage with customers professionally and empathetically.
CLO3) Participants will analyze case studies and real-world scenarios to identify common consumer issues and implement appropriate resolution strategies.
CLO4) Students will explore the impact of technology on consumer interactions, including online reviews, social media, and e-commerce platforms.
CLO5) Learners will gain knowledge of ethical considerations and best practices in customer service, promoting customer satisfaction and loyalty.

Unit 1: Conceptual Framework: Consumer affairs and Behaviour
Consumer and Markets: Concept of Consumer, Nature of markets, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP) and Local Taxes, Fair Price, labeling and packaging Experiencing and Voicing Dissatisfaction: Consumer Satisfaction/dissatisfaction-Grievances complaint, Consumer Behavior and its Application, Development of the Marketing Concept'. A Model of Consumer Decision Making.
STP Process and strategies, A Simple Frame work of CB, Consumer Behavior Roles.

Unit 2: Consumer Decision:
Dynamic Process of CB, Pre- purchase, purchase and post-purchase issues of Consumers and challenges to marketers.
Individual Decision Making, Buying and Disposing, Organizational and Household Decision Making

Unit 3: Factors Influencing Consumer Behavior:
Family Influence on CB, Family Life Cycle, Cultural and social influence on Consumer decision making process, Reference Groups and Social Influences.

Unit 4: The Consumer Protection Act, 1986 (CPA) & Grievance Redress Mechanism under the Consumer Protection Act, 1986:
Objectives and Basic Concepts: Consumer, goods, service, defect in goods, deficiency in service, spurious goods and services, unfair trade practice, restrictive trade practice.

Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy to be be provided; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties.

Unit 5: Industry Regulators and Consumer Complaint Redress Mechanism

1. Banking: RBI and Banking Ombudsman
2. Insurance: IRDA and Insurance Ombudsman
3. Telecommunication: TRAI
4. Food Products: FSSAI (an overview)
5. s Electricity Supply: Electricity Regulatory Commission
6. Advertising: ASCI
7. Consumer Protection in India

Reference Books:

1. Hawkins, Best, Coney, Consumer Behavior, (Latest Edition) Tata McGraw Hill
2. David L Loudon and Albert J Della Bitta, Consumer Behaviour (Latest Edition), Tata McGraw Hill.
3. Roger D. Black Well et al, Consumer Behaviour, Thomson, (Latest Edition)

Suggested Readings:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. Consumer Affairs" (2007) Delhi University Publication. 334 pp.
2. Aggarwal, V. K. (2003). Consumer Protection: Law and Practice. 5th ed. Bharat Law House, Delhi, or latest edition.
3. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
4. Nader, Ralph (1973). The Consumer and Corporate Accountability. USA, Harcourt Brace Jovanovich, Inc.
5. Sharma, Deepa (2011).Consumer Protection and Grievance-Redress in India: A Study of Insurance Industry (LAP LAMBERT Academic Publishing GmbH & Co.KG, Saarbrucken, Germany. 263 pp.
6. Empowering Consumers e-book, www.consumeraffairs.nic.in
7. ebook, www.bis.org 8. The Consumer Protection Act, 1986

Articles

1. Verma, D. P. S. (2002). Developments in Consumer Protection in India. Journal of Consumer Policy. Vol. 25. No. pp 107 –123.
2. Verma, D.P.S. (2002). Regulating Misleading Advertisements, Legal Provisions and Institutional Framework. Vikalpa. Vol. 26. No. 2. pp. 51-57.
3. Ralph L. Day and Laird E. Landon, Jr. (1997). Towards a Theory of Consumer Complaining Behaviour. Ag Woodside, et al. (eds.). Consumer and Industrial Buying Behaviour. New York; North Holland pp. 425-37.
4. George, S. Day and A. Aaker (1970). A Guide to consumerism. Journal of Marketing. Vol. 34. pp 12-19.
5. Sharma, Deepa (2003).New measures for Consumer Protection in India. The Indian Journal of Commerce. Vol.56. No.4. pp. 96-106
6. Sharma, Deepa (2011).Consumer Grievance Redress by Insurance Ombudsman. BIMAQUEST.Vol.11. pp.29-47.

INTERNATIONAL BUSINESS
Paper MGTB-603
LTPC
4 0 0 4
(40 Hours)

Course Learning Objective (CO):

CO1: To Create an environment of learning the basic concepts of International Business.

CO2: To Apply the knowledge gained in studying the Organizational Structure for Global business,

CO3: To Understand the Indian export documentation Process.
CO4: To Analyze the simplications of global trade for India.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:

CLO1: Understand the basic concepts of International Business. **Apply** the trends of global business and its impact on different economies. **Analyze** the impact of government policies in relation to the other developed economies of the world.

CLO2: Remember the trends of business around the world, **Understand** the role of international organizations in impacting the growth of business. **Analyze** the trade figures and to Evaluate the future expectations.

CLO3:Evaluate and Contrast between domestic and international markets. **Apply** the advantage of gaining knowledge of international markets to grow the national markets. **Analyze** the different types of international market intermediaries around the world

CLO4: Understand the role of international financial organization. **Evaluate** the concept of different marketing concept., **Analyze** the role of government and the basic structure of international business along with its organization to boost the business from the country.

Unit I (8 Hours)

Introduction to International Business: Globalization and its growing importance in world economy; Impact of globalization; International business contrasted with domestic business - complexities of international business; Modes of entry into international business. International Business Environment: National and foreign environments and their components - economic, cultural and political-legal environments; Global trading environment - recent trends in world trade in goods and services; Trends in India‟s foreign trade.

Unit II (8 Hours)

Theories of International Trade – an overview; Commercial Policy, Instruments - tariff and non-tariff measures; Balance of payment account and its components .International Organizations and Arrangements: WTO – Its objectives, principles, organizational structure and functioning; An overview of other organizations – UNCTAD, World Bank and IMF; Commodity and other trading agreements.

Unit III (8 Hours)

Regional Economic Co-operation: Forms of regional groupings; Integration efforts among countries in Europe, North America and Asia. 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 IV (8 Hours)

Organizational structure for international business operations; Key issues involved in making international production, finance, marketing and human resource decisions; International business negotiations. 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 V (8 Hours)

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. Financing of foreign trade and payment terms.

Recommended Books:

- Charles, W.L. Hill and Jain, Kumar, Arun. International Business. New Delhi: Tata McGraw-Hill.

Reference Books:

- Johnson, Derbe., and Colin Turner. International Business - Themes & Issues in the Modern Global Economy. London: Roultedge.
- Cherunilam, Francis. International Business: Text and Cases. Prentice Hall of India Ltd.
- Daniels John, D. Lee H. Radenbaugh and David P. Sullivan. International Business. Pearson Education (Singapore) Pvt. Ltd.
- Justin, Paul. International Business. Prentice Hall of India Ltd.
- Michael R. Czinkota. et al. International Business. Fortforth: The Dryden Press.
- RBI. Report on Currency & Finance, various issues.
- Griffin, Ricky W. and Michael W. Pustay. International Business - A Managerial Perspective. Prentice Hall.
- Bennett, Roger. International Business. Delhi: Pearson.
- UNCTAD Reports.
- WTO, Annual Report, various issues.

PERATION MANAGEMENT
Paper MGTB-604

Course Obectives

CO1) To Explain an understanding of how the operations, have strategic importance and can provide a competitive advantage in the workplace and techniques of location and facility planning.

CO2) To provide students with the basic concepts related to the Work Study, Method Study and Work Measurement.

CO3) To Illustrate the Materials Management function starting from Demand Managementthrough Inventory Management.

CO4) To explain the concept and core values of Quality Management (QM).To Determine the voice of the customer and the impact of quality on economic performance and long-term businesssuccess of an organization.

Course Learning Outcomes (CLOs): On completion of this course, the students will be able to:
CLO1) To identify the elements of operations management and various transformation processes to enhance productivity and competitiveness. Explain the techniques of location and facility planning.

CLO2) To Analyze and Make use of various methods of work study, method study and work measurement.

CLO3) To define and examine the materials management function starting from demand management through Inventory Management.

CLO4) Apply various Statistical Quality Control tools including the analysis of various Quality costs and quality circles. Explain the concept of TQM.

Unit-I:
Operations management - meaning, definitions, scope and objectives- interaction of operations management with other areas - manufacturing and non-manufacturing operations and their characteristics.

Unit-II:
Facilities planning - plant location - factors determining plant location - plant layout— process layout and product layout - materials handling – MRP - Principle equipment's.

Unit-III:
Capacity planning - estimation of capital requirements - maintenance management— types of maintenance -work study - time and method study - work measurement, meaning, scope and importance.

Unit-IV:
Operations planning and control - Objectives of Operations planning— planning procedure - Operations planning categories.

Unit-V:
Operations control - Meaning, Importance and objectives - Techniques of operations control.

References:
1. Russell, Roberta S, and Bernard W.Taylor, Operations Management, Pearson Education, New Delhi 2004.
2. Chase :Operations Management for Competitive Advantage, Tata McGraw Hill, New Delhi.
3. Buffa, E.S., 'Modern Production Management', New York, John Wiley, 1987.
4. Adam, E.E. and Ebert, R.J., 'Production and Operations Management' Prentice Hall of India, New Delhi 1995.
5. Chary, S .N., Production and Operations Management', Tata McGraw Hill, New Delhi 1989

RESEARCH PROJECT REPORT
Paper MGTB-605
LTPC
0 0 0 6
Objective
Student has to undergo a practical training of minimum forty five days after second semester. BBA being professional course it is essential for each student to practically apply or understand theoretical concepts what he/she learn during the course. During the training programme student is expected to collect vital information through internal and external source so as to reach concrete conclusions on the given subject. Student has to prepare the project report under the guidance of internal teacher. Director/Principal of the institution/college will decide the last date of submission of final copy. Student should submit two typed copies to the Institute. One copy for the institute and another copy for his/her personal record. Students may prepare additional copies for the organization, guide etc.

A viva-voce examination will be conducted before the Semester IV examination. A viva-voce committee of minimum two members will be appointed by the university.

Guidelines for the project report

Declaration from the student that the research work is not copied from any other existing reports. Certificate of the guide.- Guide should certify that the research work is original and completed satisfactorily under his guidance.

The Chapter scheme for the project report will be as follows-.

CHAPTER NO-I – Introduction to the study.

1.1Introduction
1.2Objectives and importance of the study

1.3 Scope and limitations of study

1.4 Research Methodology

CHAPTER NO.II – Introduction to the organisation

2.1Introduction to the industry

2.2Brief History of organisation

2.3Subsidiaries, Associates of the company

2.4Departments / Manufacturing process

2.5Important statistical information

2.6Future prospect

2.7 Organisation Structure

CHAPTER – III –

Theoretical Background Basic concepts
Necessary theoretical inputs may be added to support the research work.

CHAPTER –IV – Data Analysis and Interpretation

Data should be analyzed with help of various tools studied in the Subject "Application of Research Methods in Management".

CHAPTER-V Findings / Observations

CHAPTER VI- Suggestions / Conclusion

Appendix
Questionnaire / Charts / Data / Diagrams / Tables / etc.

Bibliography

The above guidelines are not the prescription on writing the project report but can be used as milestones while writing the Project Report. The guide has the every discretion to change the chapter scheme as per the requirement

Note
There should be proper linkage between objectives, data analysis and interpretation, findings and suggestions.Student should not use logos and name of company on the project report pages. Header and Footer shall consist of university name and institute name respectively. No other information should be included in the Header and Footer.

Alabbar School of Management

Program: Masters of Business Administration (Two Years Course)

2023-25

Programme Educational Objective (PEO)
Programme Outcomes (POs) Programme
Specific Outcomes (PSOs) Course
Outcomes (COs)

RAFFLES
UNIVERSITY

RAFFLES UNIVERSITY, NEEMRANA,
ALWAR, RAJASHTHAN 301705

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2	**Mission**	**3**
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4	**Programme Outcomes (POs)**	**4**
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6	**Semester – I**	**5-9**
6.1	**Course Outcomes (COs)**	
6.2	**CO - PO Mapping**	
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8.1	**Course Outcomes (COs)**	
8.2	**CO - PO Mapping**	
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9.2	**CO - PO Mapping**	
10	**Specialization Elective: Marketing**	**21-23**
10.1	**Course Outcomes (COs)**	
10.2	**CO - PO Mapping**	
11	**Specialization Elective: Finance**	**24-26**
11.1	**Course Outcomes (COs)**	
11.2	**CO - PO Mapping**	
12	**Specialization Elective: HR**	**27-29**
12.1	**Course Outcomes (COs)**	
12.2	**CO - PO Mapping**	
13	**Specialization Elective: Production & Operation**	**30-32**
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13.2	**CO - PO Mapping**	
14	**Specialization Elective: IB**	**33-35**
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14.2	**CO - PO Mapping**	
15	**Specialization Elective: Logistics & Supply Chain Management**	**36-38**
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15.2	**CO - PO Mapping**	
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MASTERS OF BUSINESS ADMINISTRATION (M.B.A)- 2 Years

1. Vision

To educate and inspire capable and competent leaders with a futuristic business acumen & entrepreneurial spirit.

2. Mission

To equip the students of school of commerce & management with the ability to explore, examine, think critically and develop professional skills to become responsible global leaders who can contribute meaningfully to the industry and society through excellence in learning and practice- oriented research.

3. Program Educational Objectives

PEO1: To acquire the contemporary knowledge of the Business Concepts and their application in problem solving.

PEO2: To develop and apply different tools for decision making required for solving complex managerial problems with a passion to innovate.

PEO3: To develop the leaders who are able to adapt to the needs of the domestic and global Business requirements.

4. Programme Outcomes (POs)

After completing the program students will be able to

PO1: Exhibit memory of previously learned management knowledge by recalling facts, terms, basic concepts and answers.

PO2: Demonstrate understanding of management facts and ideas by organizing, comparing, translating, interpreting, giving descriptions and stating main ideas.

PO3: Explain contemporary management issues and their implications in real life situations.

PO4: Identify solutions to the problems relating to new situations by applying acquired knowledge, facts, techniques and rules in a different way.

PO5: Apply effective strategies to solve future problems and constraints, and devise feasible solutions.

PO6: Utilize the knowledge of statistics, accounting, finance, marketing and HR for devising effective business models,

PO7: Analyze and break information into parts by identifying motives or causes. Make interfaces and find evidence to support generalizations.

PO8: Appraise techniques, skills and latest management tools to meet the competition,

PO9: Present and defend opinions clearly and effectively in the corporate and business world,

PO10: Develop the right social, ethical and legal knowledge and value systems to become responsible citizens of the country.

PO11: Create innovative strategies in their chosen field of specialization like Finance, HR, Operations and Marketing.

PO12: Engage in a lifelong learning process

5. Programme Specific Outcomes (PSOs):

After completing the program students will be able to:

- **PSO 1: Demonstrate** effective leadership skills and **build** the ability to face the challenges of corporate world.
- **PSO 2: Develop** judgements about information, validity of ideas, or quality of work based on a set of criteria,
- **PSO 3: Improve** their competency in working with and managing multi-disciplinary teams.

	FIRST SEMESTER							
SL NO	COURSE CODE	COURSE	CREDIT PATTERN L: T:P	TOTAL CREDITS	EXAMINATION MARKS			
					MT	IA	ETE	TOTAL
1	MGTM-101	Principles of Management	4:0:0	4	20	40	40	100
2	MGTM-102	Managerial Economics	4:0:0	4	20	40	40	100
3	MGTM-103	Accounting for Managers	4:0:0	4	20	40	40	100
4	MGTM-104	Business Communication	4:0:0	4	20	40	40	100
5	MGTM-105	Information Technology for Managers	3:0:2	4	20	40	40	100
6	MGTM-106	Quantitative Techniques for Managers	4:0:0	4	20	40	40	100
7	MGTM-107	Organizational Behaviour	4:0:0	4	20	40	40	100
TOTAL				28				700

MT- MID TERM
IA-INTERNAL
ASSESSMENT ETE- END
TERM EXAM

L-Lecture, T-Tutorial, P-Practical

COURSE OUTCOMES (COs):

Course	Course outcomes: - After completion of these courses' students should be able to
Semester – I	
Principles of Management	**CO1:** Discuss the evolution & growth of management thought. **CO2:** Describe and apply the concept of planning, organizing & direction. **CO3:** Apply the concept of motivation, control & coordination in an organization. **CO4:** Apply the modern approaches to management in an organization. **CO5:** Discuss the Contemporary Issues like Social Responsibility & Ethics, Globalization.
Managerial Economics	**CO1:** Understand the significant of economics in decision making. **CO2:** Understand the links between household behaviour and the economic models of demand. **CO3:** Understand the links between production costs and the economic models of supply. **CO4:** Analyse operations of markets under varying competitive conditions. **CO5:** Understanding the concept of national Income and application of the same for various managerial decisions.
Accounting for Managers	**CO1:** Describe the accounting principles and standards and rules. **CO2:** Interpret the business transactions for making the summery for final accounting purpose. **CO3:** Prepare the financial statement of an organization. **CO4:** Identify various costs and apply techniques of costing. **CO5:** Prepare cost sheet and cost accounts and apply the concept of standards costing.
Business Communication	**CO1:** Recognize importance of communication in corporate world. **CO2:** Differentiate between formal and informal communication. **CO3:** Understand the use of skills in the process of communication. **CO4:** Acquire the skills of grammar for effective writing and communication. **CO5:** Write business letters, e-mail messages, and learn telephone etiquettes.
Information Technology for Managers	**CO1:** Understand computer hardware and number system. **CO2:** Understand and apply different computer software used in business**.** **CO3:** Understand data communication and Networks system. **CO4:** Acquire the skills functional and enterprise systems for the business decision making. **CO5:** Understand the security issues in information technology
Quantitative Techniques for Managers	**CO1:** Understand scope and limitation of statistics and different graphs and diagrams used for business decision. **CO2:** Understand and apply concept of measures of central tendency and dispersion in decision making. **CO3:** Understand and interpret association among various variables. **CO4:** Use index numbers and time series for decision making. **CO5:** Understand and apply the concept of probability for solving business problems.

Organizational Behavior	**CO1:** Discuss the conceptual framework of organizational behaviour and individual dimensions of organizational behaviour. **CO2:** Explain group dynamics and demonstrate skills required for working in groups (team building). **CO3:** Analyze and compare different models used to explain individual behaviour related to motivation and leadership. **CO4:** Explain organizational culture and describe its dimensions and to examine various organizational designs. **CO5:** Discuss the implementation of organizational change

Mapping: Semester – I

MGTM-101	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	2	3	3	1	2	3	-	1	3
CO2	3	2	3	3	3	1	2	3	1	2	3	3
CO3	2	3	1	2	-	3	3	3	3	3	2	3
CO4	3	3	3	1	2	2	2	-	2	3	3	3
CO5	-	1	-	2	3	1	1	3	-	3	2	-

MGTM-102	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	2	2	2	-	2	-	3
CO2	3	3	2	3	3	-	2	2	2	-	2	3
CO3	2	3	2	2	3	2	-	1	-	-	-	3
CO4	3	2	3	3	2	2	-	2	1	-	-	3
CO5	3	3	3	3	2	3	2	3	2	2	2	3

MGTM-103	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3	2	2	1	2	2	-	2	2
CO2	2	2	2	-	2	3	2	2	2	-	-	3
CO3	2	2	3	3	3	2	2	-	-	-	2	2
CO4	3	3	1	2	1	2	2	-	-	2	2	3
CO5	3	3	2	3	3	2	3	2	3	-	2	3

MGTM-104	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	2		3		2	3				3
CO2	3	2		3			3	3	2			3
CO3	3	3		2		3			3	3	3	3
CO4	2	3	3		3			3	3	2	3	3
CO5	3	3	3	3			3			3		

MGTM-105	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2		2		2	2	2	2	3
CO2	3	2	3	3	2	3	2		2	3	3	3
CO3	2		2	2		3	2	2	3	2	2	3
CO4	1	2	2	2	2	2		2	2		2	3
CO5	3	3	2	3	3	2	3	3	2		3	3

MGTM-106	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	-	2	1	3	2	3	2	1	3
CO2	3	3	1	2	1	3	3	3		3	2	3
CO3	2	2	3	3	2	3	1	3	3	-	3	3
CO4	2	2	3	2	2	-	3		2	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTM-107	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	2	2		3	2		2	2	2	3
CO2	2		3		3	2		3		3	2	3
CO3	2	2		3	2		3	2	3	1		3
CO4		2	2	2		2	2		2		2	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

	SECOND SEMESTER							
SL NO	COURSE CODE	COURSE	CREDIT PATTERN L: T:P	TOTAL CREDITS	EXAMINATION MARKS			
					MT	IA	ETE	TOTAL
1	MGTM-201	Business Environment	4:0:0	4	20	40	40	100
2	MGTM-202	Research Methodology	3:0:2	4	20	40	40	100
3	MGTM-203	Human Resource Management	4:0:0	4	20	40	40	100
4	MGTM-204	Corporate Finance	4:0:0	4	20	40	40	100
5	MGTM-205	Marketing Management	4:0:0	4	20	40	40	100
6	MGTM-206	Operations Management	4:0:0	4	20	40	40	100
7	MGTM-207	International Business	4:0:0	4	20	40	40	100
TOTAL				28				700

MT- MID TERM
IA-INTERNAL ASSESSMENT
ETE- END TERM EXAM

L-Lecture, T-Tutorial, P-Practical

Course	Course outcomes: - After completion of these courses' students should be able to
Semester - II	
Business Environment	**CO1:** Explain the micro and macro environment of business. **CO2:** Understand and implement the provisions of industrial and legal environment. **CO3:** Understand and analyze demographic and social environment of business. **CO4:** Explain monetary and fiscal environment and apply the concepts for betterment of a business. **CO5:** Understand and discuss international business environment.
Research Methodology	**CO1:** Understand some basic concepts of research and its methodologies. **CO2:** Understand and implement data collection techniques. **CO3:** Apply the concept of sampling design. **CO4:** Apply data processing and data analysis techniques. **CO5:** Write a research report, thesis and research proposal for grants.
Human Resource Management	**CO1:** Understand basic concept, nature and importance of human resource management. **CO2:** Understand and analyze the purpose of human resource planning and practice of recruitment and selection. **CO3:** Realize the importance of training & development performance appraisal and compensation administration. **CO4:** Understand and analyze the concepts of grievance handling and industrial relation. **CO5:** Understand and apply the concept and principles of promotion, transfer and separation.

Corporate Finance	**CO1:** Recognize the importance of financial management from a strategic perspective. **CO2:** Understand and analyze valuation of securities and investment decisions. **CO3:** Compute cost of capital and develop innovative financial strategies related to capital structure. **CO4:** Understand and compute risk and return on securities. **CO5:** Discuss the financial leverage and dividend policy of a firm.
Marketing Management	**CO1:** Describe the basic concepts of marketing and marketing environment. **CO2:** Employ the concepts of consumer behaviour to choose the relevant STP strategy. **CO3:** Discuss marketing environment, marketing research process and customer value. **CO4:** Describe the concept of market segmentation, targeting and positioning. **CO5:** Apply the concepts of product mix in marketing decision making in a firm.
Operations Management	**CO1:** Apply the concept of operations management in manufacturing and service sector and will be able to plan and implement production and service-related decisions. **CO2:** Plan production schedules and plan resources (material and machine) required for production. **CO3:** Apply the concepts of purchase, stores and inventory management and analyze and evaluate material requirement decisions. **CO4:** Apply the concept of operation research decision making for various decisions related to operation. **CO5:** Understand the concept of logistics management.
International Business	**CO1:** Understand the current theory and techniques of the major business discipline. **CO2:** Know about international economic institutions and agreements. **CO3:** Discuss about multinational corporations and theory of international investment. **CO4:** Describe the concept international financial environment. **CO5:** Discuss emerging developments in internationally specially India's competitive advantage in industries.

Mapping: Semester – II

MGTM - 201	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2		2	3		2		2		3	3
CO2	3		2	2	3	2		2	3	2		3
CO3	2	3	1	1		3	2	2	3	2	2	3
CO4	2	2	2		3	3	2	2		3	3	3
CO5	2	3	3	3		1	3	3				

MGTM-202	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	3	2	3	2	2	1	2	2	2
CO2	2	2	3	1	1	-	-	-	2	-	2	2
CO3	3	3	2	3	3	2	-	3	-	-	2	3
CO4	2	2	1	1	2	2	2	-	-	2	-	3
CO5	3	3	2	2	3	3	2	3	3	3	3	3

MGTM-203	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2		2	2	2		3	2	3
CO2	2	2	3	2	2	3	3	3	3	3	3	2
CO3	3	2	3	1	3	2	2		2	2	2	2
CO4	2			3	3	1	3	3	3	2	2	2
CO5		3	2	2	1	2		2	3	1		

MGTM - 204	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	2	2			3	3
CO2	2	2	2	2	3		2	2	3	3	2	3
CO3	1		2	2	3	3	3		2		2	3
CO4			2	2	3	2		2			2	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTM-205	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	3	-	-	3	2	2	3
CO2	2	2	2	3	3	3	3	2	2	-	2	3
CO3	2	3	3	-	3	2	3	3	3	3	3	3
CO4	2	-	2	3	2	2	2	3	-	3	3	3
CO5	3	3	2	2	2	2	3	2	3	2	2	3

MGTM-206	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	2	2	2	-	3	2	3
CO2	-	2	3	2	2	3	3	3	3	3	3	2
CO3	3	2	3	1	3	2	2	-	2	2	2	2
CO4	2	-	-	3	3	1	3	3	3	2	2	2
CO5	3	2	1	3	3	1	2	3	3	3	2	2

MGTM-207	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	2	-	2	2	-	2
CO2	-	2	2	3	-	-	-	2	2	2	2	-
CO3	-	-	2	-	-	3	2	-	1	-	1	2
CO4	2	1	-	-	3	1	-	2	1	-	2	-
CO5	3	3	3	3	3	3	3	3	3	3	3	3

	THIRD SEMESTER							
SL NO	COURSE CODE	COURSE	CREDIT PATTERN L: T:P	TOTAL CREDITS	EXAMINATION MARKS			
					MT	IA	ETE	TOTAL
1	MGTM-301	Management Information System	4:0:0	4	20	40	40	100
2	MGTM-302	Legal Aspects of Business	4:0:0	4	20	40	40	100
3	MGTM-303	Business Strategy	1:0:2	4	20	40	40	100
4		Elective-I	4:0:0	4	20	40	40	100
5		Elective-II	4:0:0	4	20	40	40	100
6		Elective-III	4:0:0	4	20	40	40	100
7	MGTM-304	Summer Internship/ Project (PAP/PCP)		4			100	100
TOTAL				28				700

MT- MID TERM
IA-INTERNAL
ASSESSMENT ETE- END
TERM EXAM

L-Lecture, T-Tutorial, P-Practical

Total credit = 114

Specialization electives for III semester:

Specialization Area	Elective	Specialization paper
Marketing	MGTM-301M	Retail Management
	MGTM-302M	Consumer Behaviour
	MGTM-303M	Marketing Research
Human Resource	MGTM-301H	Human Resource Planning & Development
	MGTM-302H	Compensation Management
	MGTM-303H	Management Training & Development
Finance	MGTM-301F	Security Analysis & Portfolio Management
	MGTM-302F	Financial Markets and Institutions
	MGTM-303F	Financial Services
Production & Operations	MGTM-301P	Production and Operation Management
	MGTM-302P	Procurement Management
	MGTM-303P	Material Management
International Business	MGTM-301I	International Economics
	MGTM-302I	International Business Laws
	MGTM-303I	International Marketing
Logistics & Supply Chain Management	MGTM-301S	Essentials of Supply Chain Management
	MGTM-302S	Procurement Management
	MGTM-303S	Service Operations Management

Course	Course outcomes: - After completion of these courses' students should be able to
Semester – III	
Management Information System	**CO1:** Relate the basic concepts and technologies used in the field of management information systems. **CO2:** Understand networking system of management information system. **CO3:** Creating a virtual company and improve business quality. **CO4:** Develop MIS Systems. **CO5:** Apply enterprise resource planning (ERP) and customer relationship management (CRM).
Legal Aspects of Business	**CO1:** Evaluate the provisions of Law of Contract, 1872. **CO2:** Examine various provisions of Sale of Goods Act. **CO3:** Compare and contrast different types of negotiable instruments. **CO4:** Know the provisions of the Companies Act 2013. **CO5:** Relate and apply various provisions related to Consumer Protection Act.
Business Strategy	**CO1:** Understand the concept of strategy. **CO2:** Analyze and diagnose the business environment. **CO3:** Understand the process of strategic choice. **CO4:** Identify the inter-relationship between formulation and implementation. **CO5:** Understand the techniques of strategy evaluation.
Summer Internship and Report	**CO1:** Construct the company profile by compiling the brief history, management structure, products / services offered, key achievements and market performance for his / her organization of internship. **CO2:** Assess its Strengths, Weaknesses, Opportunities and Threats (SWOT). **CO3:** Determine the challenges and future potential for his / her internship organization in particular and the sector in general. **CO4:** Test the theoretical learning in practical situations by accomplishing the tasks assigned during the internship period. **CO5:** Apply various soft skills such as time management, positive attitude and communication skills during performance of the tasks assigned in internship organization.

Mapping: Semester – III

MGTM - 301	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2		2		3	2	3	2	3
CO2	3	2	3	3	2	3	2		2	3	3	3
CO3	2		2	2		3	2	2	3	2	2	3
CO4	2	2	2	2	2	2		2	2		2	3
CO5	3		3	3		3			3	3	3	3

MGTM-302	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	3		2	2	2		3	2	3
CO2		3	3	2	2	3	3	3	3	3	3	2
CO3	3	3	3	2	3	3	2		3	2	2	2
CO4	2			3	3	1	3	3	3	2	2	2
CO5	1	2	1		2		1	1	2		2	2

MGTM-303	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		2			2	1	2	2			
CO2		2	1	3	1				2	2		
CO3				2	2			2	1		2	2
CO4		2		1			2	2	1			2
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTM-304	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	3	3	3	2	2	2	2
CO2	-	3	3	2	1	-	1	2	1	-	2	-
CO3	1	1	2	3	3	-	2	-	-	2	3	1
CO4	1	1	2	1	-	2	3	3	2	1	1	1
CO5	2	2	3	1	-	2	3	3	2	1	2	1

	FOURTH SEMESTER							
SL NO	COURSE CODE	COURSE	CREDIT PATTERN L: T:P	TOTAL CREDITS	EXAMINATION MARKS			
					MT	IA	ETE	TOTAL
1	MGTM-401	Project Management	4:0:0	4	20	40	40	100
2	MGTM-402	Entrepreneurship	4:0:0	4	20	40	40	100
3	MGTM-403	Business Ethics	4:0:0	4	20	40	40	100
4		Elective-I	4:0:0	4	20	40	40	100
5		Elective-II	4:0:0	4	20	40	40	100
6		Elective-III	4:0:0	4	20	40	40	100
7	MGTM-404	Research Project		6			100	100
TOTAL				30				700

MT- MID TERM
IA-INTERNAL ASSESSMENT
ETE- END TERM EXAM

L-Lecture, T-Tutorial, P-Practical

Specialization electives for IV Semester:

Specialization Area	Elective	Specialization paper
Marketing	MGTM-404M	Sales & Distribution Management
	MGTM-405M	Brand Management
	MGTM-406M	Digital Marketing
Human Resource	MGTM-404H	Labour Law
	MGTM-405H	Industrial Relations
	MGTM-406H	Performance Appraisal and Evaluation
Finance	MGTM-404F	Financial Derivatives and Risk Management
	MGTM-405F	Corporate Tax Planning
	MGTM-406F	International Finance Management
Production & Operations	MGTM-404P	Total Quality Management & Six Sigma
	MGTM-405P	Process Management and Consultancy
	MGTM-406P	Enterprise Resource Planning
International Business	MGTM-404I	Global Brand Strategy
	MGTM-405I	International Business Operations and Logistics
	MGTM-406I	Export Import Procedures & Documentation
Logistics & Supply Chain Management	MGTM-404S	Application of Quality Management
	MGTM-405S	Process Management & Consultancy
	MGTM-406S	Big Data Analytics

Course	Course outcomes: - After completion of these courses' students should be able to
Semester – IV	
Project Management	**CO1:** Understand the concepts of project management. **CO2:** Understand project planning tools & techniques and the control process. **CO3:** Analyzed risk associated with the projects. **CO4:** Identify the most suitable project out of multiple projects and constraints. **CO5:** Apply network techniques for project management.
Entrepreneurship	**CO1:** Understand the concepts of entrepreneurship and entrepreneurial process. **CO2:** Discuss the entrepreneurial plan. **CO3:** Identify the international entrepreneurship opportunities. **CO4:** Understand the family and non-family entrepreneur. **CO5:** Explain the concept of venture capital.
Business Ethics	**CO1:** Understand the management models in the socio-political environment. **CO2:** Explain the normative ethics in management. **CO3:** Analyzed the factors associated with ethics compliance management. **CO4:** Know about the SEBI committees on corporate governance. **CO5:** Know the corporate frauds and regulatory responses and multiple control mechanisms.
Research Project	**CO1:** Understand the relevance of learned concepts and its applicability in real-life corporate environment. **CO2:** Apply his learning of subjects in writing the dissertation report on the problem undertaken for study. **CO3:** Analyze & prepare tabulation for the data collected. **CO4:** formulate the analysis and interpretation of data & also know about its correct presentation to use in professional manner. **CO5:** Create the logical and critical skills for correctly analyzing the industrial progress.

Mapping: Semester – IV

MGTM-401	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	1	2	-	-	1	-	-
CO2	2	3	2	3	2	2	-	2	-	-	-	-
CO3	-	2	3	3	3	3	3	-	1	-	-	2
CO4	1	1	2	2	3	3	2	-	2	2	-	-
CO5	3	3	3	3	3	3	3	3	3	3	2	3

MGTM-402	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3	2	1	3		1	1	2	2	2
CO2	1	3	2	3		3	3	2	2	3	3	2
CO3	3	2	3	1	3	2	3	3	2	2	2	3
CO4	2			3	3	1	3	3	2	2	2	2
CO5	3	1	1	3	3	1	3	2	3	2	2	2

MGTM-403	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1		2	2					
CO2		2	2						3	2	2	2
CO3			2	2	3	2	2	3				
CO4					1		2	2	2	2		2
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTM 404	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	3	-	2	2	2	2	2
CO2	-	2	-	2	2	-	-	2	2	-	2	-
CO3	2	-	1	3	2	-	3	3	-	2	3	2
CO4	2	3	2	-	-	-	-	-	2	2	2	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3

Course	Course outcomes: - After completion of these courses' students should be able to
Specializations Electives: Marketing	
Retail Management	**CO1:** Understand the various concepts of retail management. **CO2:** Learn the effect of various communication methods on buying behavior of consumers. **CO3:** Learn the important factors for designing a retail strategy. **CO4:** Learn and understand the operational challenges of retail and managing business. **CO5:** Understand importance and challenges to manage a store for better consumer response
Consumer Behaviour	**CO1:** Understand the various aspects of consumer behavior. **CO2:** Analyze the theories of psychologies in respect to strategizing effective business models for consumers buying. **CO3:** Learn and understand the factors like attitude and Reference group's impact on buying decisions of consumer. **CO4:** Learn and understand the factors like Culture and social factors impact on buying decisions of consumer. **CO5:** Analyze the pre-purchase, purchase and post purchase behaviors of consumers.
Marketing Research	**CO1:** Understand the fundamentals and significance of market research in business decision-making. **CO2:** Learn various research methodologies and apply them to different market research problems. **CO3:** Analysed and interpret data using statistical tools to derive meaningful insights. **CO4:** Develop the ability to design and execute a comprehensive market research project. **CO5:** Communicate research findings effectively to stakeholders and recommend actionable strategies.
Sales and Distribution Management	**CO1:** Make students aware about the concept of sales management and personal selling. **CO2:** Learn the fundamentals of recruiting, selecting and building a performing team of sales personals. **CO3:** Understand the fundamentals of distribution of a physical product. **CO4:** Understand the aspects of Distribution management as logistic control. **CO5:** Learn the modern ways and tools in sales management.

Brand Management	**CO1:** Understand the fundamental concepts of branding and brand management. **CO2:** Analysed the elements that contribute to brand equity and the factors that influence brand perception. **CO3:** Develop effective brand positioning strategies that resonate with target audiences. **CO4:** Formulate and implement brand communication strategies that align with the overall brand strategy. **CO5:** Evaluate and manage brand performance over time to ensure long-term brand success.
Digital Marketing	**CO1:** Understand the historical development of E-Marketing and its future trends. **CO2:** Evaluate the E-Marketing environment and recognize the ethical and legal issues associated with online marketing. **CO3:** Develop E-Marketing strategies by conducting online consumer behaviour research. **CO4:** Manage E-Marketing activities by effectively using online tools for product offerings, pricing strategies, distribution channels, and communication tools. **CO5:** Implement customer engagement strategies through social media, digital media to build and sustain online customer relationships.

Mapping: Specializations Electives (Marketing)

MGTM-301M	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	-	2	2	-	-	1	-	-
CO2	-	3	3	2	2	2	-	2	1	-	-	-
CO3	2	2	2	3	3	2	3	-	2	2	-	-
CO4	2	2	3	3	3	3	3	2	1	-	-	2
CO5	3	3	3	3	2	2	2	3	3	3	2	3

MGTM-302M	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	3	2	3	2	2	3	3
CO2	1	-	2	-	-	1	-	2	3	3	2	2
CO3	-	2	2	2	3	-	3	2	-	3	-	-
CO4	-	2	2	2	-	3	2	-	3	-	3	-
CO5	-	2	2	2	-	3	2	-	3	-	3	3

MGTM-303M	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	2	-	2	-	-	2
CO2	2	3	3	2	2	2	2	2	-	-	2	-
CO3	-	2	3	3	3	3	3	-	2	-	2	2
CO4	-	-	2	3	3	3	2	3	3	-	2	-
CO5	3	3	3	3	3	3	3	3	3	2	2	3

MGTM-404M	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	2	3	3	2	2	3	-	2	3
CO2	3	2	3	3	3	2	2	3	2	2	3	3
CO3	2	3	2	2	-	3	3	3	3	3	2	3
CO4	3	3	3	2	2	2	2	-	2	3	3	3
CO5	-	2	2	-	3	3	2	3	2	3	2	3

MGTM-405M	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	2	2	-	-	-	2	-
CO2	2	3	3	3	-	3	3	2	-	-	2	-
CO3	-	2	3	3	3	3	3	3	3	-	2	-
CO4	2	3	2	3	2	3	2	2	3	2	3	2
CO5	2	3	3	3	3	3	3	3	3	3	3	2

MGTM - 406M	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3		3			3	2	2		2
CO2	3		3	3		3	3	3	3		3	3
CO3		3		3		3			3	2	3	3
CO4	3	3	3	3				3	3	3	3	
CO5	2		2		3	3	3		3		3	3

Course	Course outcomes: - After completion of these courses' students should be able to
Specializations Electives: FINANCE	
Security Analysis and Portfolio Management	**CO1:** Understand the framework of securities market and investment **CO2:** Understand the concept of risk and return, and diversification of risk **CO3:** Understand the concept of fundamental analysis of the securities. **CO4:** Gain knowledge and skills in portfolio diversification. **CO5:** Develop proficiency in performance measurement by understanding portfolio evaluation measures.
Financial Market and Institutions	**CO1:** Understand the framework of financial system **CO2:** Develop a comprehensive understanding of financial markets, including their structure, functions,participants **CO3:** Gain a conceptual understanding of fund-based and fee-based financial services **CO4:** Foundational understanding of the basic concepts of insurance and mutual funds, role of agencies **CO5:** Understand banking, regulatory frameworks, and emerging trends in the banking sector
Financial Services	**CO1:** Understand the structure, role, and significance of various financial services in the economy. **CO2:** Analyze the operations and functioning of banking and non-banking financial institutions. **CO3:** Evaluate the different types of investment services and their impact on the financial market. **CO4:** Assess the role of insurance in risk management and its contribution to financial planning. **CO5:** Understand the regulatory framework governing financial services in India.
Financial Derivatives and Risk Management	**CO1:** Understand the global and Indian derivative markets. **CO2:** Analyzed the structure of global forward markets. **CO3:** Develop the ability to trade and value futures contracts. **CO4:** Gain proficiency in option pricing models and assess the factors influencing option prices. **CO5:** Evaluate the structure and characteristics of global swaps markets.
Corporate Tax Planning	**CO1:** Understand the framework and principles of corporate tax laws in India. **CO2:** Analysed the tax implications of various corporate decisions, including mergers, acquisitions, and restructuring. **CO3:** Develop strategies for effective tax planning and management within the legal framework. **CO4:** Evaluate the role of tax incentives and exemptions in corporate tax planning. **CO5:** Understand international taxation issues and their impact on multinational corporations

International Financial Management	**CO1:** Demonstrate a comprehensive understanding of the increasing interdependence in the global economy. **CO2:** Analyzed and interpret the Balance of Payments (BOP) by identifying its components. **CO3:** Evaluate and manage exchange risk by understanding the structure of foreign exchange markets. **CO4:** Apply principles of short-term financial management to optimize funding and investment strategies. **CO5:** Assess the impact of trade blocks and international trade agreements on global finance.

Mapping: Specializations Electives (FINANCE)

MGTM - 301F	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	2	-	2	1	-	1	1	3
CO2	-	1	3	-	2	2	2	2	2	-	3	3
CO3	2	2	3	2	-	-	-	3	2	2	-	3
CO4	2	2	1	3	3	-	3	2	-	1	2	3
CO5	3	3	2	3	2	3	3	2	3	2	3	3

MGTM - 302F	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	3	2	-	2	1	-	1	1	3
CO2	-	3	3	2	2	3	2	3	2	-	3	2
CO3	3	2	3	2	-	-	-	3	3	2	-	3
CO4	2	3	1	3	3	-	2	2	-	1	2	2
CO5	3	3	2	3	3	3	2	1	3	2	3	3

MGTM-303F	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1				1	2	2	3	2	-	2
CO2	3		2		3	-	3	3	2	2	3	2
CO3	3		2		3	3	2	3	2	-	-	-
CO4	3				3	2	3	1	3	3	-	2
CO5	3				3	3	3	2	3	3	3	2

MGTM-404F	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	1	-	2	1	2	1	1	1	1	3
CO2	-	1	2	2	3	2	3	2	2	-	3	2
CO3	2	3	3	3	-	-	-	2	3	2	2	2
CO4	1	3	2	2	2	2	2	2	1	1	2	2
CO5	2	2	3	2	2	3	2	2	3	2	3	3

MGTM-405F	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	-	2	-	2	1	-	1	1	3
CO2	-	1	3	-	2	2	2	2	2	-	3	3
CO3	2	2	3	2	-	-	-	3	2	2	-	3
CO4	2	2	1	3	3	-	3	2	-	1	2	3
CO5	3	3	2	3	2	3	3	2	3	2	3	3

MGTM - 406F	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	2	2	2	-	2	1	-	1	1	2
CO2	1	2	3	3	2	3	2	3	2	-	3	3
CO3	2	3	3	3	-	-	-	3	3	2	-	2
CO4	3	2	1	3	3	-	2	2	-	1	2	2
CO5	2	2	2	3	3	3	2	1	3	2	3	2

Course	Course outcomes: - After completion of these courses' students should be able to
Specializations Electives: HR	
Human Resource Planning & Development	**CO1:** Understand the historical evolution and the integrated role of Human Resources in strategic management. **CO2:** Gain the ability to systematically plan human resources at the enterprise level. **CO3:** Acquire skills in career management, including recruitment, selection to enhance overall employee performance and growth. **CO4:** Develop an understanding of performance appraisal systems. **CO5:** Learn the concept, objectives, and methods of maintaining a Human Resource Information System (HRIS) at both micro and macro levels.
Management Training & Development	**CO1:** Understand the conceptual framework of training. **CO2:** Develop the ability to identify training needs, plan and organize training programs. **CO3:** Gain insights into Management Development (MD) and Organizational Development (OD). **CO4:** Learn how to evaluate training programs, including calculating the return on investment (ROI). **CO5:** Explore the role of technology in training.
Compensation Management	**CO1:** Understand job evaluation techniques and the role of compensation as a strategic tool. **CO2:** Gain knowledge of the classification of compensation types. **CO3:** Learn the theories and processes related to wage structure, wage fixation, wage payment, and salary administration. **CO4:** Develop an understanding of reward systems for sales personnel. **CO5:** Acquire insights into the role of wage boards, pay commissions.
Labour Law	**CO1:** Understand the definition, meaning, and scope of labor laws in India. **CO2:** Analyzed key labour legislations in India, such as the Factories Act, 1948. **CO3:** Examine social-security legislations, including the Employees' State Insurance Act, 1948. **CO4:** Explore the history and significance of wage legislations in India. **CO5:** Discuss recent developments and contemporary issues in labour laws in India.
Industrial Relation	**CO1:** Understand the concept, scope, and key stakeholders of industrial relations. **CO2:** Analyzed the historical evolution of industrial relations in the UK and India. **CO3:** Evaluate the sources of industrial disputes related to wages, service conditions. **CO4:** Examine various industrial conflict resolution mechanisms. **CO5:** Assess the impact of globalization on industrial relations.

Performance appraisal & Evaluation	**CO1:** Understand the concept, scope, and importance of performance management. **CO2:** analyzed the performance planning process. **CO3:** Evaluate the purpose and role of appraisal in performance management. **CO4:** Gain insights into the Performance Management System (PMS). **CO5:** Assess competency - based performance management systems, methods of performance measurement through tools.

Mapping: Specializations Electives (HR)

MGTM - 301H	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2		2	2	2		3	2	3
CO2	2	2	3	2	2	3	3	3	3	3	3	2
CO3	3	2	3	1	3	2	2		2	2	2	2
CO4	2			3	3	1	3	3	3	2	2	2
CO5		3	2	2	1	2		2	3	1		

MGTM- 302H	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	3	2	2	-	-	2	-
CO2	3	3	2	2	-	3	3	2	-	-	-	-
CO3	3	3	2	2	2	3	3	3	-	2	-	-
CO4	2	2	2	3	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	3	3	3	2	2	2	-

MGTM - 303H	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	2	2	2	-	3	2	3
CO2	2	2	3	2	2	3	3	3	3	3	3	2
CO3	3	2	3	1	3	2	2	-	2	2	2	2
CO4	2	-	-	3	3	1	3	3	3	2	2	2
CO5	-	3	2	2	1	2		2	3	1	-	-

MGTM - 404H	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3		3		3	2	3	2		3
CO2		3		3	2	3	3	3		3	3	3
CO3	2	3	3	3		3		3	3		3	3
CO4	3	2	3	2	3	2	3		2	3	3	3
CO5	2	2	1	1	1	3		3	1	2	1	

MGTM- 405H	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-	1	-	-	-	-	2	1	-
CO2	2	-	2	3	2	1	1	1	2	2	3	1
CO3	2	-	3	-	1	1	1	2	2	2	1	-
CO4	2	2	2	2	1	2	2	2	1	3	2	1

MGTM - 406H	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		3		3		3	2	3	2		3
CO2		3		3	2	3	3	3		3	3	3
CO3	2	3	3	3		3		3	3		3	3
CO4	3	2	3	2	3	2	3		2	3	3	3
CO5	2	2	1	1	1	3		3	1	2	1	

Course	Course outcomes: - After completion of these courses' students should be able to
Specializations Electives: Production & Operations	
Production and Operation Management	**CO1:** learn effective forecasting of production functions, enhanced planning of product design, service operations, facility planning and project management. **CO2:** Understand forecasting of production functions. **CO3:** Enhanced planning of product design. **CO4:** learn the inventory control techniques. **CO5:** Understand the process of aggregate planning and scheduling.
Procurement Management	**CO1:** Develop a foundational understanding of procurement management. **CO2:** Acquire knowledge and skills in supplier identification, enabling effective supplier management. **CO3:** Develop the skills and knowledge of global sourcing and international procurement. **CO4:** Understand of the nature of outsourcing, and successful outsourcing implementation. **CO5:** Understand the meaning and functionalities of an e-procurement system.
Material Management	**CO1:** Acquire a foundation in materials management, logistics, and supply chain management. **CO2:** Gain a comprehensive understanding of the advantages of Material Requirements Planning (MRP) systems over conventional planning methods. **CO3:** Understand the fundamental of inventory, and various techniques for management. **CO4:** Gain a thorough understanding of inventory turn ratios and effective inventory management. **CO5:** Understand of purchasing management and Gain proficiency in materials handling techniques enhance overall supply chain performance.
Total Quality Management and Six Sigma	**CO1:** Understand the evolution of quality concepts and the need for quality improvement in businesses. **CO2:** Apply various problem-solving and quality control tools to address quality-related issues effectively. **CO3:** Implement TQM principles and tools to enhance product and process quality. **CO4:** Apply Kaizen principles for knowing its impact on management, labour relations, and organizational culture. **CO5:** Utilize Six Sigma methodologies and tools to achieve sustainable quality improvements.

Process Management and Consultancy	**CO1:** Understand the lifecycle of Business Process Management. **CO2:** Analyzed the need for Business Process Reengineering (BPR). **CO3:** Integrate BPR with management concepts. **CO4:** Develop the skills necessary for a career in consultancy. **CO5:** Explore emerging trends in consultancy.
Enterprise Resource Planning	**CO1:** Understand the fundamental concepts of Enterprise Resource Planning (ERP). **CO2:** Analyzed the challenges, strategies, and methodologies involved in ERP implementation. **CO3:** Explore the operational aspects of ERP systems. **CO4:** Evaluate the dynamics of the ERP market. **CO5:** Assess recent trends in ERP.

Mapping: Specializations Electives: Production & Operations

MGTM - 301P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3	3	-	1	-	2	-	1	3	2	-
CO2	3	1	-	-	-	-	-	-	-	-	3	1
CO3		2	3	-	1	-	1	-	2	-	3	-
CO4		-	3	-	-	-	3	-	2	-	-	-
CO5		2	1	-	2	-	3	-	-	2	1	-

MGTM - 302P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					3				3		3	3
CO2	3		3	3	2	-			2	-		
CO3			2		3	-		-	-	2		3
CO4	3		2		-							
CO5	2			3	-							3

MGTM - 303P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1			2		1		3		3	2
CO2	2		2	2	3	-		1	2	-		
CO3	2	3	3		2	-	1	-	-	2		3
CO4	2		3		-							
CO5	3	2		2	-		1	1				3

MGTM - 404P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2					-					2
CO2	1	2				-	-			-		2
CO3	2	2	2			-						2
CO4	2	2	2	2	-	-	-					2

MGTM - 405P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2			1	1	-		1		1	3
CO2	1	3			1	1	1	1		-		3
CO3	3	3	3		2	-						2
CO4	3	3	3	3	-	1	-		1		1	3

MGTM-406P	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2		2	2	2		3	2	3
CO2	2	2	3	2	2	3	3	3	3	3	3	2
CO3	3	2	3	1	3	2	2		2	2	2	2
CO4	2			3	3	1	3	3	3	2	2	2

Course	Course outcomes: - After completion of these courses' students should be able to
Specializations Electives: IB	
International Economics	**CO1:** Understand the meaning, nature, and scope of international economics. **CO2:** Gain knowledge of the pure theory of international trade. **CO3:** Analyzed commercial policies, including the debate between free trade and protectionism. **CO4:** Learn the components of the balance of payments and the mechanisms for its adjustment. **CO5:** Develop an understanding of trade policy and cooperation.
international marketing	**CO1:** Develop an understanding of basic international marketing concepts, theories, principles, and terminology. **CO2:** Demonstrate an awareness of global market and knowledge of the impact of global market factors. **CO3:** Identifying international customers through conducting marketing research. **CO4:** Developing a global marketing strategy by applying the basic concepts of Marketing Mix. **CO5:** Apply an integrated understanding of the course material by conducting an analysis of international marketing issues.
International Business Laws	**CO1:** Understand the concept of international law and legal international framework. **CO2:** Describe the business law contracts **CO3:** Work effectively with international trade in India. **CO4:** Understand international level litigation and disputes settlement. **CO5:** Know about the taxation of foreign income.
Global Brand Strategy	**CO1:** Establish and sustain brands and lead to extensions a new global brand. **CO2:** Understand the geopolitical and roll and function of trade bodies. **CO3:** Understand theoretical concepts of international brand environment. **CO4:** Learn the Service branding, familiarize with Product branding, understand brand portfolio. **CO5:** Analysis the brand management, market sizing, competitor analysis.
International Business Operations and Logistics	**CO1:** Develop basic understanding of operations and logistics. **CO2:** Learn discussion of terms of global market, current global marking approach **CO3:** Discuss current practices, issues, and concerns in the field of international logistic operations. **CO4:** Understand the reason of existence of International Trade. **CO5:** Apply logistics principles in international business decisions.

Export Import Procedures and Documentation	**CO1:** understand Import/export trade organizations and the procedure of licensing. **CO2:** understand the nature of trading houses. **CO3:** understand export sales contract and its processing. **CO4:** understand export payment methods and Export-Import trade regulatory framework in India. **CO5:** understand institutional set up for export promotion and export assistance in India.

Mapping: Specializations Electives: IB

MGTM - 303I	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	2	1	3	3	3	1	3	1	3
CO2	2	2	1	2	2		3	3	2	1	3	2
CO3	3	2	2	3	2	2			1		1	2
CO4	2	3	3	2	2	1	1	3	1	1		3
CO5	2	2	2	2	3	2	3	2	3	3	3	1

MGTM - 302I	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	3	3	2	2	2	2	-	2	1	3
CO2	2	2	2	2	2	-	2	1	2	1	2	2
CO3	3	2	1		3	2	-		1	-	-	3
CO4	3	2	3	3	3	2	-	2		1	1	2
CO5	3	3	3	3	3	3	2	2	2	2	2	2

MGTM - 303I	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	2	2	2	2	-	2	-	3
CO2	3	3	2	3	3	-	2	2	2	-	2	3
CO3	2	3	2	2	3	2	-	1	-	-	-	3
CO4	3	2	3	3	2	2	-	2	1	-	-	3
CO5	3	3	3	3	2	3	2	3	2	2	2	3

MGTM - 404I	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2			1	1	-		1		1	3
CO2	1	3			1	1	1	1		-		3
CO3	3	3	3		2	-						2
CO4	3	3	3	3	-	1	-		1		1	3
CO5	2	2			1	1	-		1		1	3

MGTM - 405I	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	2	-	2	2	-	2
CO2	-	2	2	3	-	-	-	2	2	2	2	-
CO3	-	-	2	-	-	3	2	-	1	-	1	2
CO4	2	1	-	-	3	1	-	2	1	-	2	-
CO5	3	3	3	3	3	3	3	3	3	3	3	3

MGTM-406I	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	2	-	2	2	-	3
CO2	-	3	3	2	-	1	-	2	2	3	2	-
CO3	1	1	3	-	1	3	2	-		-		3
CO4	3		1	1	2		-	2	1	1	3	1
CO5	2	2	2	2	3	2	3	3	2	3	2	2

Course	Course outcomes: - After completion of these courses' students should be able to
Specializations Electives: Logistics & Supply Chain Management	
Essentials of Supply Chain Management	**CO1:** Develop a comprehensive understanding of the basic concepts, philosophy, and essential features of supply chain management. **CO2:** Gain knowledge of logistics; understand logistics costs and the significance. **CO3:** Develop proficiency in inventory management within the supply chain context. **CO4:** Develop strategic thinking skills to analyze and address key issues in supply chain management. **CO5:** knowledge of Warehousing, apply aspect of integrated Logistics.
Procurement Management	**CO1:** Develop a foundational understanding of procurement management. **CO2:** Acquire knowledge and skills in supplier identification, enabling effective supplier management. **CO3:** Develop the skills and knowledge of global sourcing and international procurement. **CO4:** Understand of the nature of outsourcing, and successful outsourcing implementation. **CO5:** Understand the meaning and functionalities of an e-procurement system.
Service operations management	**CO1:** Understand the fundamental concepts and frameworks of service operations management. **CO2:** Analyze service processes and identify key factors influencing service design and delivery. **CO3:** Apply service quality management techniques and models to improve service performance. **CO4:** Utilize various tools and techniques for effective service capacity planning and resource management. **CO5:** Develop strategies for managing service demand, supply chain integration, and service recovery.
Application of Quality Management	**CO1:** Understand the fundamental concepts of quality management and its evolution. **CO2:** Apply various quality management tools and techniques in different organizational contexts. **CO3:** Analyze the role of quality management in enhancing customer satisfaction and business performance. **CO4:** Develop and implement quality improvement initiatives using Total Quality Management (TQM) and Six Sigma methodologies. **CO5:** Evaluate the impact of quality management practices on organizational sustainability and competitiveness.
Process Management and Consultancy	**CO1:** Understand the lifecycle of Business Process Management. **CO2:** Analyzed the need for Business Process Reengineering (BPR). **CO3:** Integrate BPR with management concepts. **CO4:** Develop the skills necessary for a career in consultancy. **CO5:** Explore emerging trends in consultancy.

Big Data Analytics	**CO1:** Understand the fundamental concepts of big data and its significance in the business context. **CO2:** Learn and apply various data analytics tools and techniques for processing and analyzing large datasets. **CO3:** Develop the ability to interpret and visualize data to derive actionable business insights. **CO4:** Understand the ethical implications and challenges associated with big data analytics. **CO5**: Apply big data analytics techniques to real-world business problems and case studies.

Mapping: Specializations Electives: Logistics & Supply Chain Management

MGTM - 301S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					3				3		3	3
CO2	3		3	3	2	-			2	-		
CO3			2		3	-		-	-	2		3
CO4	3		2		-							
CO5	2			3	-							3

MGTM - 302S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	2	2	1	1	1	2	1	3	3
CO2	2		2	2	3	-			3	2		1
CO3		1	2		2	1		-	-	2	1	2
CO4	2		3	1	-			1	1			
CO5	3	1		2	1	1	1		1	1	1	2

MGTM - 303S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		1		1	2		1	1	3		3	2
CO2	2		2	3	1	1			3	-		1
CO3			2		3	-	1	1	1	2		2
CO4	2	1	3	1	-			1			1	
CO5	2			3	1		1		1	1		3

MGTM - 404S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	3	1	1	1	3	1	3	3
CO2	2		3	3	1	-			1	1		
CO3	1	1	1		2	1	2	2	-	2		2
CO4	3		2	1	1					3	2	
CO5	2	1		3	-	2	1		3			3

MGTM - 405S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		3		1	2		2		3	1	2	2
CO2	1		2	3	2	3		1	2	-		
CO3	1		1		2	2	1	-	-	3		1
CO4	1	2	3	1	-	1		1				
CO5	2	2		3	1	2	3				1	3

MGTM - 406S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1		3		1	1	3		3	1
CO2	2	1	2	3	3	1			2	1		
CO3			1	1	3	-		1	1	2	1	2
CO4	2	2	3		-		1					
CO5	1	1	1	3	1	1			1	1	1	3

MBA: Semester-I
MGTM-101: PRINCIPLES OF MANAGEMENT

Duration: 3 Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
This module provides students with a wide-ranging introduction to management and understanding its key principles, concepts & theories and tools & techniques. The objective of this course is for each student to be able to know, comprehend, apply, analyze, synthesize and evaluate the basic principles of the fundamentals of managing organizations. Students will complete specific activities, as identified in the syllabus, related to each of the four functions of management: planning, organizing, leading and controlling.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Discuss the evolution & growth of management thought.
CO2: Describe and apply the concept of planning, organizing & direction.
CO3: Apply the concept of motivation, control & coordination in an organization.
CO4: Apply the modern approaches to management in an organization.
CO5: Discuss the Contemporary Issues like Social Responsibility & Ethics, Globalization.

COURSE CONTENTS

Unit I: Evolution & Growth of Management Thought
Concepts, Theory and Practice: The Evolution of Management Thought – Scientific Management School, Behavioral School, Quantitative School, Integration School, Contemporary School, McKinsey's 7-S approach.

Unit II: Planning, Organizing & Direction
Planning- Nature, Purpose, Types & Process of Planning; Concept of MBO, MBE & MBWA; Decision Making- Approaches, Decision Making under certainty, uncertainty & risk; Group Decision Making; Organizing- Line/ Staff Authority, Decentralization & Delegation, Effective Organizing; Direction- Supervision, Span of Supervision, Graicuna's Theory of Span of Management.

Unit III: Motivation, Control & Coordination
Motivation- elements, importance, methods, theories; Controlling- Control Process, Importance, Critical Control Standards & Techniques, Maintenance Vs Crisis Management, Overall Control Process.; Coordination- Definition, Characteristics, Objectives, Techniques.

Unit IV: Modern approaches to Management
Concept of Knowledge management, change management, technology management, supply chain management, process and project quality standards – six sigma, CMM, CMMI, and PCMM, Impact of IT quality management systems, learning organizations.

Unit V: Contemporary Issues
Social Responsibility & Ethics; Globalization & Management; Inventing & Reinventing Organizations; Culture & Multiculturalism

TEXT BOOKS

- Koontz, H. (2008). *Essentials of management*. Tata McGraw Hill.
- Prasad, L. M. (2006). *Principles of management*. Sultan Chand & Sons.

- Robbins, S. P., De Cenzo, D. A., Bhattacharya, S., & Agarwal, M. N. (2009). *Fundamentals ofmanagement: Essential concepts & applications* (6th ed.). Pearson Education India.
- Hellriegel, D., Jackson, S. E., & Slocum, J. W. (2008). *Management: A competency-based approach* (10th ed.). South-Western Cengage Learning.
- Stoner, J. A. F., Freeman, R. E., & Gilbert, D. R., Jr. (2005).

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Principles of Management, Management Thoughts, Planning and Decision Making, Organizing and Directing, Controlling and Coordination, Contemporary Management Issues

MBA: Semester-I
MGTM-102: MANAGERIAL ECONOMICS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

The basic objective of this course is to make the students aware of the various economic issues that they are expected to face as managers at the corporate level and to equip them with the tools and techniques of economic analysis for improving their decision-making skills.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Understand the significant of economics in decision making.
CO2: Understand the links between household behaviour and the economic models of demand.
CO3: Understand the links between production costs and the economic models of supply.
CO4: Analyze operations of markets under varying competitive conditions.
CO5: Understanding the concept of national Income and application of the same for various managerial decisions.

COURSE CONTENTS

Unit I: Introduction to Economics
Nature and Scope of Management Economics; Significance in decision-making and fundamental concepts; Objectives of a firm; Gap between theory and practice and role of managerial economist

Unit II: Demand Analysis
Law of Demand, Exceptions to the law of Demand, Determinants of Demand; Elasticity of Demand- Price, Income, Cross and Advertising Elasticity; Uses of Elasticity of Demand for managerial decision making, measurement of Elasticity of Demand. Demand forecasting meaning, significance and methods.
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Unit III: Supply Analysis
Law of Supply, Supply Elasticity; Analysis and its uses for managerial decision making; Production concepts & analysis; Production function, single variable-law of variable proportion, two variable- Law of returns to scale. Cost concept and analysis, short-run and long-run cost curves and its managerial use.

Unit IV: Market Equilibrium and Average Revenue Concept. Market Structure
Perfect Competition, features, determination of price under perfect competition; Monopoly: Feature, pricing under monopoly, Price Discrimination. Monopolistic: Features, pricing under monopolistic competition, product differentiation. Oligopoly: Features, kinked demand curve, cartels, price leadership; Pricing Strategies; Price determination, full cost pricing, product line pricing, price skimming, penetrationpricing.

Unit V: National Income
Concepts and various methods of its measurement, Inflation, types and causes, Business Cycle, Profit concept and major theories of profits; Dynamic Surplus theory, Risk & Uncertainty bearing theory and Innovation theory.

TEXT BOOKS

- Dwivedi, D. N. (2009). *Managerial economics* (7th ed.). Vikas Publication.
- Samuelson, P. A., & Nordhaus, W. D. (2010). *Economics* (19th ed.). McGraw Hill.

- Petersen, H. C., & Jain, P. (2006). *Managerial economics* (4th ed.). Prentice Hall.
- Mehta, P. L. (2010). *Managerial economics*. Sultan Chand & Sons.
- Peterson, H. C., & Lewis, W. C. (2010). *Managerial economics* (4th ed.). Pearson Education.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive classroom sessions with the help of Power Point presentations, reflective assessment and casestudy discussions to ensure active participation and continuous learning

Assessment Methods

The assessment method of this course is properly aligned with teaching learning processes and anticipated learning outcomes. It includes oral and written tests, problem solving exercises, presentations and end semester examinations.

Keywords

Micro Economics, Law of Demand, Law of Supply, Consumer Behavior, Theory of Production, CostFunction, Pricing, National Income.

MBA: Semester-I
MGTM-103: ACCOUNTING FOR MANAGERS

Duration: 3 Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
Understanding of the fundamental concepts, principles, and conventions of accounting.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Describe the accounting principles and standards and rules.
CO2: Interpret the business transactions for making the summery for final accounting purpose.
CO3: Prepare the financial statement of an organization.
CO4: Identify various costs and apply techniques of costing.
CO5: Prepare cost sheet and cost accounts and apply the concept of standards costing.

COURSE CONTENTS

Unit I: Introduction to Accounting
Meaning, Objectives, Basic accounting terms, accounting principles, Meaning and nature, Accounting concept and conventions, Basis of accounting – Cash and Accrual, Origin of Transactions – Source documents and vouchers, Accounting equations, Rules of Debit and Credit, Difference between Financial Accounting, Cost accounting and Management accounting.

Unit II: Recording of transactions
Books of Original entry- Journal, how to record a Transaction in Journal; Subsidiary Books; Book of Principal Entry-Ledger, Opening of Accounts, Posting and Balancing, Closing of Accounts; Trial Balance- Meaning, Objective & Preparation.

Unit III: Financial Statements
Meaning of Capital Expenditure, Revenue expenditure and Deferred Revenue Expenditure; Meaning of Financial Statement; Preparation of Manufacturing Account Trading Account, Profit and Loss Account andBalance Sheet. Depreciation: Concept, WDV and SLM methods.

Unit IV: Introduction to Cost Accounting
Meaning of Cost, Costing and Cost Accounting; Objectives of Cost Accounting, Types of Costs; Cost and Expense- Meaning & Differences; Cost Centre-Meaning, Purpose, Types, Methods and Techniques of Costing.

Unit V: Cost Records & variance analysis
Meaning of Cost Sheet, Objectives of preparing Cost Sheet, Preparation of Cost Sheet; Cost Accounting System: Job Costing, Process Costing, Contract Costing, Service/ Operating Costing. Cost Analysis: Make or buy decisions, Accept or reject decisions, Process Costing
Concept of Standards Costing, Setting and revision of Cost Standards, Concept Variance, Calculating Material, Labour and Overhead Variance.

TEXT BOOKS:

- Tulsian, P. C. (2002). *Financial accounting*. Pearson Education India.
- Hanif, M., & Mukherjee, A. (2002). *Financial accounting*. Tata McGraw Hill.
- Arora, M. N. (2012). *Cost accounting: Principles & practice*. Vikas Publishing House.
- Goyal, D. K. (2010). *Accountancy*. Arya Book Depot.
- Khan, M. Y., & Jain, P. K. (2004). *Cost accounting*. Tata McGraw Hill.

- Horngren, C. T., Datar, S. M., Foster, G., Rajan, M. V., & Ittner, C. D. (2006). *Cost accounting: Amanagerial emphasis* (12th ed.). Prentice Hall.
- Nigam, B. M. L., & Jain, I. C. (2001). *Cost accounting: Principles & practice*. Prentice Hall India.
- Tulsian, P. C. (2009). *Cost accounting*. Pearson Education India.

Note: Latest edition of readings may be used.

Teaching Learning Process

Theory/ numerical with examples, Problem solving sessions

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Financial Statements, Depreciation, Inventory Valuation, Cost Sheet, Standard costing

MBA: Semester-I
MGTM-104: BUSINESS COMMUNICATION

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

Communication is a two-way interactive process and its importance can be found in our professional as well as in our daily personal lives. We have intentionally taken a holistic approach in this module. This communication module is focused on the effective use and handling of communication situations, that individuals find themselves in both professional and personal environments. This module focuses on communication processes and key elements. It specifically explores the linkages between perception, personality, and communication including non-verbal communication. The prime purpose is to educate learners to effectively use and interpret verbal and nonverbal communication and understand what communication styles and skills can be adopted for different persons so as to ensure effective communication.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Recognize importance of communication in corporate world.
CO2: Differentiate between formal and informal communication.
CO3: Understand the use of skills in the process of communication.
CO4: Acquire the skills of grammar for effective writing and communication.
CO5: Write business letters, e-mail messages, and learn telephone etiquettes.

COURSE CONTENTS

Unit I: Elements of Communication
Communication: Meaning, Importance and Process Objectives of Communication
Media and Types of Communication
CT-Lab
Phonetic Symbols and Transcriptions Word Formation

Unit II: Basics of Communication
Verbal and Non-Verbal Communication
Formal and Informal Channels of Communication Qualities of Good Communication
CT-Lab
Affixes
Listening and speaking Skills

Unit III: Skills of Communication Barriers to Communication
Professional Communication
Interpersonal Communication and methods to improve it
CT-Lab
Words often Mis-spelt and Mis-Pronounced One Word for Many

Unit IV: Grammar
Subject-Verb Agreement (Concord)Linking Words (Conjunctions) Relative ClausesCommon Errors
CT-Lab
Synonyms and Antonyms Seminar Presentation

Unit V: Composition
Resume Writing
Business Letter Writing: Sales, Credit, Enquiry, Order, Claim, Complaint, Job Applications, etc E-mail messages
Telephone Etiquettes
CT-Lab
Group Discussion Job Interview

TEXT BOOKS:

- Guffey, M. E. (2009). *Essentials of business communication*. Cengage Learning.
- Bovee, C. L., & Thill, J. V. (2010). *Business communication today*. Pearson Education.
- Sharma, S., & Mishra, B. (2009). *Communication skills for engineers and scientists*. PHI Learning Pvt.Ltd.
- Sinha, R. P. (2009). *Current English grammar and usage with composition*. Oxford University Press.
- Raman, M., & Singh, P. (2012). *Business communication*. Oxford University Press.
- Koneru, A. (2008). *Professional communication*. Tata McGraw-Hill.
- Gangal, J. K. (2010). *A practical course for developing writing skills in English*. PHI Learning Pvt.Ltd.
- Sudha Rani, D. (2012). *Advanced manual for communication laboratories and technical reportwriting*. Pearson Education.
- Sethi, J., & Dhamija, P. V. (2007). *A course in phonetics and spoken English*. PHI Learning Pvt. Ltd.
- Konar, N. (2011). *English language laboratories: A comprehensive manual*. PHI Learning Pvt. Ltd.
- Sharma, S., & Mishra, B. (2009). *Communication skills for engineers and scientists*. PHI Learning Pvt.Ltd.
- *Oxford English learning package* (Headway Series). (2009). Oxford University Press.
- *Tata McGraw Hills English learning package*. (2010). Tata McGraw-Hill.
- *Oxford advanced learners' dictionary* (7th ed.). (2005). Oxford University Press.

Note: Latest edition of readings may be used.

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords:
English, Oral Communication, Business letters, Basic Grammar, Reported Speech

MBA: Semester-I
MGTM-105: INFORMATION TECHNOLOGY FOR MANAGERS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The primary objective of this course is to familiarize the student with basic concepts of information technology and their applications to business processes.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand computer hardware and number system.
CO2: Understand and apply different computer software used in business.
CO3: Understand data communication and Networks system.
CO4: Acquire the skills functional and enterprise systems for the business decision making.
CO5: Understand the security issues in information technology

COURSE CONTENTS

Unit I: Computer Hardware and Number System
CPU, Basic Logic Gates, Computer Memory and Mass Storage Devices, Computer Hierarchy, Input Technologies, Output Technologies. Number Systems and Arithmetic: Basic understanding of Decimal, Binary, Octal and Hexadecimal Number System.

Unit II: Computer Software
Application and System Software, Programming Languages and their Classification, Assemblers, Compilers and Interpreters; Operating Systems- Functions of Operating Systems, Types of Operating Systems (Batch Processing, Multitasking, Multiprogramming and Real time Systems).
DBMS: Traditional File concepts and Environment, Database Management Systems Concepts, Types of Data Models, ER Modeling, Integrity Constraints, SQL queries.

Unit III: Data communication and Networks
Concepts of data communication, Types of data communication Networks, Communications Media, Concepts of computer networks, Primary Network Topologies, Network Architectures- The OSI Model, Inter-networking devices. The Internet, Intranet and Extranets: Operation of the Internet, Services provided by Internet, World Wide Web.

Unit IV: Functional and Enterprise Systems
Data, Information and Knowledge concepts, Decision making process, Physical components of Information systems, Classification of Information systems

Unit V: Security Issues in Information Technology
Overview of Security Issues in Information Technology, Ransomware attack, Code injection, Cross-Site Scripting (XSS) Attack, Data Breach, Malware and Virus Infection, DDoS Attack, Weak Passwords and Authentication Issues, SPAM and Phishing, No Backups, Not Updating or Patching Regularly.

TEXT BOOKS:

- ITL Education Solutions. (2009). *Introduction to information technology*. Pearson Education.
- Turban, E., McLean, E., & Wetherbe, J. (2006). *Information technology for management: Transformingorganizations in the digital economy* (6th ed.). Wiley India.
- Sinha, P. K., & Sinha, P. (2011). *Computer fundamentals* (6th ed.). BPB Publications.
- Norton, P. (2001). *Introduction to computers*. Tata McGraw-Hill.

- Rajaraman, V. (2004). *Introduction to information technology*. PHI Learning Pvt. Ltd.
- Ram, B. (2003). *Computer fundamentals*. New Age International Publishers.

Note: Latest edition of readings may be used.

Teaching Learning Process

Theory/ numerical with examples, Practical Lab Lectures

Assessment Methods

There shall be 4 credit hours for lectures + one credit hour (Two Practical Periods per week per batch) forpractical lab + one credit hour for tutorials (per group).

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Binary, Database Management Systems, OSI Model, Microsoft Office, Information Technology, PrimaryNetwork Topologies

MBA: Semester-I
MGTM-106: QUANTITATIVE TECHNIQUES FOR MANAGERS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The focus of this course is to equip the students with the knowledge of various statistical tools and techniques used in business decision making. The course aims at providing fundamental knowledge and exposure to the students to use various statistical methods in order to understand, analyze and interpret data for managerial decision making.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand scope and limitation of statistics and different graphs and diagrams used for businessdecision.
CO2: Understand and apply concept of measures of central tendency and dispersion in decision making.
CO3: Understand and interpret association among various variables.
CO4: Use index numbers and time series for decision making.
CO5: Understand and apply the concept of probability for solving business problems.

COURSE CONTENTS

UNIT-I
Statistics: Meaning, evolution, scope, limitations and applications; data classification; tabulation and presentation: meaning, objectives and types of classification, formation of frequency distribution, role of tabulation, parts, types and construction of tables, significance, types and construction of diagrams and graphs.

UNIT-II
Measures of Central Tendency and Dispersion: Meaning and objectives of measures of central tendency, different measure viz. arithmetic mean, median, mode, geometric mean and harmonic mean, characteristics, applications and limitations of these measures; measure of variation viz. range, quartile deviation mean deviation and standard deviation, co-efficient of variation and skewness.

UNIT-III
Correlation and Regression: Meaning of correlation, types of correlation – positive and negative correlation, simple, partial and multiple correlation, methods of studying correlation; scatter diagram, graphic and direct method; properties of correlation coefficient, rank correlation, coefficient of determination, lines of regression, co-efficient of regression, standard error of estimate.

UNIT-IV
Index numbers and time series: Index number and their uses in business; construction of simple and weighed price, quantity and value index numbers; test for an ideal index number, components of time series viz. secular trend, cyclical, seasonal and irregular variations, methods of estimating secular trend and seasonal indices; use of time series in business forecasting and its limitations, calculating growth rate in time series.

UNIT -V
Probability: Basic concepts and approaches, addition, multiplication and Bayes' theorem. Probabilitydistributions - meaning, types and applications

TEXT BOOKS:

- Gupta, S. P., & Gupta, M. P. (2007). *Business statistics*. Sultan Chand & Sons.
- Gupta, C. B. (2012). *An introduction to statistical methods*. Vikas Publishing House.
- Levin, R. I., & Rubin, D. S. (2013). *Statistics for management* (7th ed.). Pearson Education.
- Bharadwaj, R. S. (2009). *Business statistics*. Excel Books.
- Levin, R. I. (2012). *Business statistics*. Pearson Education.
- Black, K. (2013). *Business statistics* (7th ed.). Tata McGraw-Hill.
- Schaum, M. (2011). *Schaum's outline of business statistics* (4th ed.). McGraw-Hill Education.
- Ray, A. K., Sharma, R., & Choudhary, K. (2004). *Mathematical statistics*. Oxford University Press.
- Kapoor, V. K. (2014). *Business statistics*. S. Chand Publishing.

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords:

Statistics, Central tendencies, Dispersion, Correlation, Regression, Probability, Bays' Theorem

MBA: Semester-I

MGTM-107: ORGANIZATIONAL BEHAVIOR

Duration: 3 Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

This module provides students with an elaborative understanding of organizational behavior, its key principles, concepts & theories. The range of concepts & theories that students will be introduced to include foundation of organizational behavior, groups & group dynamics, motivation, leadership, organization design, organization structure, work stress, organization culture, organization effectiveness and development. By the end of the module, students will be fully equipped with the knowledge and skillsrequired to understand & deal human behavior in the organization as individual, group member & organization as a whole.

COURSE OUTCOMES

After completing the course, the student shall be able to:

CO1: Discuss the conceptual framework of organizational behaviour and individual dimensions of organizational behaviour.

CO2: Explain group dynamics and demonstrate skills required for working in groups (team building).

CO3: Analyze and compare different models used to explain individual behaviour related to motivationand leadership.

CO4: Explain organizational culture and describe its dimensions and to examine various organizationaldesigns.

CO5: Discuss the implementation of organizational change.

COURSE CONTENTS

Unit I: Foundations of Organizational Behavior

Conceptual framework of OB- Nature & Scope of Organizational Behavior, Determinants of Organizational Behavior, Challenges of Organizational Behavior;

Individual Dimensions of OB- Nature of Human Behavior, Personality, Perception, Learning, attitudes &Values, Emotional Intelligence, Individual Decision Making, OB Mod

Unit II: Group & Group Dynamics

Defining and classifying groups, group structure and processes, individual vs group behavior, group dynamics theories, group decision making process, organizational conflicts, types and causes, techniques of conflict resolution.

Team vs groups, team development, Ingredients of effective teams, team life cycle, interpersonal skills - Johari window and transactional analysis, employee counseling.

Unit III: Motivation & Leadership Theories

Motivation - Needs, contents and processes, Maslow's hierarchy of needs, Herzberg's two factory theory,ERG theory, Vroom's Expectancy theory, Reinforcement theory and Behavior modification.

Leadership - Ohio State Studies, Michigan studies, and managerial grid. Contingency theories - Fiedler's model, Hersey and Blanchard's situational theory, leader-member exchange theory, path goal theory, and charismatic leadership.

Unit IV: Structural & Cultural Dimensions of OB

Design of Organization Structure, Forms of Organization Structure, works Design & Work Stress, Organizational Climate & Culture.

Unit V: Organization Effectiveness & Change

Organization Effectiveness, Organization Change, Organization development

TEXT BOOKS:

- Prasad, L. M. (2011). *Organizational behavior*. Sultan Chand & Sons.
- Robbins, S. P., Judge, T. A., & Sanghi, S. (2009). *Organizational behavior* (13th ed.). Pearson PrenticeHall.
- Hersey, P., Blanchard, K. H., & Johnson, D. E. (2008). *Management of organizational behavior:Leading human resources* (9th ed.). Pearson Prentice Hall.
- Davis, K. (1981). *Organizational behavior: Human behavior at work* (7th ed.). McGraw-Hill.
- Luthans, F. (2011). *Organizational behavior: An evidence-based approach* (12th ed.). McGraw-HillEducation.

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Organizational Behavior, Personality traits, Group behavior, Motivation, Leadership, Stress Management

MBA: Semester-II
MGTM-201: BUSINESS ENVIRONMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The basic objective of this course is to familiarize the participants with various aspects of economic, social, political and cultural environment of India. This will help them in gaining a deeper understanding of the environmental factors influencing Indian business organizations.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Explain the micro and macro environment of business.
CO2: Understand and implement the provisions of industrial and legal environment.
CO3: Understand and analyze demographic and social environment of business.
CO4: Explain monetary and fiscal environment and apply the concepts for betterment of a business.
CO5: Understand and discuss international business environment.

COURSE CONTENTS

Unit I: An Overview of Business Environment
Type of Environment-Internal, External; Micro and Macro Environment, Competitive Structure of Industries, Environmental Analysis and Strategic Management, Nature of the economy, structure of the economy, economic policies; Nature of Indian planning, Planning Commission; Achievement and failure of economic planning in India; Recent GNP trends, Major economic reforms.

Unit II: Industrial & Legal Environment
Industrial policy up to 1991, the new industrial policy, Public, private, joint and cooperative sectors, privatization through disinvestment, village and small industries, industrial sickness, Regulatory role of the government, MRTP act, trade practices act, FEMA, patents and trade mark. Competition act 2000 Rational and extent of state intervention.

Unit III: Demographic and Societal Environment
Size of Population, Age Structure, Other demographic trends; population control policy, human development Impact of foreign culture on business; Business and society; Business ethics and corporate governance; Social responsibility of business, social audit, consumer rights and business; Poverty and unemployment in India, planning for poverty elevation

Unit IV: Monetary and Fiscal Environment
Measure of money supply, Monetary and fiscal policies, liquidity and interest rate environment; Overall structure and trends of taxation; direct taxes; recommendations of the 10^{th} plan advisory Group; Kelkar Committee Recommendations, indirect taxes - Kelkar Committee Recommendations; fiscal deficit and its management, alternate deficit concepts, deficit trends, challenges of deficit management, public borrowings in the fiscal environment.

Unit V: International Business Environment
Evaluation of WTO, function of WTO, Doha declaration, significance of foreign investment, FDI in India trends and pattern; FII, cross-border M&As. Trade balance and BOP; Globalization of world economy, trend in globalization, foreign trade policy, export promotion, EXIM policy, EPZs, EOUs, TPs & SEZs.

TEXT BOOKS

- Aswathappa, K. (2000). *Essentials of business environment* (7th ed.). Himalaya Publishing House.
- Cherunilam, F. (2007). *Business environment: Text and cases*. Himalaya Publishing House.

- Gupta, C. B. (2008). *Business environment* (4th ed.). Sultan Chand & Sons.
- Bedi, S. (2004). *Business environment*. Excel Books.
- Agrawal, R. (2005). *Business environment*. Excel Books.
- Shaikh, S. (2010). *Business environment* (2nd ed.). Pearson Education.

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Business Environment, Societal Environment, Monetary and fiscal policies, WTO, FDI, FII, EXIM policy

MBA: Semester-II
MGTM-202: RESEARCH METHODOLOGY

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
Any body of knowledge cannot develop without the underlying research. This module introduces the fundamentals of research, its process and the way in which findings of a research initiative is presented andreported. It exposes the students to the various statistical tools being used to analyze data and draw inferences.
To provide a fundamental understanding of the research process, its tools and techniques and to help the students learn the art and science of presenting research finding in the form of a well formatted report.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand some basic concepts of research and its methodologies.
CO2: Understand and implement data collection techniques.
CO3: Apply the concept of sampling design.
CO4: Apply data processing and data analysis techniques.
CO5: Write a research report, thesis and research proposal for grants.

COURSE CONTENTS

Unit I: Introduction to Research
Meaning, types, process, research problem, Research design: Meaning, types of research design, features ofa good research design, components of theory – definitions, concepts, constructs, variables, hypothesis, process of research and structure of research proposal.

Unit II: Data collection techniques
Data: Meaning, types, Data collection methods, Data collection instruments, Questionnaire vs. Schedule, Allied data collection instruments: Warranty cards, Distributor/Store audits, Pantry audits, Consumerpanels, Mechanical devices, Projective techniques, Depth interviews, Content analysis, Case study method,its advantages & disadvantages.

Unit III: Sampling design
Introduction, Methods of the sampling: Sampling concepts, non-probability sampling, probability sampling, dependent and interdependent methods, Merit and limitation of sampling, sampling and non- sampling error, Test of hypothesis chi square test & goodness of fit.

Unit IV: Data compilation and analysis
Data processing: Editing, Coding, Classification, Tabulation, Issues in data processing
Data analysis: Types, Percentage analysis, Computer aided Charts (Pie chart, Bar diagram, Doughnut, Linediagram), Descriptive analysis, t-test, F-test, Z test and interpretation of the results.

Unit V: Report writing
Steps of writing research report, Report Layout: Preliminary pages, Main text, End matter, Mechanics of writing research report, Bibliography and references format, Precautions in writing research report.

TEXT BOOKS:

- Kothari, C. R. (2004). *Research methodology: Methods and techniques* (2nd ed.). New Age International Publishers.

- Paneerselvam, R. (2004). *Research methodology*. PHI Learning Pvt. Ltd.
- Green, P. E., Tull, D. S., & Albaum, G. (1996). *Research for marketing decisions* (5th ed.). PrenticeHall of India Pvt. Ltd.
- Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research methods for business students* (8th ed.).Pearson Education.
- Krishnaswamy, K. N., Sivakumar, A. I., & Mathirajan, M. (2010). *Management research methodology*
- (4th impression). Dorling Kindersley (India) Pvt. Ltd.

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords:

Statistics, Central tendencies, Dispersion, Correlation, Regression, Probability, Bays' Theorem

MBA: Semester-II
MGTM-203: HUMAN RESOURCE MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
This module introduces the students with the key concepts, theories, tools & techniques of human resource management. The range of concepts that students will be introduced to include philosophy of HRM, human resource planning, job analysis, recruitment & selection, training & development, compensation & labor relation. By the end of the module, students will be fully equipped with the skills & techniques required to plan & manage the human resource in the organization.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand basic concept, nature and importance of human resource management.
CO2: Understand and analyze the purpose of human resource planning and practice of recruitment andselection.
CO3: Realize the importance of training & development performance appraisal and compensation administration.
CO4: Understand and analyze the concepts of grievance handling and industrial relation.
CO5: Understand and apply the concept and principles of promotion, transfer and separation.

COURSE CONTENTS

Unit I: Human Resource Management - An Overview
Human Resources Management (HRM): Meaning, Nature and Scope, Difference between HRM and Personnel Management, HRM functions and objectives, Evolution of HRM environment – external and internal; HRM within organization structure.
Human Resources Development in India: evolution and principles of HRD, HRD vs. Personnel functions, Role of HR managers. Strategic Human Resource Management

Unit II: Human Resource Planning (HRP), Recruitment and Selection
Human resources planning: definition, purposes, processes and limiting factors; human resources information systems (HRIS): personnel records and statistics, the use of information systems in HRM, HR accounting and audit.
Recruitment: recruitment policy, recruitment procedures, job analysis, job description, job specification, recruitment methods, and evaluation.
Selection: the selection procedure, the design of application form, selection methods, the offer of employment, and evaluation of process.

Unit III: Training & Development Performance Appraisal and Compensation Administration
Training and development: purpose, methods, and issues in training and management development programs.
Performance appraisal: definition, purpose of appraisal, procedures and techniques including 360 DegreeAppraisal, the appraisal interview, and follow up.
Compensation Administration: Nature and Objectives of compensation, components of pay structure inIndia, Wage Policy in India – Minimum Wage, Fair Wage and Living Wage.
Incentive Payments: Meaning and Definition, Prerequisites for an effective incentive system, Types andScope of incentive scheme, Incentive Schemes in Indian Industries, Fringe Benefits.

Unit IV: Grievance Handling and Industrial Relation

Discipline and grievance procedures: definition, disciplinary procedure model, the other procedures, grievance procedures and interview;
Industrial relations: aspect of industrial relations (IR), nature and importance of union-management relations

Unit V: Promotion, Transfer and Separation
Promotion and Transfer: Promotion: purpose, principles and types; Transfer – reason, principles and types. Separation: retirement, resignation, and termination of contract: layoff and exit interviews. Dealing with the human aspects of terminations: procedures for terminations, counseling, training and notice ofdismissal.

TEXT BOOKS:

- Aswathappa, K. (2009). *Human resource management: Text & cases* (5th ed.). McGraw Hill Education.
- Dessler, G., & Varkkey, B. (2011). *Human resource management* (11th ed.). Pearson Prentice Hall.
- DeCenzo, D. A., & Robbins, S. P. (2006). *Fundamentals of human resource management*. Wiley.
- Bhattacharyya, D. K. (2010). *Human resource management* (2nd ed.). Excel Books.
- Bernardin, H. J. (2007). *Human resource management: An experiential approach* (5th ed.). Tata McGraw-Hill.
- Snell, S., & Bohlander, G. (2008). *Human resource management*. South-Western Cengage Learning.

Note: Latest edition of readings may be used.

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Human Resource Management, Recruitment, Selection, Training & Development, Performance Appraisal,Promotion, Transfer

MBA: Semester-II
MGTM-204: CORPORATE FINANCE

Duration: 3 Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The focus in this paper would be on issues related to finance in the Indian Corporate Sector. The contents are related to the practices observed in Indian Corporate Sector. The objective is to enable and equip the future managers with basic tools for applying financial analysis.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Recognize the importance of financial management from a strategic perspective.
CO2: Understand and analyze valuation of securities and investment decisions.
CO3: Compute cost of capital and develop innovative financial strategies related to capital structure.
CO4: Understand and compute risk and return on securities.
CO5: Discuss the financial leverage and dividend policy of a firm.

COURSE CONTENTS

Unit I: Introduction to Financial Management
Meaning, objectives and scope, conflicts in profit versus wealth or value maximization principle, Timevalue of money.

Unit II: Valuation of Securities and Investment Decisions
Definitions, Types of Securities, Valuations of Bond, and Types of Yield associated with Bond, Valuation of Preference share, Valuations of Equity. Capital budgeting techniques-Net Present Value Method, Internal Rate of Return Method. Cost of Capital-equity and debt.

Unit III: Cost of Capital and capital Structure
Cost of individual source of finance, cost of debenture, cost of preference share, cost of equity, cost of Term loan, weighted cost of capital, theory of capital structure, traditional approach, Net income, Net operating Income, MM approach.

Unit IV: Risk and Return
Calculating risk and return for individual security, Beta estimation, overview of capital market theory,Characteristic line, Securities market line.

Unit V: Short term financing, Leverage and Dividend Policy:
Management of Working Capital: Cash management, Inventory Management, Receivables Management, working capital leverage; Leverage- operating, financial and composite leverage, Dividend policy; Grahm- Dodd model, Walter Model, Gordon model, MM model.

TEXT BOOKS

- Pandey, I. M. (2010). *Financial management* (10th ed.). Vikas Publishing House.
- Khan, M. Y., & Jain, P. K. (2007). *Financial management: Text, problems, and cases* (6th ed.). TataMcGraw-Hill Education.
- Rustagi, R. P. (2011). *Financial management: Theory, concepts, and problems* (5th ed.). TaxmannPublications.

Note: Latest edition of readings may be used.

Teaching Learning Process
Theory/ numerical with examples, Problem solving sessions

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Financial Management, Time value of money, Investment decisions, Cost of capital, Risk and return,Financial Leverage, Dividend policy.

MBA: Semester-II
MGTM-205: MARKETING MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The course introduces a wide range of marketing concepts and explores the various functional areas of marketing management. The course provides an opportunity to the students to explore and relate the conceptual and applied learning of the subject to the real market situations.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Describe the basic concepts of marketing and marketing environment.
CO2: Employ the concepts of consumer behaviour to choose the relevant STP strategy.
CO3: Discuss marketing environment, marketing research process and customer value.
CO4: Describe the concept of market segmentation, targeting and positioning.
CO5: Apply the concepts of product mix in marketing decision making in a firm.

COURSE CONTENTS

Unit-I: Introduction to Marketing
Marketing defined, Marketing process, Core marketing concepts (Need, want, demand, market offering, marketing myopia, Markets), Marketing Management orientations (Production, Product, Selling, Marketing, Societal marketing), Marketing vs. Selling, Marketing mix (4 P's of marketing).
Marketing environment, internal environment, External environment, Micro environment, Macro environment and their impact or influences on marketing decisions

Unit-II: Consumer Behavior
Introduction to Consumer buying behavior, Buyer Vs Consumer, factors influencing the Consumer buying behavior Classification of CB (High & Low involvement) Dissonance reducing Buying Behavior, Habitual Behavior, Complex Buying Behavior, Variety Seeking Buying Behavior, Impulse Behavior, Buying Decision process, Stimulus Response model.

Unit-III: Market research & Customer oriented marketing
Marketing information system, Sources of customer related information; Marketing research, Concepts, Steps of marketing research process; Customer oriented marketing: Market segmentation, bases of market; segmentation, patterns of segmentation, Targeting, Differentiation & Positioning, positioning maps; Strategic Marketing plan: Contents of a structured marketing plan.

Unit-IV: Segmentation, Targeting and Positioning:
Introduction to STP, STP Process, Requirement for Effective Segmentation, Bases for Segmenting Consumer Markets, Steps in STP, Segmentation Strategy. Market Targeting (developing selection criteria), Types of Market Targeting, Targeting Strategy, Positioning, Positioning for Competitive Advantage, Steps & Positioning Strategy.

Unit-V: NPD & Marketing Mix
Product life cycle & strategies, BCG Matrix, SWOC Analysis, Porters five force Model. Product: Introduction to Product, Level of the product, new product development, Product mix & strategies. Price: pricing objectives, selection of pricing policy, approaches to price adjustment, pricing strategies. Distribution: Channel Management & Distribution methods. Promotion: Promotion mix, Promotion strategies.

TEXT BOOKS:

- Kotler, P., Armstrong, G., Agnihotri, P., & Haque, E. U. (2010). *Principles of marketing: A SouthAsian perspective* (13th ed.). Dorling Kindersley (India) Pvt. Ltd.
- Panda, T. K. (2009). *Marketing management: Text and cases* (2nd ed.). Excel Books.
- Ramaswamy, V. S., & Nama Kumari, S. (2009). *Marketing management: Global perspective Indiancontext* (4th ed.). Macmillan Publishers India Ltd.

Note: Latest edition of readings may be used.

Teaching Learning Process

Theory with examples, case study, market research etc

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Marketing Management, Consumer behaviour, Market Research, Product Mix, Segmentation, Targeting,Positioning

MBA: Semester-II
MGTM-206: OPERATIONS MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

Production/operations management involves the integration of numerous activities and processes to produce products and services in a highly competitive global environment. Many companies have experienced a decline in market share as a result of their inability to compete on the basis of product design, cost or quality. Most now agree that world class performance in operations i.e., in product design, manufacturing, engineering and distribution, is essential for competitive success and long-term survival.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Apply the concept of operations management in manufacturing and service sector and will be able toplan and implement production and service-related decisions.
CO2: Plan production schedules and plan resources (material and machine) required for production.
CO3: Apply the concepts of purchase, stores and inventory management and analyze and evaluate material requirement decisions.
CO4: Apply the concept of operation research decision making for various decisions related to operation.
CO5: Understand the concept of logistics management.

COURSE CONTENTS

Unit-I: Introduction to Operations management

Importance and functions of operation management, types of production system, facilities location, facilities layout and materials handling, Product design and process selection, Types of layouts, Analysis and selection of layout-product and process layout, Computer integrated manufacturing system and line balancing.

Unit-II: Production planning and control

Introduction, functions aggregate planning and master production scheduling; materials requirement planning; BOM capacity requirement planning, techniques, problems in MRP and CRP, business process reengineering, TPM, method study & work measurement.

Unit-III: Materials management

Introduction, meaning, importance and functions; purchasing management; stores management and inventory management, types of inventories, inventory control systems-perpetual, periodic, JIT, KANBAN; quality assurance-six sigma concepts acceptance sampling, statistical quality control; quality movement, quality circles, ISO quality certification and types, maintenance management.

Unit-IV: Operations Research

Introduction, Linear programming –Graphical method, Trans-shipment, Transportation problems, Assignment model, travelling salesman problems, PERT/CPM, Inventory Model, Game theory

Unit-V: Logistics Management

Introduction to logistics management, significance of logistics, Total distribution concepts; Integrated logistics, Materials handling packaging and transportation system; Case-special cases on Japanese manufacturing systems.

TEXT BOOKS

- Panneerselvam, R. (2012). *Production and operations management*. Prentice Hall of India.
- Krajewski, L. J., & Ritzman, L. P. (1999). *Operations management: Strategy and analysis* (5th ed.).Pearson Education.
- Chase, R. B., Aquilano, N. J., & Jacobs, F. R. (1999). *Production and operations management: Manufacturing and services* (8th ed.). Tata McGraw-Hill.
- Adam, E. E., & Ebert, R. J. (2001). *Production and operations management: Concepts, models, andbehavior* (5th ed.). Prentice Hall of India.
- Maurer, R. (2004). *One small step can change your life: The kaizen way*. Workman Publishing Company.

Note: Latest edition of readings may be used.

Teaching Learning Process

Theory/ numerical with examples, Problem solving sessions

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Operations Management, Production Panning, Material Management, Operation Research, Logistic.

MBA: Semester-II
MGTM-207: INTERNATIONAL BUSINESS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
Develop a deep understanding of the international business environment, including the dynamics **of** globalization, international trade theories, economic institutions, and financial mechanisms, while critically analyzing the role of multinational corporations, foreign direct investment, and emerging global trends. This knowledge will enable students to strategically navigate and manage the complexities of international markets and identify potential opportunities and threats for businesses in the global economy.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand the current theory and techniques of the major business discipline.
CO2: Know about international economic institutions and agreements.
CO3: Discuss about multinational corporations and theory of international investment.
CO4: Describe the concept international financial environment.
CO5: Discuss emerging developments in internationally specially India's competitive advantage in industries.

COURSE CONTENTS

Unit I: International Business Environment
Introduction, Concept, Scope, Trends, Challenges and Opportunities; Globalization - Forces, Meaning, dimensions and stages in Globalization - Introduction to theories of International Trade by Adam Smith, Ricardo and Ohlin & Heckscher, Firm Specific Theories like Product Life Cycle Theory by Raymond Vernon and the Porter's Competitive Advantage Theory by Porter - Trading Environment of International Trade - Tariff and Non-tariff Barriers - Trade Blocks – Forms of Integration like Free Trade Area, Customs Union, Common Market, Economic Union and Economic Integration-NAFTA, SAPTA, SAARC, Indo- Lanka Free Trade Agreement, India-Singapore CECA- Rise of new economies like Japan, South East Asiaand China (with comparison to India)

Unit II: International Economic Institutions and Agreements
General Agreement on Trade and Tariffs (GATT), The Uruguay Round, WTO (Seattle & Doha and Hongkong round of talks), Agreement on Textiles and Clothing (ATC), TRIPS, TRIMS, GATS-Dispute Settlement IMF, Asian Bank, World Bank, IBRD, IFC, IDA, UNCTAD, ILO, WIPO, UNIDO- GSP, GSTP and other international agreements and strategic alliances; International Commodity Trading and Agreements.

Unit III: Multinational Corporations and Foreign Direct Investment
Nature of Multinational Corporations; MNC's and International Trade; Dominance of MNC's; India's Presence; Goals of MNC's; Fundamental Goals of Host Governments; Defenders and Critics of MNCs; In Defense of MNC's Foreign investments - Introduction, Patterns, Structure, Issues and Effects; Types of Foreign Investment-like FDI and Portfolio Investments; Theories of International Investments; FDI AND Production Linkages; Foreign Investment in India; Foreign Investment by Indian Companies; Cross-BorderMergers and Acquisitions

Unit IV: International Financial Environment
Financial Markets and Instruments - Introduction to Export and Import Finance - Methods of payment in International Trade – International Trade Financing- Institutional Finance for Trade-EXIM Bank-

Forfaiting- Balance of Trade and Balance of Payments- Components of balance of payments- balance ofpayment disequilibrium and correction of disequilibrium-Financing of BOP deficit.

Unit V: Emerging Developments and Other Issues
Globalization and internal reform process - India's competitive advantage in industries like IT, pharmaceuticals, Steel, Textiles, Gems and Jewelry etc. – Potential Opportunities and threats

TEXT BOOKS:

- Hill, C. W. L., & Jain, A. K. (2009). *International business* (6th ed.). Tata McGraw-Hill.
- Aswathappa, K. (2010). *International business* (4th ed.). Tata McGraw-Hill.
- Paul, J. (2011). *International business* (4th ed.). Prentice Hall of India.
- Cherunilam, F. (2010). *International business: Text and cases* (4th ed.). Prentice Hall of India.

Note: Latest edition of readings may be used.

Teaching Learning Process
Theory/ numerical with examples, Problem solving sessions

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Operations Management, Production Panning, Material Management, Operation Research, Logistic.

MBA: Semester-III
MGTM-301: MANAGEMENT INFORMATION SYSTEM

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

Today, the management of information systems is mostly associated with databases, the Internet, and server rooms. However, "information management" has been around since before the invention of these tools. It is as old as commerce itself, as traders, bankers, and merchants have always had reason to track sales and inventory. Creditors must be aware of how much capital has been lent to borrowers and how much money has been deposited at banks. In its most general terms, information systems encompass any interactions between organized data and people.

MIS can be the means by which information is transmitted (such as the Internet), the software that displays the information (such as Microsoft Excel), or the systems that manage the data. In this course, you will learn about the various components of information systems and how to leverage them in business.

COURSE OUTCOMES

After successful completion of the course a student will be able to:

CO1: Relate the basic concepts and technologies used in the field of management information systems.
CO2: Understand networking system of management information system.
CO3: Creating a virtual company and improve business quality.
CO4: Develop MIS Systems.
CO5: Apply enterprise resource planning (ERP) and customer relationship management (CRM).

COURSE CONTENTS

Unit-I: Introduction

Concept of Data and Information, Information Systems, Classification, Operations Support System (OSS), Management Support System (MSS), Transaction Processing System (TPS), Process Control System (PCS), Enterprise Collaboration System (ECS), Management Information System (MIS), Decision Support System (DSS)

Unit-II: Artificial Intelligence (AI)

Artificial Intelligence (AI), Applications of Artificial Intelligence, Neural Networks, Fuzzy Logical Control System, Virtual Reality, Expert System (ES), Executive Information System (EIS), Cross Functional Information Systems.

Unit-III: Role of MIS

Strategic Advantage with MIS, Competitive Strategy Concept, The Value Chain and Strategic IS, Using IT for Strategic Advantage, Business Process Re-engineering, creating a Virtual Company, Improving Business Quality, Total Quality Management, Becoming an Agile Company, Building a Knowledge Creating Company.

Unit-IV: Developing MIS Systems

System Development Life Cycle, Investigation Phase, Prototyping, Feasibility Analysis, System Analysis (DFD and ER Diagram), System Design, Implementing Business Systems, Testing, Documenting, Training, Conversion and Maintenance.

Unit-V: Applications

Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Security and Ethical Challenges of IT, Ethical Responsibility - Business Ethics, Technology Ethics; Cyber Crime and Privacy Issues.

TEXT BOOKS:

- Laudon, K. C., & Laudon, J. P. (2002). *Management information systems: Managing the digital firm* (1st ed.). Prentice Hall.
- O'Brien, J. A. (2009). *Management information systems* (12th ed.). Tata McGraw-Hill.
- Jawedkar, W. S. (2006). *Management information system* (3rd ed.). Tata McGraw-Hill.
- Arora, A., & Bhatia, A. (2009). *Management information system* (1st ed.). Excel Books.
- Davis, G. B., & Olson, M. H. (1985). *Management information systems* (2nd ed.). Tata McGraw-Hill.
- Murdick, R. G., Ross, J. E., & Claggett, J. R. (1990). *Information systems for modern management* (3rded.). Prentice Hall of India.

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Management Information System (MIS), Management Support System (MSS), Artificial Intelligence (AI),Business Process Re-engineering, Enterprise Resource Planning (ERP)

MBA: Semester-III
MGTM-302: LEGAL ASPECTS OF BUSINESS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

'*Ignorantia juris non excusat*' meaning thereby, 'ignorance of law cannot be excused'. So, whether a person is aware of law or not, any violation of law even if unintentional, attracts penal action. It is therefore essential for a businessman to understand the fundamental legal aspects which directly affect the business operations. Some of such 'must-understand' legal areas covered in this module include provisions relating to Contracts, Sale of goods and matters associated with the formation and functioning of companies in India.

To provide a fundamental understanding of the various provisions of Indian Contract Act, 1872 Sale of Goods Act, 1930, Negotiable Instrument Act, 1881, Indian Companies Act, 1956 and the consumer Protection Act, 1986 pertaining to Indian business scenario.

COURSE OUTCOMES

After successful completion of the course a student will be able to:
CO1: Evaluate the provisions of Law of Contract, 1872.
CO2: Examine various provisions of Sale of Goods Act.
CO3: Compare and contrast different types of negotiable instruments.
CO4: Know the provisions of the Companies Act 2013.
CO5: Relate and apply various provisions related to Consumer Protection Act.

COURSE CONTENTS

Unit I: The Indian Contract Act 1872

The Indian Contract Act 1872: Meaning and Essentials of contract; Kinds of contract based on validity, formation & performance; law relating to offer and acceptance, consideration, competency to contract, free consent, void agreements, performance of contracts, discharge of contracts, breach of contracts and quasi contract; Special contracts: contract of indemnity and guarantee, bailment and pledge, and agency.

Unit II: Sale of Goods Act 1930

Sale of Goods Act 1930: Sale and agreement to sell implied conditions and warranties, sale by non-owners,rights of unpaid seller.

Unit III: Negotiable Instruments Act 1881

Negotiable Instruments Act 1881: Meaning of negotiable instruments, type of negotiable instruments,promissory note, bill of exchange, cheque.

Unit IV: The Companies Act 2013

The Companies Act 2013: Meaning and types, Incorporation, Memorandum & Articles of association, Prospectus, Issue of shares and bonus shares, rights issue, sweat equity, role of directors, share qualification, company meetings. The Limited Liability Partnership Act 2008: Meaning and nature of limited partnership, formation, partners & their relations, extent and limitation of liability.

Unit V: Consumer Protection Act 1986

Consumer Protection Act 1986: Objectives and machinery for consumer protection, defects and deficiency removal, rights of consumers. The Right to Information Act 2005: Salient features and coverage of the act, definition of terms information, right, record, public authority; obligations of public authorities, requesting information and functions of PIO. Information Technology Act 2000: The rationale behind the act, Digital signature and Electronic signature, Electronic Governance

TEXT BOOKS:

- Tulsian, P. C. (2003). *Business law*. Tata McGraw-Hill Education.
- Garg, S. (2005). *Case laws in mercantile law*. Ramesh Book Depot.
- Kuchhal, M. C. (2009). *Modern Indian company law*. Shree Mahavir Book Depot.
- Aggarwal, R. (2012). *Mercantile & commercial laws*. Taxmann Publications.
- Majumdar, A. K., & Kapoor, G. K. (2012). *Company law*. Taxmann Publications.
- Gogna, P. P. S. (2008). A textbook of mercantile law (commercial law). S. Chand.
- Singh, A. (2008). *Principles of mercantile law*. Eastern Book Company.

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Indian Contract Act, 1872; Sale of Goods Act, 1930; Negotiable Instrument Act, 1881; Indian CompaniesAct, 1956; Consumer Protection Act, 1986

MBA: Semester-III
MGTM-303: BUSINESS STRATEGY

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

Strategy is at the heart of general management education. It explores how firms compete and what they need to do to be successful. Clear strategic thinking should inform the decisions of every general manager and is the basic competence of management consultants everywhere. The Course structure gives an insight into the strategic planning process done by organizations. The student is required to learn basics of thathow a strategy is formed and finally implemented by organization.

COURSE OUTCOMES

After successful completion of the course a student will be able to:
CO1: Understand the concept of strategy.
CO2: Analyze and diagnose the business environment.
CO3: Understand the process of strategic choice.
CO4: Identify the inter-relationship between formulation and implementation.
CO5: Understand the techniques of strategy evaluation.

COURSE CONTENTS

Unit I:

Concept of strategy: Defining strategy, Levels at which strategy operates, Strategic Decision Making and Approaches to Strategic Decision making, essence of strategic thinking, replacing planning with strategic thinking, strategic management process, Mission and Purpose, Objectives and Goals, Strategic Business Units.

Unit II:

Environment Analysis and Diagnosis - Concept of Environment and its components, Environment scanning and appraisal, organizational appraisal, Strategic advantage analysis and diagnosis, SWOT analysis.

Unit III:

Grand Strategies –Stability, growth, retrenchment & combination strategies- Modernization, Diversification, Integration, Merger, Take-over and Joint Venture strategies, Turnaround – divestment and Liquidation strategies; Strategies for competing in globalizing markets.
Process of Strategic Choice – Process of strategic choice – Gap analysis; Industry analysis, competitor analysis - Porter's Five forces Model of competition. SWOT analysis- Synergy and Dysergy, Mckinsey's 7's framework; GE-9 Cell Model, Bostan's Consultancy Model; Distinctive competitiveness; Factors affecting Strategic Choice.

Unit IV:

Inter-relationship between formulation and implementation; Issues in strategy implementation, Resource Allocation, Budgets, Behavioural Issues – Leadership styles – Charismatic, transformational, visionary, team, cross-cultural & ethical leadership, Corporate culture and values power Social Responsibilities – Ethics, Building capable organization.
Functional Issues – Financial, Marketing, Operations and Personnel Plans and policies. Strategy and Structure: Organization structure, Structural Considerations, Structure for strategies, Organizational design and change, Matching structure and strategy.

Unit V:

Strategy Evaluation: Importance, Overview of strategic evaluation, strategic control, techniques of strategicevaluation and control, Operational Control.

Corporate Governance – Introduction & meaning, stakeholders, ownership & management, governingboard, governance issues, governance & strategic implementation.

TEXT BOOKS:

- Kazmi, A. (2008). *Business policy and strategic management*. Tata McGraw-Hill Education.
- Glueck, W. F. (2005). *Strategic management and business policy*. Tata McGraw-Hill Education.
- Porter, M. E. (1996). Competitive advantage: Creating and sustaining superior performance. Free Press. (Note: Michael Porter's work often cited is "Competitive Advantage," which is a key text in strategic management; adjust if a specific publication year for a textbook version is known.)
- Budhiraja, S. B., & Atheya, A. (2005). *Cases in strategic management*. Excel Books.

Note: Latest edition of readings may be used.

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

SWOT analysis, Merger, transformational, Joint Venture, Enterprise Resource Planning (ERP), CorporateGovernance

MBA: Semester-III

MGTM-307: SUMMER INTERNSHIP/ PROJECT (PAP/PCP)

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

Student has to undergo a practical training of minimum forty-five days after second semester. MBA being professional course it is essential for each student to practically apply or understand theoretical concepts what he/she learn during the course. During the training programme student is expected to collect vital information through internal and external source so as to reach concrete conclusions on the given subject. Student has to prepare the project report under the guidance of internal teacher. Director/Principal of the institution/college will decide the last date of submission of final copy. Student should submit two typed copies to the Institute. One copy for the institute and another copy for his/her personal record Students mayprepare additional copies for the organization, guide etc.

A viva-voce examination will be conducted before the Semester III examination. A viva-voce committee ofminimum two members will be appointed by the university.

COURSE OUTCOMES

After successful completion of the course a student will be able to:

CO1: Construct the company profile by compiling the brief history, management structure, products /services offered, key achievements and market performance for his / her organization of internship.

CO2: Assess its Strengths, Weaknesses, Opportunities and Threats (SWOT).

CO3: Determine the challenges and future potential for his / her internship organization in particular andthe sector in general.

CO4: Test the theoretical learning in practical situations by accomplishing the tasks assigned during theinternship period.

CO5: Apply various soft skills such as time management, positive attitude and communication skills duringperformance of the tasks assigned in internship organization.

COURSE CONTENTS

Guidelines for the project report

Declaration from the student that the research work is not copied from any other existing reports. Guideshould certify that the research work is original and completed satisfactorily under his guidance.
The Chapter scheme for the project report will be as follows-.

CHAPTER NO-I – Introduction to the study

Introduction; Objectives and importance of the study; Scope and limitations of study; Research Methodology

CHAPTER NO. II – Introduction to the organization

Introduction to the industry; Brief History of organization; Subsidiaries, Associates of the company Departments / Manufacturing process; Important statistical information; Future prospect; OrganizationStructure

CHAPTER – III - Theoretical Background

Basic concepts; Necessary theoretical inputs may be added to support the research work.

CHAPTER –IV – Data Analysis and Interpretation

Data should be analyzed with help of various tools studied in the Subject "Application of ResearchMethods in Management".

CHAPTER-V Findings / Observations

CHAPTER VI- Suggestions / Conclusion

Appendix
Questionnaire / Charts / Data / Diagrams / Tables / etc

Bibliography
The above guidelines are not the prescription on writing the project report but can be used as milestones while writing the Project Report. The guide has every discretion to change the chapter scheme as per the requirement

Note
There should be proper linkage between objectives, data analysis and interpretation, findings and suggestions. Student should not use logos and name of company on the project report pages. Header and Footer shall consist of university name and institute name respectively. No other information should be included in the Header and Footer. Use of colors in text matter should be avoided.

MBA: Semester-III
MGTM-301F: SECURITY ANALYSIS & PORTFOLIO MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

Integration of the world's Financial Markets has undoubtedly increased the Investment Opportunities Manifold. A number of Transformations have taken place in India ever since the Economy was opened up. A Constitution of Securities Exchange Board of India (SEBI) as Regulator was a Major Step in the Direction of Reforms in this subject, we Included A sense of Awareness is Included Among the Investors and they are encouraged to invest in the capital markets.

It covers in depth, the Investment Climate in India, Various Investment Avenues, Risk Return Profiles, and Fundamental Analysis etc. This subject also enables the Student to Portfolio Management by Specify Appropriate Investment Policy or to be Frame an Investment Policy for the Business Organizations.

COURSE OUTCOMES

After completing the course, the student shall be able to:

CO1: Understand the framework of securities market and investment.

CO2: Understand the concept of risk and return, and diversification of risk.

CO3: Understand the concept of fundamental analysis of the securities.

CO4: Gain knowledge and skills in portfolio diversification.

CO5: Develop proficiency in performance measurement by understanding portfolio evaluation measures.

COURSE CONTENTS

Unit I: Investment Scenario:

Concept of Investment, Investment Objective and Constraints; Investment Classification; Financial Market;Real Investment Avenues

Units II: Risk and Return:

Concept of Risk and Return, Reduction of risk through Diversification, Quantify Portfolio Return and Risk,Security Market lines and its Applications.

Unit III: Fundamental Analysis and Equity Valuation Model:

Objective and Beliefs of Fundamental Analysis, Industry Analysis, Structural Analysis, Company Analysis, Valuation Methods, Dividend Discount Models, Measures of Relative Value, Price Earnings Ratio, Price to Book Value Ratio, Price to Sales Ratio, Free Cash Flow Model to Equity Model.

Units IV: Portfolio Revision:

Portfolio Diversification, Portfolio Revision, Transaction Costs, Constraints in Portfolio Rebalancing, Portfolio Monitoring and Rebalancing, Portfolio Revision Techniques, Issues in portfolio Rebalancing, Selection and Revision of equity portfolios.

Unit V: Performance Measurement:

Portfolio Evaluation Measures, measures of returns, portfolio segment measurement, Eugene Fame's portfolio decomposition, use of multiple benchmark and multiple index models for performance, performance attribution analysis, monitoring influence of asset allocation decisions, sector and security selection, performance evaluation of the portfolio manager.

TEXT BOOKS:

- Sharpe, W. F., & Alexander, G. J. (2000). *Investments*. PHI Learning Pvt. Ltd.
- Bodie, Z., Kane, A., & Marcus, A. J. (2010). *Investments*. Tata McGraw-Hill Education.

- Mayo, H. B. (2008). *Introduction to investments*. Cengage Learning.
- Maheshwari, Y. (2009). *Investment management*. PHI Learning Pvt. Ltd.
- Jones, C. P. (2011). *Investment analysis and management*. Wiley India.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Financial Market, Risk and Return, Fundamental Analysis, Technical Analysis, Portfolio Diversification

MBA: Semester-III
MGTM-303F: FINANCIAL SERVICES

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The course aims to provide a comprehensive understanding of the various financial services offered in the financial market. It covers the operations, functions, and structure of financial services such as banking, insurance, investment services, mutual funds, leasing, and venture capital. The course is designed to equip students with the knowledge and skills needed to navigate the financial services industry and understand its critical role in the economy.

COURSE OBJECTIVES:
After completing the course, the student shall be able to:
CO1: Understand the structure, role, and significance of various financial services in the economy.
CO2: Analyze the operations and functioning of banking and non-banking financial institutions.
CO3: Evaluate the different types of investment services and their impact on the financial market.
CO4: Assess the role of insurance in risk management and its contribution to financial planning.
CO5: Understand the regulatory framework governing financial services in India.

COURSE CONTENTS

Unit I: Introduction to Financial Services
- Overview of Financial Services: Definition, importance, and types of financial services.
- Financial System in India: Structure and constituents.
- Role of Financial Services in Economic Development.
- Emerging Trends in Financial Services.

Unit II: Banking and Non-Banking Financial Institutions
- Commercial Banking: Functions, role in economic development, and recent trends.
- Non-Banking Financial Companies (NBFCs): Functions, regulations, and growth in India.
- Microfinance Institutions: Concept, operations, and impact on financial inclusion.
- Development Financial Institutions (DFIs): Role and significance.

Unit III: Investment Services
- Investment Banking: Functions, structure, and role in capital markets.
- Mutual Funds: Types, structure, regulations, and performance evaluation.
- Venture Capital: Concept, process, stages of financing, and exit strategies.
- Asset Management Companies: Structure, functions, and regulatory environment.

Unit IV: Insurance Services
- Insurance: Principles, types, and significance.
- Life Insurance: Policies, risk assessment, and benefits.
- General Insurance: Types, functions, and significance.
- Regulatory Framework for Insurance in India (IRDAI).
- Reinsurance: Concept and global practices.

Unit V: Regulatory Framework and Emerging Trends
- Regulatory Framework Governing Financial Services in India: RBI, SEBI, IRDAI.
- Financial Inclusion: Concept, significance, and measures in India.
- Fintech and Digital Financial Services: Impact on traditional financial services.
- Ethical Issues and Challenges in Financial Services.

- Case Studies on Financial Service Providers.

TEXT BOOKS

- Bhole, L. M., & Mahakud, J. (2011). *Financial Institutions and Markets: Structure, Growth and Innovations* (6th ed.). Tata McGraw-Hill Education.
- Khan, M. Y. (2019). *Financial Services* (8th ed.). Tata McGraw-Hill Education.
- Pathak, B. V. (2018). *The Indian Financial System: Markets, Institutions and Services* (5th ed.). Pearson Education India.
- Gurusamy, S. (2019). *Financial Services and System* (4th ed.). McGraw-Hill Education.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Financial Services, Banking, NBFCs, Investment Banking, Mutual Funds, Insurance, Regulatory Framework, Financial Inclusion, Fintech.

MBA: Semester-III
MGTM-302F: FINANCIAL MARKETS AND INSTITUTIONS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The focus in this paper would be on issues related to the financial markets & instruments along with different financial services and current scenario of Indian financial system & markets.
This paper introduces the financial market's products and services, markets and market participants. The objective of this course is to familiarize the student with the operations of Indian financial markets and basic concepts of different financial services along with the banking system.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand the framework of financial system.
CO2: Develop a comprehensive understanding of financial markets, including their structure, functions,participants.
CO3: Gain a conceptual understanding of fund-based and fee-based financial services
CO4: Foundational understanding of the basic concepts of insurance and mutual funds, role of agencies.
CO5: Understand banking, regulatory frameworks, and emerging trends in the banking sector.

COURSE CONTENTS

Unit I: Introduction to the Financial System
Nature and role of financial system, financial system and financial markets, government intervention in the financial system, informal and formal financial system, components of formal financial system-institutions, intermediaries, markets and services, functions and weaknesses of Indian Financial System.

Unit II: Introduction to Financial Markets
Money market and Capital market, money market instruments- T Bills, CPs & CDs; Capital Market-primary and secondary, methods of raising capital, Derivative concepts, Role of SEBI.

Unit III: Introduction to Financial services
Fund based and Fee based service; Conceptual aspect of factoring, forfeiting, credit rating, bill discounting,leasing, securitization and consumer finance; Evaluation of strategic decisions regarding factoring, leasing and merger & acquisitions.

Unit IV: Insurance and Mutual funds
Basic concepts of insurance and mutual funds, role of IRDA and AMFI

Unit V: Introduction to Banking
An overview of the different activities performed by a bank; Retail Banking: Concepts, forms and productsof retail banking. Corporate Banking: meaning, nature, functions and products.

TEXT BOOKS:

- Gordon, E., & Natarajan, K. (2016). *Financial markets and services*. Himalaya Publishing House.
- Gomez, C. (2008). *Financial markets, institutions and financial services*. Prentice Hall of India.
- Saunders, A., & Cornett, M. M. (2012). *Financial markets and institutions: An introduction to the riskmanagement approach*. Tata McGraw-Hill Education.
- Pathak, B. (2014). *Indian financial system*. Pearson Education.

- Bhole, L. M., & Mahakud, J. (2009). *Financial institutions and markets: Structure, growth and innovations*. Tata McGraw-Hill Education.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Financial system, Money market and Capital market, financial services, insurance and mutual funds,Corporate Banking

MBA: Semester-III
MGTM-301H: HUMAN RESOURCE PLANNING & DEVELOPMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
This paper has been designed keeping in mind the current need of organizations. Human resource planning and management has become a bigger challenge for organization due to growing globalization and emerging new trends specially because of changing environment. This paper addresses all those challenges and suggests ways to handle them efficiently.
The objective of this paper is to develop a conceptual as well as a practical understanding of Human Resource Planning and Development in organizations. It includes almost every basic aspect of human resource management orientation.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand the historical evolution and the integrated role of Human Resources in strategic management.
CO2: Gain the ability to systematically plan human resources at the enterprise level.
CO3: Acquire skills in career management, including recruitment, selection to enhance overall employeeperformance and growth.
CO4: Develop an understanding of performance appraisal systems.
CO5: Learn the concept, objectives, and methods of maintaining a Human Resource Information System(HRIS) at both micro and macro levels.

COURSE CONTENTS
Unit-I
Overview of Human Resources, Historical evolution, Integrated HR function, Corporate and HR environment, Strategic environment, Strategic Management

Unit-II
HR planning at Enterprise level, need for systematic planning, Planning process, Operating Environment- Internal & External, Job description, Models & techniques of Manpower demand and Supply forecasting; Retention-Redeployment and Exit strategies

Unit-III
Career management-Recruitment and Selection, Employee Induction Programme, Employee training, Training needs & objective setting, Methods of training, Development & Development needs, Human Resource Development, Development process

Unit-IV
Performance planning – Performance appraisal, Measures of appraisal, System components appraisal methods, Ethics of appraisal, Problems & issues

Unit-V
Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level

TEXT BOOKS

- Durai, P. (2010). *Human resource management*. Pearson Education, South Asia.
- Storey, J., Salaman, G., & Mabey, C. (1998). *Strategic human resource management: A reader*. SAGEPublications.
- Mabey, C., & Thomson, R. (2011). *Developing human resources*. Routledge, Taylor & Francis Group.
- Dessler, G., & Varkkey, B. (2010). *Human resource management* (11th ed.). Prentice Hall.
- Richard D. Johnson, Michael J. Kavanagh, Mohan Thite (2011): Human Resource Information System 2e, SAGE Publications, 2011.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Strategic Management, Job description, Career management, Performance appraisal, Human ResourceInformation System

MBA: Semester-III
Paper MGTM-302H: COMPENSATION MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

Compensation management has undergone a big change. Remuneration system now-a-days is framed in such a way that it serves the purpose for all types of employees. For example, we have different pay system for sales person, scientist, upper management personnel and so on. This curriculum addresses those all problems and give a clear understanding of emerging trends in compensation management.
The course is designed to promote understanding of issues related to the compensation or rewarding humanresources in the corporate sector, public services and other forms of organizations and to impart skills in designing, analyzing and restructuring reward management systems, policies and strategies.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Understand job evaluation techniques and the role of compensation as a strategic tool.CO2: Gain knowledge of the classification of compensation types.
CO3: Learn the theories and processes related to wage structure, wage fixation, wage payment, and salaryadministration.
CO4: Develop an understanding of reward systems for sales personnel.
CO5: Acquire insights into the role of wage boards, pay commissions.

COURSE CONTENTS

Unit-I

Job Evaluation - Definition – Techniques; Role of compensation in organization: economic and behavioral theories related to compensation; strategic perspectives of compensation; compensation as motivational tool.

Unit-II

Compensation - classification – types, incentives - fringe benefits- principles, Non-monetary benefits, Importance of remuneration system, factors influencing Employee remuneration – External factor, internalfactors, Challenges of Remuneration.

Unit-III

Theories of wages-Wage Structure-Wage fixation- Wage Payment-Salary administration

Unit-IV

Rewards for sales personnel – Pay-commission-pay & commission-performance based pay system-incentives-Executive compensation plan and packages.

Unit-V

Wage Boards-Pay Commissions-Compensation management in Multinational Organizations.

TEXT BOOKS

- Aswathappa, K. (2009). *Human resource management: Text & cases* (5th ed.). McGraw Hill.
- Henderson, R. I. (2006). *Compensation management in a knowledge-based world* (10th ed.). PearsonPrentice Hall.

- Chingos, P. T. (2002). *Paying for performance: A guide to compensation management* (2nd ed.). JohnWiley & Sons Inc.
- Upadhyay, S. S. (2009). *Compensation management: Rewarding performance*. Global India Publications Pvt. Ltd.
- Singh, B. D. (2009). *Compensation and reward management*. Excel Books.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Job Evaluation, Compensation, Wage structure, Executive compensation, Compensation management

MBA: Semester-III
MGTM-303H: MANAGEMENT TRAINING & DEVELOPMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

Training and development are one of the key areas where rapid changes have been observed. Introduction of new technology in the market has made it compulsory for managers to train their employee for the survival of the enterprise. Secondly, training makes an employee efficient and effective resulting in better job satisfaction and increased overall production of the company which ultimately leads to profitability.

This paper has been designed, keeping in view the needs of the organizations. Successful managerial performance depends on the individual's ability to observe, interpret the issues and modify his approach and behavior. All organizations need to pay adequate attention to equip their employees. Rapid progress in technology has changed not only in the physical facilities but also in the abstract qualities required of the men who are using them. This paper will attempt to orient the students to tailor themselves to meet the specific needs of the organizations in training and development activities.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Understand the conceptual framework of training.
CO2: Develop the ability to identify training needs, plan and organize training programs.
CO3: Gain insights into Management Development (MD) and Organizational Development (OD).
CO4: Learn how to evaluate training programs, including calculating the return on investment (ROI).
CO5: Explore the role of technology in training.

COURSE CONTENTS

Unit-I

Training: Introduction - Conceptual framework of training - approaches on training – Difference between Training and Development - Training and applied psychology - principles of training - Learning and skills acquisition - Transfer and retention of skills.

Unit-II

Need for Training - Methods of Identification of Training needs - Training policy - Planning and organizing the training programmes - Methods of Training - – on the job training – off the job training – choosing optimum method – the lecture –panel discussion – behaviour modeling – interactive demonstrations – brain storming – case studies, incident process, in-baskets, team tasks, agenda setting, role plays, simulations, business games, critical incidents, grouping methods, transactional analysis,exception analysis.

Unit-III

Management Development (MD) and Organizational Development (OD) - Difference between MD and OD - Aims and objectives of MD and OD - Methods of MD -OD interventions – Succession Planning and Career development.

Unit-IV

Evaluation of training-need for evaluation, Principles of evaluation, Criterion and Approaches: Return on investment in training, Process of calculating ROI in training; emerging trends in training and development; new perspectives on training- Cross culture training.

Unit-V

Technology in training: CBT, Multimedia training, e-learning/Online learning, Distance learning

TEXT BOOKS:

- Gupta, B. L. (2011). *Management training and development*. Vrinda Publication.
- Saks, A. M., & Haccoun, R. R. (2010). *Managing performance through training and development* (5thed.). Nelson Education Ltd.
- Schneier, C. E., & Russell, C. J. (1994). *The training and development sourcebook* (2nd ed.). HumanResource Development Press.
- French, W. L., & Bell, C. H. (2008). *Organization development* (6th ed.). Pearson Prentice Hall.
- Anderson, D. L. (2012). *Organization development: The process of leading organizational change* (2nded.). Sage Publications.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Training, Compensation, simulations, Management Development (MD) and Organizational Development(OD), Cross culture training, e-learning/Online learning

MBA: Semester-III
MGTM-301I: INTERNATIONAL ECONOMICS

Duration: 3Hrs. **Marks: 100** **Credits:4**

COURSE OBJECTIVE
The course stresses policy topics that are topical. It is intended to introduce select economic and policy issues for advanced economies, the economies in transition, and emerging and developing countries

COURSE OUTCOMES:
After completing the course, the student shall be able to:
CO1: Understand the meaning, nature, and scope of international economics.
CO2: Gain knowledge of the pure theory of international trade.
CO3: Analyzed commercial policies, including the debate between free trade and protectionism.
CO4: Learn the components of the balance of payments and the mechanisms for its adjustment.
CO5: Develop an understanding of trade policy and cooperation.

COURSE CONTENTS

Unit-I: Meaning, Nature and Scope of International Economics:
Theoretical and descriptive international economics; features of global economy; categories of economies; developing and developed economies; characteristics of developed and developing economies; growing economic power of developing countries; factors promoting global economic co-operation; India and the global economy

Unit-II: The Pure Theory of International Trade
Features of international trade; International trade equilibrium-some analytical tools; the classical theory of comparative advantage; the classical theory of comparative costs; refinements of the comparative costs theory; the modern theory of factor endowments: the Heckscher-Ohlin theory; international trade and factor prices; factor intensity reversals: Stopler-Samuelson and Rybezynski Theorems; New theories of international trade; economic growth and international trade; technical progress and international trade; the gains from trade; the terms of trade; terms of trade and economic development.

Unit-III: Commercial Policy:
Free trade versus protection: Tariffs; effective rate of protection; on-tariff barriers; import quotas; dumping; exchange control; international cartels; state trading; international economic integration; ASEANand NAFTA

Unit-IV: Balance of Payments:
Meaning and components; adjustment mechanism of the balance of payments; balance of payments policies; internal and external balance; income adjustment: foreign trade multiplier; foreign exchange rate; foreign exchange rate policy; devaluation; optimum currency area; the foreign exchange market; international capital movements; the transfer problem.

Unit-V: Trade Policy and Co-operation:
Trade strategy; trade barriers; social issues in international trade; south-south co-operation; SAARC; SAPTA; Indo-lanka free trade agreement; indo-Singapore CECA; GSTP

TEXT BOOKS:

- Cherunilam, F. (2012). *International economics*. Tata McGraw Hill.
- Jhingan, M. L. (2015). *International economics*. Vrinda Publications.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
International economics, International trade, tariff barriers, balance of payments, SAARC

MBA: Semester-III
MGTM-302I: INTERNATIONAL BUSINESS LAWS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
This course is an introduction to International Business Law and legal systems of various countries. Students who intend to become internationally oriented professionals will learn how firms' doing business between more than 185 countries are governed and regulated. Students will also learn the role of international organizations in the process of regulating international business, as well as international treaties, conventions and agreements. Students will learn to analyze countries' legal and business conditions, as well as develop and deliver written presentation.

COURSE OBJECTIVES:
After completing the course, the student shall be able to:
CO1: Understand the concept of international law and legal international framework.
CO2: Describe the business law contracts
CO3: Work effectively with international trade in India.
CO4: Understand international level litigation and disputes settlement.
CO5: Know about the taxation of foreign income.

COURSE CONTENTS

Unit I: Introduction to Law
Meaning of Law, Law and Society, Systems of Law, Development of Law, Sources of Law, LegalEnvironment of International Business

Unit II: Business Law Contracts
Sanctity of Contracts, Principles of Governing the formation, Performance and Termination of Contracts, Contractual remedies, Special contracts such as indemnity, guarantee, Bailment, Agency, Partnership

Unit III: International Business Law
Law relating to international trade in India, International Sales Contract, Contracts related to Credit, carriage and insurance, international legal conventions, conflict of Laws and Contracts, contracts retailing to consultancy and technology transfer, -Joint ventures, FDI

Unit IV: International Litigation and dispute Resolution
Provisions in contracts- Litigation- Jurisdiction applicable Law, recognition Enforcement, ADRs Types,International Conventions, and Law in India, Process and Procedure for settlement of Disputes

Unit V International Taxation and other matters
Indian Law Governing taxation of foreign income, avoidance of double taxation treaties, anti-dumping andcountervailing duties, product liability, environmental law and international sales

TEXT BOOKS:
- Schaffer, R., et al. (2009). *International business law and its environment*. Cengage.
- D'Arcy, L., Murray, C., & Clave, B. (2009). *Schmitthoff's export trade: The law and practice ofinternational trade*.
- Motiwal, O. P. (2009). *International trade law and practice*.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
International law, Bailment, Joint ventures, FDI, Litigation, countervailing duties

MBA: Semester-III
MGTM-303I: INTERNATIONAL MARKETING

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

To improve the learning and knowledge of the students about the concepts of International marketing; making the students understand marketing in all cultures; to create awareness about the economic, political and social changes that have occurred over the last decade which have altered the landscape of global business; to brief the students about the strategic implications of competition in different country markets.

COUSE OUTCOMES

After completing the course, the student shall be able to:

CO1: Develop an understanding of basic international marketing concepts, theories, principles, and terminology.

CO2: Demonstrate an awareness of global market and knowledge of the impact of global market factors.

CO3: Identifying international customers through conducting marketing research.

CO4: Developing a global marketing strategy by applying the basic concepts of Marketing Mix.

CO5: Apply an integrated understanding of the course material by conducting an analysis of international marketing issues.

COURSE CONTENTS

Unit I: An Overview of International Marketing

The scope and challenges of international marketing: global perspective, international marketing defined, the international marketing task, environmental adaptation, the self-reference criterion and Ethnocentrism, stages of international marketing involvement, strategic orientation; The dynamic environment of international trade: global perspective, balance of payments, protectionism, easing trade restrictions, IMF and World Bank

Unit II: The Cultural Environment of Global Markets

Global perspective; geography and global markets; geography, nature and economic growth; social responsibility and environmental management; world population trends; world trade routes; communication links; historical perspective in global business; Cultural dynamics in assessing global markets:

Global perspective; culture: definition and scope; cultural knowledge: factual versus interpretive knowledge, cultural sensitivity and tolerance; cultural values: business customs in global markets; political risks in global business

Unit III: Assessing Global Market Opportunities

Developing a global vision through marketing research: breadth and scope of international marketing research, problems of availability and use of secondary data, problems in analyzing and interpreting research information; Emerging markets: marketing and economic development, marketing in a developing country, developing countries and emerging markets; strategic implications of marketing; patterns of Multinational Corporations; global markets and multinational markets.

Unit IV: Developing Global Marketing Strategies

Global Marketing Management: planning and organization; products and services for consumers; products and services for businesses; International marketing channels; Exporting and logistics: special issues for business; integrated marketing communications and international advertising; personal selling and sales management; pricing for international markets;

Unit V: Implementing Global Marketing Strategies

Negotiating with international customers, partners and Regulators; the danger of stereo types; the pervasiveimpact of culture on negotiation behavior; implications for managers and negotiators

TEXT BOOKS:

- **Cateora, P. R., & Graham, J. L.** (2007). *International marketing*. Tata McGraw Hill.
- **Onkvisit, S., & Shaw, J. J.** (2010). *International marketing: Analysis and strategy* (5th ed.). PearsonEducation.
- **Vasudeva, P. K.** (2012). *International marketing*. Excel Books.
- **Michael, & Ikka.** (2016). *International marketing*. South-Western Cengage Learning.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

International marketing, Global perspective, Multinational Corporations, Exporting and logistics

MBA: Semester-III
MGTM-301M: RETAIL MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

With International retailers like Wal-Mart, Metro, Carrefour etc. expanding their arms in India, organized retailing is set to take Indian retail scenario by storm. The organized retailing sector is generating huge demand for management professionals to handle retailing operations in a professional manner. This necessitates the introduction of Retail management courses for the management professionals. This paper helps the students learn the functional aspects of organized Retailing and its management.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Understand the various concepts of retail management.
CO2: Learn the effect of various communication methods on buying behavior of consumers.
CO3: Learn the important factors for designing a retail strategy.
CO4: Learn and understand the operational challenges of retail and managing business.
CO5: Understand importance and challenges to manage a store for better consumer response.

COURSE CONTENTS

Unit-I: Introduction to Retail Management

Retailing: Meaning, Retail format, types of retailers (store, non-store retailing), Indian retailing scenario,Functions performed by retailers.

Unit-II: Retail Consumer behavior and communication mix

Types of buying decisions; Retail buying process, Factors influencing retail buying decisions. Retail communication mix: Meaning, methods, Retail communication process.

Unit-III: Retailing strategy

Definition, strategic retail planning process
Location & site analysis: Types of retail locations, factors affecting Trade area demand, factors affectingattractiveness of a site.

Unit-IV: Retail operations

Supply chain management: Meaning, process, importance, and retail logistics.
CRM: Meaning, Importance, CRM process (customer data collection, data analysis, target customer identification, Development of CRM program implementation)
Retail Pricing: Pricing strategies (EDLP, HLP), Price adjustments (Mark downs, coupons, Rebates, Pricebundling, multiple-unit pricing, variable pricing, online pricing)

Unit-V: Store management

Functions of store manager, Layout and Visual merchandising: Types of store layout designs, planograms,Merchandise presentation techniques.
Customer service: Importance, SERVQUAL GAPS MODEL.

TEXT BOOKS:

- Levy, M., Weitz, B. A., & Pandit, A. (2012). *Retailing management* (8th ed.). New Delhi: Tata McGraw-Hill Education Private Ltd.
- Vedamani, G. G. (n.d.). *Retail management*. Mumbai: Jaico Publishing House.
- Pradhan, S. (n.d.). *Retailing management: Text and cases* (2nd ed.). New Delhi: Tata McGraw-HillPublishing Company.

- ICFAI Centre for Management Research. (2003). *Retail management*. Hyderabad: ICFAI Centre forManagement Research.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Retailing, Retail format, communication mix, CRM, Supply chain management, SERVQUAL GAPSMODEL

MBA: Semester-III
MGTM-302M: CONSUMER BEHAVIOUR

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

The course introduces a wide range of behavioral concepts, and explores the strategic implications of customer behavior for marketers. The course challenges students to explore and relate the realities and implications of buyer behavior in modern cut throat markets.

The core objective of the course is to demonstrate to the student as to how an understanding of buyer behavior can help to improve and facilitate effective strategic decision making in the field of marketing. It also aims to help them understand and legitimize the behavior of a consumer in response to a variety of marketing stimuli.

COURSE OUTCOMES

After completing the course, the student shall be able to:

CO1: Understand the various aspects of consumer behavior.

CO2: Analyze the theories of psychologies in respect to strategizing effective business models for consumers buying.

CO3: Learn and understand the factors like attitude and Reference group's impact on buying decisions ofconsumer.

CO4: Learn and understand the factors like Culture and social factors impact on buying decisions ofconsumer.

CO5: Analyze the pre-purchase, purchase and post purchase behaviors of consumers.

COURSE CONTENTS

Unit I: Consumer research, segmentation & motivation

- Consumer research, Quantitative vs. Qualitative research, Consumer research process
- Consumer segmentation, basis of segmentation, segmentation patterns, Targeting, Positioning
- Consumer motivation, Buying motives and their application in advertising appeals

Unit II: Consumer personality, perception & learning

- Personality concept, theories, Personality types (Type A, Type B) and their impact on consumerbehavior
- Perception & individual information processing
- Learning, Cognitive learning (Classical conditioning, Instrumental conditioning)
- Brand equity, Brand loyalty

Unit III: Consumer attitude, reference group & family influence:

- Consumer attitudes, Measurement (Semantic differential scale, Likert scale), effecting attitudechange
- Reference groups and their influence
- Family influences

Unit IV: Socio-cultural influence & consumer decision making:

- Social class, stratification in India, Social class mobility, Social class influence
- Culture, Sub-culture, their influences
- Consumer decision making, types, process

Unit V: Consumer behavior in market, post purchase behavior & organizational consumer

- Consumers in real markets, factors affecting outlet selection, In-store influences

- Consumer post purchase behavior, dissonance, consumer satisfaction/dissatisfaction
- Organizational consumer-Buying process, factors influencing organizational buying behavior

TEXT BOOKS:

- Schiffman, L. G., & Kanuk, L. L. (2006). *Consumer behavior* (9th ed.). New Delhi: Dorling Kindersley(India) Pvt. Ltd.
- Loudon, D. L., & Bitta, A. J. D. (2008). *Consumer behavior: Concepts and applications* (4th ed.). NewDelhi: Tata McGraw-Hill Publishing Company Ltd.
- Blackwell, R. D., Miniard, P. W., & Engel, J. F. (2009). *Consumer behavior* (India ed.). New Delhi:Cengage Learning India Pvt. Ltd.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Consumer research, Quantitative vs. Qualitative research, Brand equity, Brand loyalty, Likert scale

MBA: Semester-III
MGTM-303M: MARKETING RESEARCH

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

The objective of this course is to equip students with the knowledge and skills required to design, execute, and interpret market research studies. Students will learn how to collect, analyze, and interpret data to make informed marketing decisions, understand consumer behavior, and assess market potential. The course covers both qualitative and quantitative research methods and emphasizes the practical application of research techniques in real-world scenarios.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Understand the fundamentals and significance of market research in business decision-making.
CO2: Learn various research methodologies and apply them to different market research problems.
CO3: Analysed and interpret data using statistical tools to derive meaningful insights.
CO4: Develop the ability to design and execute a comprehensive market research project.
CO5: Communicate research findings effectively to stakeholders and recommend actionable strategies.

COURSE CONTENTS

Unit I: Introduction to Market Research

Market Research**:** Definition, objectives, and importance.
Types of Market Research: Exploratory, descriptive, and causal research.
Market Research Process**:** Steps involved from problem definition to reporting.
Ethics in Market Research**:** Ethical considerations and challenges.

Unit II: Research Design and Data Collection

Research Design**:** Definition, types of research design (exploratory, descriptive, causal), and their applications.
Sampling Techniques**:** Probability and non-probability sampling methods, sampling errors, and sample size determination.
Data Collection Methods**:** Primary and secondary data, survey methods (questionnaire design, interviews), observation, and experimentation.
Measurement and Scaling**:** Types of scales (nominal, ordinal, interval, ratio), reliability, and validity.

Unit III: Data Analysis and Interpretation

Data Preparation: Data cleaning, coding, and entry.
Descriptive Statistics**:** Mean, median, mode, standard deviation, and variance.
Inferential Statistics**:** Hypothesis testing, t-tests, chi-square tests, ANOVA, and regression analysis.
Use of Software**:** Introduction to software tools like SPSS, Excel, or R for data analysis.
Interpretation of Results**:** Drawing conclusions from data analysis and making informed decisions.

Unit IV: Market Research Applications

Consumer Research**:** Understanding consumer behavior, preferences, and buying patterns.
Product Research**:** Concept testing, product positioning, and product life cycle.
Advertising Research**:** Measuring advertising effectiveness, copy testing, and media selection.
Brand Research**:** Brand equity measurement, brand positioning, and brand perception studies.
Market Segmentation**:** Identifying and targeting market segments based on research.

Unit V: Reporting and Presenting Research Findings

Report Writing**:** Structure of a research report, presenting data, and visual representation (charts, graphs).
Presenting Research Findings**:** Effective communication techniques, presenting to stakeholders, and making actionable recommendations.
Case Studies**:** Real-world examples of market research studies and their impact on business decisions.
Trends in Market Research**:** Digital research methods, big data analytics, and emerging trends.

TEXT BOOKS

- Malhotra, N. K., & Dash, S. (2016). **Marketing Research: An Applied Orientation** (7th ed.). Pearson.
- Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2012). **Business Research Methods** (9th ed.). Cengage Learning.
- Burns, A. C., & Bush, R. F. (2014). **Marketing Research** (7th ed.). Pearson.
- Aaker, D. A., Kumar, V., Leone, R. P., & Day, G. S. (2012). **Marketing Research** (11th ed.). Wiley.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Market Research, Research Design, Data Collection, Sampling Techniques, Consumer Behavior, Product Research, Advertising Research, Brand Research, Data Analysis, Report Writing.

MBA: Semester-III
MGTM301P: PRODUCTION & OPERATION MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

The course aims to equip students with a comprehensive understanding of various aspects of production and operations management. It begins by exploring the production function, focusing on the design of products, planning functions, material planning, layout, and scheduling. The course delves into the evolution of production and operations management, providing students with insights into the historical context and development of this field.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: learn effective forecasting of production functions, enhanced planning of product design, service operations, facility planning and project management.
CO2: Understand forecasting of production functions.
CO3: Enhanced planning of product design.
CO4: learn the inventory control techniques.
CO5: Understand the process of aggregate planning and scheduling.

COURSE CONTENTS

UNIT I- Operations Management

An overview, historical development of pom, pom scenario today

UNIT II- Product and Process designing:

product and process development – manufacturing process technology – cad and cam

UNIT III- Operational Planning and Work Study

Facilities - location - facilities layout and materials handling capacity planning – method study – work measurement – work design – job design – work sampling – industrial engineering techniques operations planning and control; planning and control for mass production - planning and control for batch production - planning and control of projects - maintenance management.

UNIT IV- Materials Management

Purchase systems and procedure inventory management and control; deterministic and probabilistic models - stores management - standardization, codification and variety reduction - waste management.

UNIT V- Aggregate planning and Quality Management

Preparation of aggregate demand forecasting, specification of organizational policies for smoothing capacity utilization, determination of feasible production alternatives and determination of optimal production strategy. Quality management: economics of quality assurance and inspection and quality control – acceptance sampling – theory control charts – control charts for variable and attributes – total quality of management – iso 9000 series standards – six sigma

TEXT BOOKS

- S.N. Chary, Production and Operation's Management. Elwood S. Buffa, Modern Production Management, Maclain JO and U Thomas, 1995. Operations Management

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Supply Chain Management, Just-in-time, Enterprise resource planning, Integrated logistics, Materialshandling

MBA: Semester-III
MGTM-302P: PROCUREMENT MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

This course will put the emphasis on the design and management of processes and control systems of the inbound supply chain. The content that is covered in this course include procurement processes and strategies, risk pooling and multi-stage inventory control systems, value of collaboration and streamlined information and financial flow in supply chains, supplier relationship management as well as elementary and advanced methods for analysis and planning.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Develop a foundational understanding of procurement management.
CO2: Acquire knowledge and skills in supplier identification, enabling effective supplier management.
CO3: Develop the skills and knowledge of global sourcing and international procurement.
CO4: Understand of the nature of outsourcing, and successful outsourcing implementation.
CO5: Understand the meaning and functionalities of an e-procurement system.

COURSE CONTENTS

Unit-I: Introduction to Procurement management

Function of procurement, purchasing cycle, roles in the purchasing organization for a large project, contribution of shipping and freight forwarding agents in procurement management, preparation of purchase specifications, nature and relevance of purchase requisition, importance of procurement management.

Unit-II: Supplier Selection

Supplier identification, Key issues in Supplier selection, Supplier selection Methods, Contract with thesupplier, bidding process, Bargaining and Negotiation.

Unit-III: Sourcing

Global sourcing and international procurement, problems associated with international sourcing and recommend solutions, nature of arbitration in international sourcing, implications of customs and countertrade in global sourcing.

Unit-IV: Outsourcing

Meaning and nature of outsourcing; Methodologies of outsourcing; Drawbacks of outsourcing and ways ofavoiding or managing such drawbacks

Unit-V: E-Procurement Systems

Meaning by an e-procurement system, Benefits of e-procurement, barriers to e-procurement, and keyindicators for measuring the benefits of e-procurement

TEXT BOOKS

- Bailey, P., Farmer, D., Jessop, D., & Jones, D. (2008). *Procurement: Principles and management*.Prentice Hall.
- Lysons, K., & Farrington, B. (2008). *Excellence in procurement: How to optimise costs and add value*.Kogan Page.

- Menon, K. S. (2010). *Purchasing and materials management*.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Supply Chain Management, Just-in-time, Enterprise resource planning, Integrated logistics, Materialshandling

MBA: Semester-III
MGTM-303P: MATERIAL MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The course intends to equip students with updated knowledge of modern materials management concepts and aims to develop their functional expertise in the store and purchase management discipline. To increasethe profitability of industry, the course intends to prepare the fleet of students equipped with latest tools and techniques of materials management so that they can face the challenges arising out of present scenarioof competitiveness due to globalization of economy

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Acquire a foundation in materials management, logistics, and supply chain management.
CO2: Gain a comprehensive understanding of the advantages of Material Requirements Planning (MRP)systems over conventional planning methods.
CO3: Understand the fundamental of inventory, and various techniques for management.
CO4: Gain a thorough understanding of inventory turn ratios and effective inventory management.
CO5: Understand of purchasing management and Gain proficiency in materials handling techniques enhance overall supply chain performance.

COURSE CONTENTS

Unit-I: Introduction to Material management
Introduction: Materials Management - Evolution, Importance, Scope and Objectives - Interface with other functions. Concept of Logistics and Supply Chain Management and evolution to 4PL, Trade off Customer Service & Cost

Unit-II: Material Requirement Planning
Advantages over conventional planning (Order Point Method) – Input and output of MRP system - Forecasting – Overview of quantitative and qualitative methods of forecasting - Master Production Schedule - Bill of Materials – BOM Explosion - Material flow in MRP. MRP II. Concept of ERP; (Numerical expected on BOM Explosion, estimating Net requirements)

Unit-III: Inventory Management
Need of Inventory, Costs associated with Inventory, Types of Inventory, Basic EOQ Model, EOQ with discounts, Classification of material, ABC Analysis, VED, HML, FSN, GOLF, SOS (Numerical expected on Basic EOQ, EOQ with discounts & ABC)

Unit-IV: Inventory control & Cost Reduction techniques
Inventory turns ratios, Standardization, need and importance, Codification, concept, benefits. Value Engineering and Value Analysis, concept and process.

Unit-V: Purchasing Management and Materials Handling
Responsibilities of Purchase Department, Purchase Cycle, Negotiation & Bargaining, Vendor relations,Purchasing Methods, Global sourcing.
Principles of Materials Handling system - Materials Handling Equipment's – Safety issues

TEXT BOOKS

- Gopalakrishnan, P., & Sundaresan, M. (1996). *An integrated approach to materials management*. Prentice Hall of India.
- Dutta, A. (2005). *Materials management.* Excel Books.

- Ahuja, K. K. (2009). *Materials management*. CBS Publishers & Distributors.
- Menon, K. S. (2007). *Purchasing and materials management*. McGraw-Hill Education.
- Gopalakrishnan, P. (2007). *Handbook of materials management*. Tata McGraw-Hill.
- Jhamb, L. C. (2002). *Materials & logistics management*. Himalaya Publishing House.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Materials Management, Bill of Materials (BOM), Inventory Management, Materials Handling.

MBA: Semester-IV
MGTM-401: PROJECT MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
This course examines business planning and project management in theory and practice. It offers a practical approach to managing projects, focusing on organizing, planning, and controlling the efforts of the project.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand the concepts of project management.
CO2: Understand project planning tools & techniques and the control process.
CO3: Analyzed risk associated with the projects.
CO4: Identify the most suitable project out of multiple projects and constraints.
CO5: Apply network techniques for project management.

COURSE CONTENTS

Unit I: Introduction to Business Planning and Project management
Business Planning: Importance of Planning; the planning process-objectives vis-a vis a plan; the benefits of planning; types of plans used by the managers-short-range and long-range plans, strategic and operational plans; policies and procedures; budgets and projects.
Overview of the Project Management: Capital investment - Investment and Difficulties, Types of capital Investment, Phase of Capital Budgeting, Levels of Decision Making.

Unit-II: Planning Tools & Techniques and the Control Process
Forecasting; contingency planning; Benchmarking; Best Practices; use of staff planners; participatory planning; Importance of controlling; steps in the control process; types of controls; internal and external controls; organizational control; information and financial controls; operations management and controls.

Unit III: Project Risk Analysis:
Sources, Measures, and perspectives on Risk, Sensitivity Analysis, Scenario Analysis, Break even Analysis, Simulation Analysis, Decision tree Analysis Project selection under P

Unit IV: Multiple projects and Constraints:
Constraints, Method of Ranking, Mathematical programming Approach, Linear Programming Approach,and Integer Linear Programing model, Goal Programing Model.

Unit V: Network Techniques for Project Management:
Development of Project network, Time Estimation, Determinations of Critical Path, PERT Model, CPMModel, Network Cost system

TEXT BOOKS

- **Chandra, P.** (2009). *Projects: Planning, analysis, selection, financing, implementation, and review* (7thed.). Tata McGraw-Hill.
- **Panneerselvam, R.** (2005). *Project management*. PHI Learning Pvt. Ltd.
- **Choudhary, S.** (2007). *Project management*. Tata McGraw-Hill.
- **Nicholas, J. M.** (2004). *Project management for business and technology: Principles and practice* (2nded.). Pearson Education.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Project Management, Business Planning, Risk Analysis, Linear Programming Approach, Project network.

MBA: Semester-IV
MGTM-402: ENTREPRENEURSHIP

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The course aims to acquaint the students with challenges of starting new ventures and enable then toinvestigate, understand and internalize the process of setting up a business.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand the concepts of entrepreneurship and entrepreneurial process.
CO2: Discuss the entrepreneurial plan.
CO3: Identify the international entrepreneurship opportunities**.**
CO4: Understand the family and non-family entrepreneur.
CO5: Explain the concept of venture capital.

COURSE CONTENTS

Unit I: Introduction to Entrepreneurship
Definition of Entrepreneur, Internal and External Factors, Functions of an Entrepreneur, Entrepreneurial motivation and Barriers, Classification of Entrepreneurship, Theory of Entrepreneurship, Concept of Entrepreneurship, Development of entrepreneurship; Culture, stages in entrepreneurial process.

Unit II: Creativity and Entrepreneurial Plan
Creativity and Entrepreneurial Plan: Idea Generation, Screening and Project Identification, Creative Performance, Feasibility Analysis: Economic, Marketing, Financial and Technical; Project Planning: Evaluation, Monitoring and Control segmentation. Creative Problem Solving: Heuristics, Brainstorming, Synaptic, Value Analysis, Innovation.

Unit III: International Entrepreneurship Opportunities
International Entrepreneurship Opportunities: The nature of international entrepreneurship, Importance of international business to the firm, International versus domestics' entrepreneurship, Stages of economic development.
Institutional support for new ventures: Supporting Organizations; Incentives and facilities; Financial Institutions and Small-scale Industries, Govt. Policies for SSIs.

Unit IV: Family and Non-Family Entrepreneur
Family and Non-Family Entrepreneur: Role of Professionals, Professionalism vs family entrepreneurs, Role of Woman entrepreneur.

Unit V: Venture Capital
Venture Capital: Venture capital, Nature and Overview, Venture capital process, locating venture capitalists.

TEXT BOOKS

- **Hisrich, R. D., Peters, M., & Shepherd, D.** (2008). *Entrepreneurship* (7th ed.). New Delhi: TataMcGraw-Hill.
- **Barringer, B. R., & Ireland, R. D.** (2008). *Entrepreneurship: Successfully launching new ventures*
- (3rd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- **Lall, M., & Sahai, S.** (2008). *Entrepreneurship*. New Delhi: Excel Books.

- **Charantimath, P. M.** (2005). *Entrepreneurship development and small business enterprises* (1st ed.).New Delhi: Pearson Education.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Entrepreneurship, Creative Performance, Govt. Policies, Family Entrepreneur, Non-Family Entrepreneur,Venture Capital

MBA: Semester-IV
MGTM-403: BUSINESS ETHICS

Duration: 3 Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

The main objective of teaching Business Ethics and Corporate Governance to students of Management is to provide detailed knowledge to the students about the significant contribution of ethics and corporate Governance in the welfare of the society at large. Ethics constitutes the value and social system for individuals and organizations. It promotes an orderly corporate life and a disciplined society. Ethics and values are deep rooted in our traditional heritage of culture and beliefs. In fact, it has been realized that a successful business is one that is ethical and upholds its contribution to the society at large. Similarly, corporate governance is the acceptance by the management of the inalienable rights of the shareholders as the true owners of the corporation and of their role as trustees on behalf of the shareholders.

To improve the learning and knowledge of the students about the concepts of values and ethics, display of values, role of ethics and values in building an organization, aligning individual and organizational values for optimal gains and also to improve the knowledge and learning of the students about the best corporate governance practices.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Understand the management models in the socio-political environment.
CO2: Explain the normative ethics in management.
CO3: Analyzed the factors associated with ethics compliance management.
CO4: Know about the SEBI committees on corporate governance
CO5: Know the corporate frauds and regulatory responses and multiple control mechanisms.

COURSE CONTENTS

Unit I: Management Models in the Socio-Political Environment

Business and the new world, management challenges for the 21st Century, models of management in the current environment, management process and ethics, ethical issues, work ethics, promoting ethical climatein the business, relationship between values and behavior, similarities between attitudes and values, value system for managers

Unit II: Normative Ethics in Management

Theories of ethics, ethical reasoning, ethical relativism, ethical conflict and ethical congruence, normative ethics in management, categories of ethical theories, virtue ethics in business, strengths and weaknesses of virtue ethics

Unit III: Managing Ethics

Ethical activities, code of ethics, ethics training programs, ethics committees, law enforcing ethical conduct, company codes, key organizational and program design factors associated with ethics compliance management, recipients of intended ethical action, the rational organization, Employees obligations to the firm, firm's duties towards employees.

Unit IV: SEBI Committee on Corporate Governance

The key mandatory recommendations focusing on strengthening the responsibilities of audit committees, improving the quality of financial disclosures including the proceeds from initial public offerings, corporate executive boards to assess and disclose business risks in the annual reports of companies,

position of nominee directors, stock holder approvals and disclosures relating to compensation to non-executive directors

Unit V: Corporate Governance and Performance

Government failure: Corporate frauds and regulatory responses; an overview of corporate governance; internal control mechanisms; ownership concentration; contractual theory of the firm; executive compensation; outside control mechanisms; multiple control mechanisms; alternate governance systems.

TEXT BOOKS:

- Murthy, C. V. S. (2009). *Business ethics: Text and cases*. New Delhi: Himalaya Publishing House.
- Ghosh, B. (2009). *Ethics in management and Indian ethos*. New Delhi: Vikas Publishing House.
- Securities and Exchange Board of India (SEBI). (2003). *Report of the SEBI Committee on CorporateGovernance*.
- Weston, J. F., Mitchell, M. L., & Mulherin, J. H. (2004). *Takeover, restructuring, and corporategovernance* (4th ed.). Upper Saddle River, NJ: Pearson Education.

Note: Latest edition of readings may be used

Teaching Learning Process

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Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Socio-Political Environment, Normative Ethics, Ethical code, SEBI, Corporate governance.

MBA: Semester-IV
MGTM-407: RESEARCH PROJECT AND VIVA-VOCE

Duration: 3 Hrs. **Marks: 100** **Credits: 4**

MBA: Semester-IV
MGTM-404F: FINANCIAL DERIVATIVES AND RISK MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
This course provides inputs that cater to the requirement of a reader intending to gain expertise in the area. The contents are divided into five chapters. These cover various features, dynamics and impact of Derivative markets and instruments, Forward markets and instrument futures markets options, markets. It is to explain the Structure of Global Derivative Market vis-a-vis the Indian Market. it Include Fundamental Concepts of Instruments, their Characteristics, Mechanics of their Trading, Pricing Principles, Hedging andvarious applications of Derivative Instruments.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand the global and Indian derivative markets.
CO2: Analyzed the structure of global forward markets.
CO3: Develop the ability to trade and value futures contracts.
CO4: Gain proficiency in option pricing models and assess the factors influencing option prices.
CO5: Evaluate the structure and characteristics of global swaps markets.

COURSE CONTENTS

Unit I: Derivative Markets and Instruments: Global scenario, Indian scenario, Tipes of risk, tipes of Derivative Instruments, International Derivative market, Elementary pricing principles, purpose of Derivatives.

Unit II: Forward Market and Instruments:
The Structure of Global Forward Markets types and Features of Forward Contracts, Valuing ForwardContracts, Forward contracts strategies

Unit III: Futures:
Structure of Global Futures Markets, Types of Contracts and Characteristics, the Mechanics of Future Trading, Valuation of Future Contracts, Applications of Futures (Hedging)

Unit IV: Option markets:
Introduction to options: structure of global option market option trading, option pricing -principle and models. Factors Influencing Option Prices Intrinsic and time value of an Option. Valuation of option (calls and put); Option pricing models- (Binomial option pricing model and Black -Scholes model). sensitivity of option premium.

Unit V: Swap Markets:
The structure of Global Swaps Markets, Types and characteristics of swaps, valuing swaps, Swap strategies, Forward swap and Swap tons**.**

TEXT BOOKS:
- Gupta, S. L. (2013). *Financial derivatives*. PHI Learning Pvt. Ltd.
- Hull, J. C. (2011). *Options, futures, and other derivatives* (8th ed.). Pearson.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Derivative Instruments, Forward Contracts, Future Contracts, option trading, Project network Forwardswap and Swap

MBA: Semester-IV
MGTM-405F: CORPORATE TAX PLANNING

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The course on Corporate Tax Planning aims to provide students with a comprehensive understanding of the principles and practices of corporate taxation in India. It is designed to equip students with the knowledge required to make informed tax planning decisions, manage tax liabilities, and understand the implications of tax laws on corporate strategies.

COURSE OUTCOME
After completing the course, the student shall be able to:
CO1: Understand the framework and principles of corporate tax laws in India.
CO2: Analyze the tax implications of various corporate decisions, including mergers, acquisitions, and restructuring.
CO3: Develop strategies for effective tax planning and management within the legal framework.
CO4: Evaluate the role of tax incentives and exemptions in corporate tax planning.
CO5: Understand international taxation issues and their impact on multinational corporations

COURSE CONTENTS

Unit I: Introduction to Corporate Taxation
- Introduction to Tax Planning: Meaning and objectives.
- Tax avoidance, tax evasion, and tax management.
- Overview of Corporate Tax Laws in India.
- Tax liability and computation of taxable income for companies.
- Residential status of companies and its tax implications.

Unit II: Tax Planning for Business Decisions
- Tax considerations in business decisions: Lease vs. Purchase, Make or Buy decisions.
- Tax planning for depreciation and investment decisions.
- Tax implications of capital structure decisions.
- Tax planning for financial management decisions.

Unit III: Tax Planning in Corporate Restructuring
- Mergers and Acquisitions: Tax implications and planning.
- Amalgamations, Demergers, and Spin-offs: Tax aspects.
- Transfer of assets between companies and its tax consequences.
- Tax implications of joint ventures and collaborations.

Unit IV: Tax Incentives and Exemptions
- Tax incentives for corporate growth: Export incentives, SEZs, and infrastructure development.
- Deductions and exemptions available under Income Tax Act.
- Tax holidays for new industries and specific sectors.
- Tax planning for Research and Development expenditures.

Unit V: International Taxation and Transfer Pricing
- Overview of International Taxation: Double Taxation Avoidance Agreements (DTAAs).
- Transfer Pricing: Concepts, regulations, and methods.
- Tax planning for foreign subsidiaries and associated enterprises.
- Impact of international tax laws on Indian companies.

TEXTBOOKS:

- Ahuja, G., & Gupta, R. (2023). **Corporate Tax Planning and Management**. Bharat Law House.
- Singhania, V. K., & Singhania, M. (2022). **Direct Taxes Planning and Management**. Taxmann Publications Pvt. Ltd.
- Srinivas, E. A. (2021). **Corporate Tax Planning**. Tata McGraw-Hill.
- Lakhotia, R. N., & Lakhotia, S. (2021). **Corporate Tax Planning Handbook**. Vision Books.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Corporate Taxation, Tax Planning, Tax Management, Mergers and Acquisitions, Tax Incentives, International Taxation, Transfer Pricing, Corporate Restructuring

MBA: Semester-IV
MGTM-406F: INTERNATIONAL FINANCE MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
Liberalization and Globalization of Economies in the recent years has increased the Prominence of International Finance and Trade, which prompted the Finance Managers to concentrate on the International Perspective as well, and it is Vital for a Student learning Finance to know the Intricacies of the Foreign Exchange Market and the Methods to Combat the Forex Risk.
Aim of this subject is to develop a body of knowledge and skills, and make it available to the students to make them successful managers in the new era of liberalization and globalization.

COURSE OUTCOME
After completing the course, the student shall be able to:
CO1: Demonstrate a comprehensive understanding of the increasing interdependence in the global economy.
CO2: Analyzed and interpret the Balance of Payments (BOP) by identifying its components.
CO3: Evaluate and manage exchange risk by understanding the structure of foreign exchange markets.
CO4: Apply principles of short-term financial management to optimize funding and investment strategies.
CO5: Assess the impact of trade blocks and international trade agreements on global finance.

COURSE CONTENTS

Unit I: Introduction to International Finance
Increasing interdependence in the global economy, trends in international trade and cross-border financial flow, recent developments in global financial markets, liberalization, Integration and Innovation, Challenges of International Financial Management, Theory of Absolute Advantage, Theory of Comparative advantage, Heckscher-Ohlin Model, Imitation -Gap Theory.

Unit II Balance of Payments
Concept of Economic transactions, Resident, General Government institution, principles of accounting, Components of the BOP Account, factor affecting the components of the Bop account, balance of payments compilation, BOP- The Indian Perspective, Importance and limitations of BOP Statistics.

Unit III Introduction and Management to Exchange risk
Structure and the Participants, Types of Transactions, Mechanics of Currency dealing, exchange rate quotations, arbitrage, forward rates evolution of Exchange control and the foreign exchange market in India, relation between forex and money market, covered interest arbitrage, covered parity theorem, option forwards, cancelation of forward contracts, purchasing power parity, interest rate parity, defining foreign exchange exposure, measuring foreign exchange exposure, management of exchange risk, Internal vs External Hedging Strategies.

Unit IV: Short Term Financial Management:
Short Term Funding and Investment, Centralized vs. Decentralized Cash Management, Netting, Pooling,Exposure Management, Offshore Invoicing Centers

Unit V: Introduction to Trade block
Formation of Trade Blocks, OPEC, its Objective, Function of European Community (EC), Function and Structure of WTO Agreements, trade related Aspects of Intellectual Property Rights (TRIPS), trade related aspects of Investment Measures (TRIMS), General Agreement on Trade in Services

(GATS), Trade Negotiations under GATT, EXIM Policy Historical Perspective, Objective, Highlight of Current policy, imports export import formation capital goods scheme (EPCG).

TEXT BOOKS:

- Apte, P. G. (2009). *International financial management*. The McGraw-Hill Companies.
- Cherunilam, F. (2009). *International economics*. The McGraw-Hill Companies.
- Madura, J. (2011). *International corporate finance*. Cengage Learning.
- Melvin, M. (2011). *International money and finance*. Pearson Education.

Note: Latest edition of readings may be used

Teaching Learning Process

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Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Liberalization, arbitrage, Balance of Payments, Netting, export import formation capital goods scheme (EPCG), trade related Aspects of Intellectual Property Rights (TRIPS), trade related aspects of Investment Measures (TRIMS)

MBA: Semester-IV
MGTM-404H: LABOUR LAW

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
Understanding of the legal framework is important for the efficient decision-making relating to management and employees' relations. The course aims to provide an understanding, application and interpretation of the various labour laws and their implications for industrial relations and labour issues.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand the definition, meaning, and scope of labor laws in India.
CO2: Analyzed key labour legislations in India, such as the Factories Act, 1948.
CO3: Examine social-security legislations, including the Employees' State Insurance Act, 1948.
CO4: Explore the history and significance of wage legislations in India.
CO5: Discuss recent developments and contemporary issues in labour laws in India.

COURSE CONTENTS

Unit I:
- Definition and meaning of Labour,
- Need, Importance and scope of labour laws in India.
- New development in the labour laws in India.
- A glance of International Labour Laws.

Unit II: Labour Legislations in a Changing Context
- The Factories Act, 1948
- The Shop and Establishments Act, 1953
- The Contract Labour (Regulation and Abolition) Act, 1970

Unit III: Social-Security Legislations
- The Employees' State Insurance Act, 1948
- Maternity Benefit Act, 1961
- The Workmen's Compensation Act, 1923
- The Payment of Gratuity Act, 1972
- Employees' provident Funds and Miscellaneous Provisions Act, 1952

Unit IV: Wage Legislations
- The History of Wage legislations
- The Payment of Wages Act, 1936
- The Minimum Wages Act, 1948
- The Payment of Bonus Act, 1965

Unit V: Other Significant Legislations
- Recent development in labour laws in India
- Contemporary Issues regarding labor in India

TEXT BOOKS:

- Singh, P. N., & Kumar, N. (2010). *Employee relations management*. Pearson.

- Malik, P. L. (2009). *Handbook of labour and industrial law* (5th ed.). Eastern Book Company.
- Saharay, H. K. (2013). *Industrial and labour laws of India*. Universal Law Publishing.
- Jain, S. P. (2014). *Industrial & labour laws*. Dhanpat Rai & Co.
- Monappa, A. (2012). *Industrial relations*. Tata McGraw Hill.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Labour Laws, The Factories Act, 1948, Payment of Gratuity Act, 1972, Wage legislations

MBA: Semester-IV
MGTM-405H: INDUSTRIAL RELATIONS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
Industrial relations constitute one of the most delicate and complex problems of the modern industrial society. This paper has been made keeping in mind all kind of Industrial relation problems and how to handle them effectively. The objective of this paper is to develop a conceptual and practical framework of Industrial relations i.e. Relationship between employee and management.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand the concept, scope, and key stakeholders of industrial relations.
CO2: Analyzed the historical evolution of industrial relations in the UK and India.
CO3: Evaluate the sources of industrial disputes related to wages, service conditions.
CO4: Examine various industrial conflict resolution mechanisms.
CO5: Assess the impact of globalization on industrial relations.

COURSE CONTENTS

Unit I
Industrial Relations- Concept and scope, Stake holders; Approaches to Industrial Relations; Labor Market, Demand and Supply of Labor, Nature and composition of Indian labor, Employment and Unemployment Scenarios.

Unit II
History: Evolution of Industrial Relations UK), Emergence of Industrial relations/ Trade Union movement in India, Government initiatives, Industrial relations machineries, ILO and its impact on Indian IR scenarios.

Unit III
Industrial Disputes resolutions: Sources – Wages, service conditions and discipline, Concept of wages, Wage theories, wage differentials, Regulations for protection of wages, service conditions and Work discipline; Law of natural justice and domestic enquiries; Workers participation in Management, Works committees, Joint Councils.

Unit IV
Industrial Conflict: Negotiation, Mediation/ Conciliation, Arbitration, Adjudication- Labor court, IndustrialTribunal, National Tribunal; Special reference to Pay Commissions.

Unit V
Trends: Globalization and its impact on Industrial Relations, Employee Engagement practices, current trends in Industrial Relations in India, Industrial Relations bill- ifs and buts, Ethics, governance and Industrial Relations.

TEXT BOOKS:

- Singh, P. N., & Kumar, N. (2013). *Employee relations management*. Pearson.
- Tripathi, P. C. (2004). *Personnel management and industrial relations*. Sultan Chand & Sons.
- Monappa, A. (2008). *Industrial relations*. Tata McGraw Hill.
- V.P., M. (2010). *HRM and human relations*. Himalaya Publishing House.

- Mamoria, C. B., & Mamoria, S. (2013). *Dynamics of industrial relations in India*. Himalaya PublishingHouse.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Industrial Relations, ILO, Trade Union, Joint Councils, Conciliation, Arbitration

MBA: Semester-IV
MGTM-406H: PERFORMANCE APPRAISAL AND EVALUATION

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
To acquaint the student to develop an understanding of the performance appraisal and evaluation of employees and its implications. The Study of performance management helps in motivation, employee development and productivity improvement to meet organization goals.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand the concept, scope, and importance of performance management.
CO2: analyzed the performance planning process.
CO3: Evaluate the purpose and role of appraisal in performance management.
CO4: Gain insights into the Performance Management System (PMS).
CO5: Assess competency - based performance management systems, methods of performance measurement through tools.

COURSE CONTENTS

Unit I
Introduction to Performance Management, Definition, nature, scope, importance, Business and sub functional Performance Management, Performance Management as a management Tool, Performance objectives and standards, Standards of Performance; Performance Domains and dimensions.

Unit II
Performance Planning Process, Contents of Performance Plan; 8 Step Model, Individual and Group Performance Planning, Role clarity and Job description; meaning of Performance appraisal, methods and approaches to performance appraisal, Obstacles in appraisal, Designing appraisal for better results, Performance Appraisal Interview, Potential Appraisal.

Unit III
Introduction, Definition, Purpose and Role of appraisal in Performance Management, Methods and Steps in Performance Appraisal; Why Appraisal Fail, Types of Appraisal, Approaches and Design, MBO, 360*, Potential Appraisal, Performance Review, Performance counseling/ Mentoring; Team Performance Appraisal.

Unit IV
Introduction to PMS, Importance, Features, Process of Building PMS, PMS Dimensions, Conceptual Framework; 4 pillars of PMS, PMS Prism, Strategic Performance Management, Performance and Strategy linkage, Components of SPM, SPM- Balanced Score Card, SPM and Matrix, SPM Environment threat and Risks.

Unit V
Competency Based Performance Management System, Performance Measurement, Performance Measurement through BSC, Performance and Succession Plan/ Career Development, International Performance Management, Performance Audit, Human Resource Valuation accounting and Audit.

TEXT BOOKS:

- Bhattacharya, D. K. (2012). *Performance management systems and strategies: Textbook*. Pearson.
- Aguinis, H. (2013). *Performance management*. Pearson.
- Chadha, M. (2008). *Performance management*. Macmillan.

- Armstrong, M., & Baron, A. (2005). *Performance management*. Jaico.
- Cardy, R. L. (2004). *Performance management*. PHI.
- Kohli, D. (2010). *Performance management*. Oxford University Press.
- Sharma, D. (2010). *Performance management*. Himalaya Publishing House.
- Sahu, R. K. (2009). *Performance management system*. Eastern Book Company.
- Rao, T. V. (2009). *Performance management and appraisal*. Sage Publications.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and group discussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Performance Management, Performance appraisal, MBO, PMS, Human Resource Valuation accounting

MBA: Semester-IV
MGTM-404I: GLOBAL BRAND STRATEGY

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
To develop the ability to Understand the methods of managing brands and strategies for brand management. Learn nature, scope and structure of International Business. Understand the influence of global environmental factors on international business operations.

COURSE OUTCOMES:
After completing the course, the student shall be able to:
CO1: Establish and sustain brands and lead to extensions a new global brand.
CO2: Understand the geopolitical and roll and function of trade bodies.
CO3: Understand theoretical concepts of international brand environment.
CO4: Learn the Service branding, familiarize with Product branding, understand brand portfolio.
CO5: Analysis the brand management, market sizing, competitor analysis.

COURSE CONTENTS

Unit-I: Evolution of Global Branding:
Colonialism- a major force of globalization and created a multitude of cross-border trade links. The SecondWorld War- new consumer brands came to Europe and Asia. Big push for branding - erosion andsubsequent demise of communism; The fall of the Berlin Wall-opened up previously inaccessible markets to foreign brands in Eastern and Central European markets, other markets such as Chile and South Africa; Opening up of China- a massive market and a massive production location for U.S, Japanese and European Brands.

Unit-II: Defining a Global Brand:
A brand-a construct and not a living and breathing organism; Brands- created, stimulated and applied by people working in organizations seeking to create worthwhile experiences for their customers that will induce behaviour beneficial to the organization; Global brands- as brands that are available across multiple geographies, without specifying any lower limit or any continental requirements

Unit-III: The Brand Environment:
The brand environment- brand's own expression, perception and recognition-surrounded by internal and external factors that have an influence on the brand; Operation of a brand in an environment-the element ofthe strategic planning cycle and, on the other hand, organizational conventions, competitive forces, market structures, cultural factors, consumer motivation and media attention; the lenses and filters through which consumers perceive and experience the brand.

Unit-IV: The Management of Global Brands:
Local brands versus a global brand-multiple markets; a conflict between finding an optimum fit of the brand with local circumstances, and the desire to obtain brand consistency across markets; global and local brand management-a common basis for their brand strategy and planning. Common basis-a shared language, definitions, interpretations, assessments and most importantly a clear understanding of the relationships between the factors that shaped a brand in its global and local context; success and failure of global brands; the global brand proposition model-the internal and external analysis; emerging marketfirms and branding.

Unit-V: Applied Analytics in Brand Management:
Environmental Analysis, Competitor Analysis, Market Sizing, TAM, SAM, Target Market, R&D, Interviews, Surveys.

TEXT BOOKS:

- Hollensen, S., & Banerjee, M. (2018). *Global marketing with a special Indian focus* (4th ed.). Pearson.
- Johansson, J. K. (2011). *Global marketing* (4th ed.). Tata McGraw-Hill Publishing Company Limited.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Global branding, Competitive Forces, brand strategy, Environmental Analysis, TAM, SAM

MBA: Semester-IV
MGTM-405I: INTERNATIONAL BUSINESS OPERATIONS AND LOGISTICS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
Business today is set in a global environment. The global environment is forcing companies, regardless of their location or primary market base, to consider the rest of the world in their competitive strategy analysis. Firms cannot isolate themselves or ignore external factors such as economic trends, competitive situations, or technology innovation in other countries if some of their competitors are competing or are located in those countries. Now a day it not uncommon for a company to develop a new product in the United States, manufactures it in Asia, and sells it in Europe. International markets are predominated by Multinational Corporations who have perfected the principles, procedures, and practices of operations management. Most of the International business originates from developed countries who have a long history of industrial growth and this has kept the MNC's in good stead. MNC's have deep pockets, spend vast sums on R&D, carve core competencies for themselves, come out with innovative products, maintain quality, and fix low prices for their products.

COURSE OUTCOMES:
After completing the course, the student shall be able to:
CO1: Develop basic understanding of operations and logistics.
CO2: Learn discussion of terms of global market, current global marking approach
CO3: Discuss current practices, issues, and concerns in the field of international logistic operations.
CO4: Understand the reason of existence of International Trade.
CO5: Apply logistics principles in international business decisions.

COURSE CONTENTS

Unit I: Global Operations & Logistics: Evolution and Design
Forces of Globalization; operations and logistics: application and objectives; Strategic role of operations and logistics; the strategic framework; flow management; global operations and logistics: an integrated approach; the concept of an operations and logistics strategy; the strategic process.

Unit II: The globalization of Operations and Marketing Strategies
The four driving forces of globalization process; global market, technological, cost, political and macroeconomic forces; changing consumer behaviour; global versus local marketing; functional integration of logistics and operations; the global product; sectorial integration: Manufacturer/distributor; efficient consumer response (ECR); The need for a global marketing approach; current and future challenges.

Unit III: Global Operations and Logistic Planning
The evolving concept of outsourcing; the importance of channels of distribution in physical distribution; the architecture of a physical distribution network in a globalized operations approach; logistic service firms and Third-Party Logistics; demand, volatility, information distortion and the Bullwhip Effect in supply chains; from domestic to global supply chains: added complexities and uncertainties; vertical integration issues in global supply chains.

Unit IV: Risk Management in Global Operations
Operating exposure to exchange rate; risk and its management; the concept of operating exposure; managing operating exposure; pricing strategies for exporting firms; use of operational flexibility to minimize operating exposure; global sourcing strategies under exchange rate uncertainty; impact of exchange rates and classification of hedging strategies in global sourcing; basic function of foreign exchange markets; micro and macro level strategies for managing exchange rate risk.

Unit V: Effective Management of Global Operations and Logistics

The global LIS/LITS (Logistics Information system/Global Logistics and Telecommunications System); characteristics of LITS; Logistics organization and its relationship with LITS; Functional and geographic dimensions of LITS; Operations and logistics control: key activities need performance information; measuring performance in functional integration; new organizations related to manufacturing and logistics operations; the organizational implications of sect oral logistics co-operation; the international factor in global organizations.

TEXT BOOKS:

- Dornier, P., Ernst, R., Fender, M., & Kouvelis, P. (2007). *Global operations and logistics: Text andcases*. John Wiley & Sons.
- Bennett, R. (2007). *International business* (2nd ed.). Pearson Education.
- Aswathappa, K. (2010). *International business* (3rd ed.). Tata McGraw-Hill Publishing Company Limited.
- Hill, C. W. L., & Jain, A. K. (2011). *International business* (6th ed.). Tata McGraw-Hill PublishingCompany Limited.
- Radebaugh, L. H., & Sullivan, D. P. (2010). *International business: Environment and operations* (11thed.). Pearson Education.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Globalization, efficient consumer response (ECR), outsourcing, hedging, LIS/LITS (Logistics Informationsystem/Global Logistics and Telecommunications System)

MBA: Semester-IV
MGTM-406I: EXPORT IMPORT PROCEDURES AND DOCUMENTATION

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
To get students aware of the procedures of export and imports with the help of that MBA student will be able to compile the documents required for the purpose of the foreign trade. The roles of different regulatory and controlling bodies will be well known to the students.

COURSE OUTCOMES:
After completing the course, the student shall be able to:
CO1: understand Import/export trade organizations and the procedure of licensing.
CO2: understand the nature of trading houses.
CO3: understand export sales contract and its processing.
CO4: understand export payment methods and Export-Import trade regulatory framework in India.
CO5: understand institutional set up for export promotion and export assistance in India.

COURSE CONTENTS

Unit-I
Significance of procedures and documentation in international trade; procedures and documentation as trade barriers; WTO provisions; Aligned Documentation System (ADS); official machinery for trade procedures and documentation;

Unit-II
ITC (HS) classification System; Role of ICC; INCOTERMS; nature of export/trading houses

Unit-II
Export order processing; export contract; export price quotations; shipping and custom clearance of export and import cargo; central excise clearance; main export and import documents; Role of forwarding agents; cargo insurance and claim procedure.

Unit-III
Methods of payment in international trade; documentary collection of export bills; UCPDC guidelines; realization of export proceeds – provisions of RBI's Exchange Control Manual;

Unit-IV
Pre-shipment and post-shipment finance; role of EXIM bank and ECGC in India

Unit-V
Major export promotion schemes in India – EPCGS, duty exemption scheme; DEPB scheme; SIL; facility for deemed exports; Export promoting institution's – role of export promotion councils, commodity boards and ITPO

TEXT BOOKS:

- Jitendra, M. D. (2008). *Export procedures and documentation*. Rajat Publications.
- Wadia, P. (2010). *Export markets and foreign trade management*. Kanishka Publications.
- Nabhi's. (2012). *Exporters manual and documentation*. Nabhi's.
- Nabhi's. (2015). *New import-export policy procedures*. Nabhi's.

Note: Latest edition of readings may be used

Teaching Learning Process
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Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
International trade, WTO; Aligned Documentation System (ADS); forwarding agents; cargo insurance, EXIM bank, EPCGS

MBA: Semester-IV
MGTM-404M: SALES & DISTRIBUTION MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

The course exposes the students to a wide range of activities and sub-activities involved in the field of Sales & distribution management and attempts to equip them with skill sets required to handle thismarketing sub-function dexterously.

To apprise the student with the detailed conceptual and functional aspects of Sales management as also to augment and reinforce conceptual learning with application in real corporate framework.

COURSE OUTCOMES

After completing the course, the student shall be able to:

CO1: Make students aware about the concept of sales management and personal selling.

CO2: Learn the fundamentals of recruiting, selecting and building a performing team of sales personals.

CO3: Understand the fundamentals of distribution of a physical product.

CO4: Understand the aspects of Distribution management as logistic control.

CO5: Learn the modern ways and tools in sales management.

COURSE CONTENTS

Unit I: Sales Management & personal selling

- Conceptual understanding, Sales objectives, Importance
- Personal selling: Buying decision process, Classification of buyer accounts, Personal selling process,Selling methods
- Sales forecasting, budgeting, Territories, Quotas

Unit II: Sales force management

- Need assessment, Recruitment, Selection
- Sales organization structures
- Sales force development: Training, Motivating, Compensating
- Sales force control mechanism

Unit III: Distribution management:

- Importance, Types of distribution channels, Channel decisions
- Selecting & motivating distribution channel partners
- Distribution channel cost control
- Retailing explored
- Wholesaling explored

Unit IV: Logistics & Supply Chain Management:

- Logistics: Conceptual understanding
- Functional areas of Logistics management

Key decision areas of logistics management:

- Inventory management
- Warehousing
- Transportation
- Merchandize shrinkage/theft

Unit V: Recent trends in Sales management:

- Sales Management Information system
- Relationship marketing
- E-selling/e-marketing/Selling with internet leverage
- Direct marketing
- International Sales Management

TEXT BOOKS:

- Still, R. R., Cundiff, E. W., & Govoni, N. A. P. (2008). *Sales management decisions, strategies, andcases* (5th ed.). Prentice Hall of India Pvt. Ltd.
- Havaldar, K. K., & Cavale, V. M. (2009). *Sales and distribution management: Text and cases*. TataMcGraw Hill Education Pvt. Ltd.
- Gupta, S. L. (2005). *Sales and distribution management: Text & cases—An Indian perspective*. ExcelBooks.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Sales forecasting, budgeting, Territories, Quotas, Recruitment, Selection, Retailing, Inventory management, Relationship marketing

MBA: Semester-IV
MGTM-405M: BRAND MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

The objective of this course is to provide students with a deep understanding of the principles and practices of brand management. It aims to equip students with the knowledge and skills required to build, manage, and sustain strong brands in the marketplace. The course covers key topics such as brand equity, brand positioning, brand communication, and brand strategy, with a focus on real-world applications.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Understand the fundamental concepts of branding and brand management.
CO2: Analyze the elements that contribute to brand equity and the factors that influence brand perception.
CO3: Develop effective brand positioning strategies that resonate with target audiences.
CO4: Formulate and implement brand communication strategies that align with the overall brand strategy.
CO5: Evaluate and manage brand performance over time to ensure long-term brand success.

COURSE CONTENTS

Unit I: Introduction to Branding and Brand Management

Branding Concepts: Definition of a brand, importance of branding, and the role of brand management.
Brand Equity: Understanding brand equity, its components, and its importance in business strategy.
Brand Identity and Image: Differences between brand identity and brand image, and how they impact brand perception.
Brand Life Cycle: Stages of a brand's life cycle and strategies for managing each stage.

Unit II: Brand Positioning and Brand Equity

Brand Positioning: Concepts, importance, and methods of brand positioning.
Differentiation: Creating unique value propositions and differentiating brands from competitors.
Brand Equity Measurement: Techniques for measuring brand equity, including brand audits and brand tracking.
Customer-Based Brand Equity (CBBE): The role of customer perceptions and experiences in building brand equity.

Unit III: Brand Communication and Brand Strategy

Integrated Marketing Communication (IMC): Role of IMC in brand communication, key elements, and strategies.
Brand Communication Channels: Advertising, public relations, digital marketing, social media, and experiential marketing.
Brand Storytelling: Importance of brand narratives and how to create compelling brand stories.
Brand Extension: Strategies for extending a brand into new categories and markets.

Unit IV: Managing Brand Performance and Brand Architecture

Brand Portfolio Management: Managing multiple brands within a portfolio, brand hierarchy, and brand architecture.
Global Branding: Challenges and strategies for managing global brands.
Brand Revitalization: Strategies for rejuvenating declining brands and managing brand crises.
Brand Performance Evaluation: Metrics and tools for assessing brand performance and making

data-driven decisions.

Unit V: Emerging Trends in Brand Management
Digital Branding: Impact of digital media on brand management, and strategies for building digital brands.
Brand Co-Creation: Engaging consumers in the brand creation process.
Corporate Social Responsibility (CSR) and Branding: The role of CSR in brand building and reputation management.
Sustainable Branding: Trends in sustainability and their impact on brand management.

TEXT BOOKS

- Keller, K. L. (2013). **Strategic Brand Management: Building, Measuring, and Managing Brand Equity** (4th ed.). Pearson.
- Aaker, D. A. (2010). **Building Strong Brands**. Free Press.
- Kapferer, J. N. (2012). **The New Strategic Brand Management: Advanced Insights and Strategic Thinking** (5th ed.). Kogan Page.
- Temporal, P. (2015). **Advanced Brand Management: Managing Brands in a Changing World** (3rd ed.). Wiley.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Brand Equity, Brand Positioning, Brand Communication, Brand Strategy, Brand Architecture, Brand Portfolio, Brand Revitalization, Digital Branding, Brand Co-Creation, Sustainable Branding.

MBA: Semester-IV
MGTM-406M: E-MARKETING

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

The course describes the internet and the various business models employed in online marketing, and it explores methods for conducting online market research and developing competitive intelligence for an organization. Its detail processes for planning and implementing comprehensive e-marketing strategies using alternative online pricing strategies, Web-based advertising and promotion, and internet distribution channels. E marketing also considers other critical issues such as customer acquisition and retention, customer relationship management (CRM), and the challenges faced by firms in the application of e- marketing strategies in global markets.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Understand the historical development of E-Marketing and its future trends.
CO2: Evaluate the E-Marketing environment and recognize the ethical and legal issues associated withonline marketing.
CO3: Develop E-Marketing strategies by conducting online consumer behaviour research.
CO4: Manage E-Marketing activities by effectively using online tools for product offerings, pricing strategies, distribution channels, and communication tools.
CO5: Implement customer engagement strategies through social media, digital media to build and sustainonline customer relationships.

COURSE CONTENTS

Unit I: E-Marketing in Context

- Past, Present, and Future
- Strategic E-Marketing and Performance Metrics
- The E-Marketing Plan

Unit II: E-Marketing Environment

- Building Inclusive E-Markets
- Ethical and Legal Issues

Unit III: E-Marketing Strategy

- E-Marketing Research
- Consumer Behavior Online
- Segmentation, Targeting, Differentiation, and Positioning Strategies

Unit IV: E-Marketing Management

- Product: The Online Offer
- Price: The Online Value
- The Internet for Distribution
- E-Marketing Communication Tools

Unit V: Customer engagement strategies

- Engaging Customers with Social Media
- Buying Digital Media Space
- Customer Relationship Management

TEXT BOOKS:

- Chaffey, D., & Ellis-Chadwick, F. (2019). *Digital marketing: Strategy, implementation, and practice*
- (7th ed.). Pearson Education.
- Ryan, D. (2017). *Understanding digital marketing: Marketing strategies for engaging the digital generation* (4th ed.). Kogan Page.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

E-Marketing, Segmentation, Targeting, CRM

MBA: Semester-IV
MGTM-404P: TOTAL QUALITY MANAGEMENT AND SIX SIGMA

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The course is developed exclusively for the Management and Strategy Institute and is designed to give the student a strong understanding of TQM and how to apply it in a professional work environment. It also covers all basic TQM principles and gives the student a solid understanding of TQM and how it is implemented in a business environment.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Understand the evolution of quality concepts and the need for quality improvement in businesses.
CO2: Apply various problem-solving and quality control tools to address quality-related issues effectively.
CO3: Implement TQM principles and tools to enhance product and process quality.
CO4: Apply Kaizen principles for knowing its impact on management, labour relations, and organizational culture.
CO5: Utilize Six Sigma methodologies and tools to achieve sustainable quality improvements.

COURSE CONTENTS

Unit-I: Introduction to Total Quality Management
Basics of Total Quality: Evolution of Quality, Definitions of Quality, Symptoms of a Non-Quality Business, what is Total Quality, Total Quality Control (TQC), Dimensions of Quality (Kano's Model), Quality Challenge to Industry, and Need for Quality Improvement: Impact of quality improvement, Differences between ISO 9000 and TQM.

Unit-II: Problem Solving and QC Tools
Types of problems, QC Tools, approaches to problem Identification, Quality improvement Methodologies, Problem solving process, seven basic QC Tools, Applications of problem-solving Tools, Seven Management Tools: Tree diagram, Matrix diagram, Matrix data analysis, Process decision program chart, Arrow diagram.

Unit-III: TQM Principles and Tools
Continuous process improvement, PDSA cycle, 5S, Supplier partnership, Partnering, Sourcing, Benchmarking, Quality Function Deployment (QFD), House of quality, Taguchi quality; Loss function, Total Productive Maintenance (TPM)

Unit-IV: Kaizen
Continuous Improvement: Kaizen Umbrella, Kaizen and Management, Kaizen and Innovation, Main Kaizen practice: Management, Kaizen and Labour-Management relations, Cultural change for Kaizen, 3- MUs checklist of Kaizen activities, 5-S Kaizen movement, 4 Ms checklist.

Unit-V: Six Sigma
Quality engineering and Six Sigma, DMAIC process for process and design improvement, Acceptance Sampling, SPC (Statistical Process Control), Taguchi methods for robust design, Six Sigma sustainability; Case studies.

TEXT BOOKS:

- Sharma, D. D. (2009). *Total Quality Management*. Sapna Book House.

- Stamatis, D. H. (2003). *Six Sigma Fundamentals: A Complete Guide to the System, Methods and Tools*.Productivity Press.
- Harry, M. J., Schroeder, R., Linsenmann, D. R., & Richard. (2000). *Six Sigma: The BreakthroughManagement Strategy Revolutionizing The World's Top Corporations*. Currency.
- Charantimath, P. M. (2003). *Total Quality Management*. Pearson Education.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Total Quality Control (TQC), Matrix diagram, Quality Function Deployment (QFD), Kaizen Umbrella, SixSigma

MBA: Semester-IV
MGTM-405P: PROCESS MANAGEMENT AND CONSULTANCY

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The primary objective of this course is to learn to apply the concepts and techniques of business process analysis and improvements as building blocks for all operations improvement strategies. Students will learn how to analyze and improve business processes in different contexts, and using different process improvement tools

COURSE OUTCOME
After completing the course, the student shall be able to:
CO1: Understand the lifecycle of Business Process Management.
CO2: Analyzed the need for Business Process Reengineering (BPR).
CO3: Integrate BPR with management concepts.
CO4: Develop the skills necessary for a career in consultancy.
CO5: Explore emerging trends in consultancy.

COURSE CONTENTS

Unit-I: Introduction to Business Process Management
Process Management Lifecycle, Process Architectures, Core versus Support Processes, Process Modeling, People-Centric and System Centric Processes, Preparing a Process for Automation, Workflow and Decisions, Task and Resource Allocation, Process Improvement.

Unit-II: Business Process Reengineering
Introduction to BPR, Need for reengineering, BPR and Performance improvement, Pitfalls and Myths of BPR

Unit-III: BPR in Action
BPR and management concepts: TQM, Quality Function Deployment, ISO Standards, ERP. BPR implementation methodology, success factors of BPR, BPR in manufacturing Industry, Change management in BPR.

Unit-IV: Consultancy
Consultants: Types, Skills and Values, Consulting as a Profession, Marketing and Selling of Consulting Services, The Changing Consulting Industry.

Unit-V: Trends in Consultancy
Strategic and Organization Information Technology Consulting, Strategic Marketing Consulting, Strategy and Operations Management Consulting, Consulting to CEOs and Boards, Consulting in the Public and Not-for-profit Sector, Consulting to Global Clients, Intervention and Change, Merger and Acquisition Integration, The Future of Consulting.

TEXT BOOKS:

- Harmon, P. (2007). *Business process change: A guide for business managers and BPM and Six Sigmaprofessionals* (2nd ed.). Morgan Kaufmann.
- Barcus, S. W., & Wilkinson, J. W. (Eds.). (1986). *Handbook of management consulting services*.McGraw-Hill.
- Dey, B. R. (2001). *Business process reengineering and change management*. Wiley.

- Bell, C. R., & Nadler, L. (1990). *Clients and consultants: Meeting and exceeding expectations* (2nd ed.).Gulf Publishing Company.
- Connor, D. (1995). *Increasing revenue from your clients*. John Wiley & Sons.
- Connor, D., & Davidson, J. (1990). *Marketing your consulting and professional services*. John Wiley &Sons.
- Holtz, H. (1990). *Choosing and using a consultant*. John Wiley & Sons.
- Sethi, V., & King, W. R. (1998). *Organizational transformation through BPR*. Pearson.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Business Process Management, Business Process Reengineering (BPR), ISO Standards, Merger and Acquisition

MBA: Semester-IV
MGTM-406P: ENTERPRISE RESOURCE PLANNING

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
Understand the fundamental concepts and technologies of Enterprise Resource Planning (ERP), analyze the challenges and methodologies of ERP implementation, explore the functionality of ERP business modules, evaluate the dynamics of the ERP market, and assess recent trends and future directions in ERP.

COURSE OUTCOME
After completing the course, the student shall be able to:
CO1: Understand the fundamental concepts of Enterprise Resource Planning (ERP).
CO2: Analyzed the challenges, strategies, and methodologies involved in ERP implementation.
CO3: Explore the operational aspects of ERP systems.
CO4: Evaluate the dynamics of the ERP market.
CO5: Assess recent trends in ERP.

COURSE CONTENTS

Unit-I: Introduction to Enterprise Resource Planning
Basic Concept & Introduction to Enterprise Resource Planning*;* Related Technologies – Business Intelligence, E-Commerce and E-Business, Business Process Reengineering, Data Warehousing, Data Mining, OLAP, Product life Cycle management, SCM, CRM

Unit-II: ERP Implementation
Implementation Challenges, Strategies, Life Cycle, Pre-implementation Tasks, Requirements Definition, Methodologies, Package selection, Project Teams, Process Definitions, Vendors and Consultants, Data Migration, Project management, Post Implementation Activities.

Unit-III: ERP in Action and Business Module
Operation and Maintenance, Performance, Maximizing the ERP System, Business Modules, Finance, Manufacturing, Human Resources, Plant maintenance, Materials Management, Quality management, Marketing, Sales, Distribution and service.

Unit-IV: ERP Market
ERP Marketplace, Dynamics, SAP AG, Oracle, PeopleSoft, JD Edwards, QAD Inc, SSA Global, LawsonSoftware, Epicor, Intuitive.

Unit-V: Recent trends in ERP
Enterprise Application Integration, ERP and E-Business, ERP II, Total quality management, Future Directions, Trends in ERP.

TEXT BOOKS:

- Leon, A. (2008). *ERP Demystified* (2nd ed.). Tata McGraw Hill.
- Sumner, M. (2007). *Enterprise Resource Planning*. Pearson Education.
- Mazzullo, J. (2007). *SAP R/3 for Everyone*. Pearson.
- Fernandez, J. A. (1998). *The SAP R/3 Handbook.* Tata McGraw Hill.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Enterprise Resource Planning (ERP), Data Migration, Project management, Materials Management, Oracle, E-Business

MBA: Semester-III
MGTM301S: ESSENTIALS OF SUPPLY CHAIN MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE

Supply chain management involves a number of decisions that benefit by quantitative techniques of analysis and design. The course will take up a few of these to explore modelling, computation and IT-enabled implementation of solutions in some areas of Supply Chain Management. The application areas include material flow management across the supply chain, value management and analysis of total supply chain costs, robust design of supply chains, co-ordination of supply chain decisions and handling of uncertainties in supply chain management. The emphasis will be on modelling, analysis and implementation issues, including a few case studies, but the relevant techniques will be covered as required.

COURSE OUTCOMES

After completing the course, the student shall be able to:
CO1: Develop a comprehensive understanding of the basic concepts, philosophy, and essential features ofsupply chain management.
CO2: Gain knowledge of logistics; understand logistics costs and the significance.
CO3: Develop proficiency in inventory management within the supply chain context.
CO4: Develop strategic thinking skills to analyze and address key issues in supply chain management.
CO5: knowledge of Warehousing, apply aspect of integrated Logistics.

COURSE CONTENTS

UNIT I- Introduction to Supply Chain Management

Basic Concept & Philosophy of Supply Chain Management*;* Essential features, various flows (cash, valueand information); Key Issues in SCM; benefits and case examples

UNIT II- Logistics Management and Purchasing & Vendor management

Logistics as part of SCM, Logistics costs, Inbound and outbound logistics, bullwhip effect in logistics, Centralized and decentralized purchasing, functions of purchase department and purchase policies, single vendor concept, management of stores.

UNIT III- Inventory Management in SC

Inventory fundamentals, Basic EOQ models; Inventory review policies; Just-in-time manufacturing; Kanban System of Inventory Management, Enterprise resource planning.

UNIT IV- Strategic Issues in Supply Chain

Quick Response Systems, Vendor Management Inventory, Supplier Relationship, Supplier Certification; Supplier Selection Process, Supplier Contracts, Mass Customization & Principle of Postponement, Role of network design in Supply Chains.

UNIT V- Warehousing decisions & Emerging Issues

Warehousing and its uses and types; Total distribution concepts, Integrated logistics, Materials handling,Packaging and transportation system.

TEXT BOOKS

- **Chopra, S., & Meindl, P.** (2007). *Supply chain management* (3rd ed.). Pearson.
- **Raghuram, G.** (2000). *Logistics and supply chain management* (1st ed.). Macmillan.
- **Sahay, B. S.** (2003). *Supply chain management* (1st ed.). Macmillan.

- **Agarwal, D. K.** (2003). *A text book of logistics and supply chain management* (1st ed.). Macmillan.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Supply Chain Management, Just-in-time, Enterprise resource planning, Integrated logistics, Materialshandling

MBA: Semester-III
MGTM-302S: PROCUREMENT MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
This course will put the emphasis on the design and management of processes and control systems of the inbound supply chain. The content that is covered in this course include procurement processes and strategies, risk pooling and multi-stage inventory control systems, value of collaboration and streamlined information and financial flow in supply chains, supplier relationship management as well as elementary and advanced methods for analysis and planning.

COURSE OUTCOMES
After completing the course, the student shall be able to:
CO1: Develop a foundational understanding of procurement management.
CO2: Acquire knowledge and skills in supplier identification, enabling effective supplier management.
CO3: Develop the skills and knowledge of global sourcing and international procurement.
CO4: Understand of the nature of outsourcing, and successful outsourcing implementation.
CO5: Understand the meaning and functionalities of an e-procurement system.

COURSE CONTENTS

Unit-I: Introduction to Procurement management
Function of procurement, purchasing cycle, roles in the purchasing organization for a large project, contribution of shipping and freight forwarding agents in procurement management, preparation of purchase specifications, nature and relevance of purchase requisition, importance of procurement management.

Unit-II: Supplier Selection
Supplier identification, Key issues in Supplier selection, Supplier selection Methods, Contract with thesupplier, bidding process, Bargaining and Negotiation.

Unit-III: Sourcing
Global sourcing and international procurement, problems associated with international sourcing and recommend solutions, nature of arbitration in international sourcing, implications of customs and countertrade in global sourcing.

Unit-IV: Outsourcing
Meaning and nature of outsourcing; Methodologies of outsourcing; Drawbacks of outsourcing and ways ofavoiding or managing such drawbacks.

Unit-V: E-Procurement Systems
Meaning by an e-procurement system, Benefits of e-procurement, barriers to e-procurement, and keyindicators for measuring the benefits of e-procurement.

TEXT BOOKS

- Bailey, P., Farmer, D., Jessop, D., & Jones, D. (2008). *Procurement: Principles and management*.Prentice Hall.
- Lysons, K., & Farrington, B. (2008). *Excellence in procurement: How to optimise costs and add value*.Kogan Page.

- Menon, K. S. (2010). *Purchasing and materials management*.

Note: Latest edition of readings may be used

Teaching Learning Process
Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods
Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords
Supply Chain Management, Just-in-time, Enterprise resource planning, Integrated logistics, Materialshandling

MBA: Semester-IV
MGTM-303S: SERVICE OPERATIONS MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The objective of this course is to equip students with the knowledge and skills required to manage service operations effectively. The course focuses on the unique challenges of managing service processes, ensuring service quality, and optimizing service delivery to enhance customer satisfaction and operational efficiency.

COURSE OUTCOME
After completing the course, the student shall be able to:
CO1: Understand the fundamental concepts and frameworks of service operations management.
CO2: Analyze service processes and identify key factors influencing service design and delivery.
CO3: Apply service quality management techniques and models to improve service performance.
CO4: Utilize various tools and techniques for effective service capacity planning and resource management.
CO5: Develop strategies for managing service demand, supply chain integration, and service recovery.

COURSE CONTENTS

Unit I: Introduction to Service Operations Management
- Nature and characteristics of services
- The role of services in the economy
- Service strategy and competitiveness
- Service process design and service blueprinting
- Service encounter and customer experience management

Unit II: Service Design and Delivery
- Service product development and innovation
- Designing the service delivery system
- Facility location and layout in services
- Managing service supply relationships
- Technology in service operations (self-service, automation, AI)

Unit III: Service Quality Management
- Dimensions of service quality
- SERVQUAL model and its application
- Managing customer expectations and perceptions
- Techniques for measuring service quality
- Continuous improvement in service operations (Six Sigma, Lean)

Unit IV: Capacity and Demand Management in Services
- Service capacity planning and management
- Strategies for managing service demand (yield management, pricing, promotions)
- Inventory management in services
- Scheduling and workforce management in service operations
- Managing queues and customer wait times

Unit V: Service Recovery and Supply Chain Management
- Service recovery strategies and systems

- Managing service failures and customer complaints
- Integration of service supply chains
- Outsourcing and offshoring of services
- Ethical issues in service operations

TEXTBOOKS

- Fitzsimmons, J. A., & Fitzsimmons, M. J. (2013). **Service Management: Operations, Strategy, Information Technology** (8th ed.). McGraw-Hill Education.
- Haksever, C., & Render, B. (2013). **Service Management: An Integrated Approach to Supply Chain Management and Operations** (2nd ed.). Pearson Education.
- Metters, R. D., King-Metters, K. H., Pullman, M. E., & Walton, S. (2006). **Successful Service Operations Management** (2nd ed.). Thomson South-Western.
- Johnston, R., & Clark, G. (2008). **Service Operations Management: Improving Service Delivery** (3rd ed.). Pearson Education.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Service Operations, Service Design, Service Quality, Capacity Management, Service Recovery, Service Supply Chain, Service Strategy, Customer Experience, Technology in Services

MBA: Semester-IV
MGTM-404S: APPLICATION OF QUALITY MANAGEMENT

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
This course aims to provide students with a comprehensive understanding of quality management concepts and their practical applications in various industries. The course will cover the principles, practices, and tools of quality management, with a focus on continuous improvement, customer satisfaction, and operational excellence.

COURSE OUTCOME
After completing the course, the student shall be able to:
CO1: Understand the fundamental concepts of quality management and its evolution.
CO2: Apply various quality management tools and techniques in different organizational contexts.
CO3: Analyze the role of quality management in enhancing customer satisfaction and business performance.
CO4: Develop and implement quality improvement initiatives using Total Quality Management (TQM) and Six Sigma methodologies.
CO5: Evaluate the impact of quality management practices on organizational sustainability and competitiveness.

COURSE CONTENTS

Unit I: Introduction to Quality Management
- Evolution of Quality Management: Historical perspective, key contributors.
- Definitions and Concepts: Quality, quality control, quality assurance, and quality management.
- Quality Management Philosophies: Deming, Juran, Crosby, and Ishikawa.
- Importance of Quality in Business: Customer satisfaction, cost of quality, and competitive advantage.

Unit II: Quality Management Tools and Techniques
- Basic Quality Tools: Flowcharts, check sheets, Pareto charts, cause-and-effect diagrams, histograms, scatter diagrams, and control charts.
- Advanced Quality Tools: Failure Mode and Effects Analysis (FMEA), Design of Experiments (DOE), and Statistical Process Control (SPC).
- Quality Function Deployment (QFD) and its application in product design.
- Benchmarking and its role in quality improvement.

Unit III: Total Quality Management (TQM)
- Principles of TQM: Customer focus, continuous improvement, employee involvement.
- TQM Implementation: Strategies, challenges, and best practices.
- Role of Leadership in TQM: Creating a quality culture, management commitment.
- Case Studies: TQM in manufacturing and service industries.

Unit IV: Six Sigma and Lean Management
- Six Sigma Methodology: DMAIC (Define, Measure, Analyze, Improve, Control) process.
- Six Sigma Tools: Process mapping, root cause analysis, regression analysis.
- Lean Management: Principles, tools, and techniques.
- Integrating Lean and Six Sigma for operational excellence.

Unit V: Quality Management in the Global Context
- International Quality Standards: ISO 9000, ISO 14000, and other relevant standards.

- Quality Audits: Purpose, process, and benefits.
- Quality in Supply Chain Management: Supplier quality management, outsourcing.
- Sustainability and Quality: Environmental quality management, corporate social responsibility (CSR).

TEXT BOOKS:

- Evans, J. R., & Lindsay, W. M. (2017). *Managing for Quality and Performance Excellence* (10th ed.). Cengage Learning.
- Dale, B. G., Van der Wiele, T., & Van Iwaarden, J. (2013). *Managing Quality* (6th ed.). Wiley.
- Goetsch, D. L., & Davis, S. B. (2014). *Quality Management for Organizational Excellence: Introduction to Total Quality* (7th ed.). Pearson.
- Montgomery, D. C. (2012). *Introduction to Statistical Quality Control* (7th ed.). Wiley.
- Pyzdek, T., & Keller, P. (2014). *The Six Sigma Handbook* (4th ed.). McGraw-Hill Education.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Quality Management; Total Quality Management (TQM); Six Sigma; Lean Management; Continuous Improvement; Customer Satisfaction; ISO Standards

MBA: Semester-IV
MGTM-405S: PROCESS MANAGEMENT AND CONSULTANCY

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE
The primary objective of this course is to learn to apply the concepts and techniques of business process analysis and improvements as building blocks for all operations improvement strategies. Students will learn how to analyze and improve business processes in different contexts, and using different process improvement tools

COURSE OUTCOME
After completing the course, the student shall be able to:
CO1: Understand the lifecycle of Business Process Management.
CO2: Analyzed the need for Business Process Reengineering (BPR).
CO3: Integrate BPR with management concepts.
CO4: Develop the skills necessary for a career in consultancy.
CO5: Explore emerging trends in consultancy.

COURSE CONTENTS

Unit-I: Introduction to Business Process Management
Process Management Lifecycle, Process Architectures, Core versus Support Processes, Process Modeling, People-Centric and System Centric Processes, Preparing a Process for Automation, Workflow and Decisions, Task and Resource Allocation, Process Improvement.

Unit-II: Business Process Reengineering
Introduction to BPR, Need for reengineering, BPR and Performance improvement, Pitfalls and Myths ofBPR.

Unit-III: BPR in Action
BPR and management concepts: TQM, Quality Function Deployment, ISO Standards, ERP. BPR implementation methodology, success factors of BPR, BPR in manufacturing Industry, Change management in BPR.

Unit-IV: Consultancy
Consultants: Types, Skills and Values, Consulting as a Profession, Marketing and Selling of Consulting Services, The Changing Consulting Industry.

Unit-V: Trends in Consultancy
Strategic and Organization Information Technology Consulting, Strategic Marketing Consulting, Strategy and Operations Management Consulting, Consulting to CEOs and Boards, Consulting in the Public and Not-for-profit Sector, Consulting to Global Clients, Intervention and Change, Merger and Acquisition Integration, The Future of Consulting.

TEXT BOOKS:

- Harmon, P. (2007). *Business process change: A guide for business managers and BPM and Six Sigmaprofessionals* (2nd ed.). Morgan Kaufmann.
- Barcus, S. W., & Wilkinson, J. W. (Eds.). (1986). *Handbook of management consulting services*.McGraw-Hill.
- Dey, B. R. (2001). *Business process reengineering and change management*. Wiley.

- Bell, C. R., & Nadler, L. (1990). *Clients and consultants: Meeting and exceeding expectations* (2nd ed.).Gulf Publishing Company.
- Connor, D. (1995). *Increasing revenue from your clients*. John Wiley & Sons.
- Connor, D., & Davidson, J. (1990). *Marketing your consulting and professional services*. John Wiley &Sons.
- Holtz, H. (1990). *Choosing and using a consultant*. John Wiley & Sons.
- Sethi, V., & King, W. R. (1998). *Organizational transformation through BPR*. Pearson.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords

Business Process Management, Business Process Reengineering (BPR), ISO Standards, Merger and Acquisition

MBA: Semester-IV
MGTM-406S: BIG DATA ANALYTICS

Duration: 3Hrs. **Marks: 100** **Credits: 4**

COURSE OBJECTIVE:
This course aims to provide students with a comprehensive understanding of Big Data Analytics, focusing on the tools, techniques, and methodologies used to analyse and interpret large datasets. The course will equip students with the skills needed to leverage big data for strategic decision-making and business intelligence.

COURSE OUTCOMES:
After completing the course, the student shall be able to:
CO1: Understand the fundamental concepts of big data and its significance in the business context.
CO2: Learn and apply various data analytics tools and techniques for processing and analyzing large datasets.
CO3: Develop the ability to interpret and visualize data to derive actionable business insights.
CO4: Understand the ethical implications and challenges associated with big data analytics.
CO5: Apply big data analytics techniques to real-world business problems and case studies.

COURSE CONTENTS:

Unit I: Introduction to Big Data
- Overview of Big Data: Definition, characteristics, and significance.
- Types of Big Data: Structured, semi-structured, and unstructured data.
- Big Data vs. Traditional Data: Challenges and opportunities.
- Big Data Technologies: Hadoop, NoSQL databases, and data warehousing.

Unit II: Data Collection, Storage, and Processing
- Data Sources: Social media, sensors, transactions, etc.
- Data Storage: Distributed file systems, Hadoop Distributed File System (HDFS).
- Data Processing: MapReduce, parallel processing, and in-memory computing.
- Data Quality and Pre-processing: Cleaning, integration, and transformation.

Unit III: Data Analytics Techniques
- Descriptive Analytics: Statistical methods, data summarization.
- Predictive Analytics: Regression analysis, classification, and clustering.
- Prescriptive Analytics: Optimization, simulation, and decision analysis.
- Advanced Analytics: Machine learning, neural networks, and deep learning.

Unit IV: Data Visualization and Interpretation
- Data Visualization Tools: Tableau, Power BI, and D3.js.
- Techniques for Visualizing Large Datasets: Dashboards, infographics, and interactive visualizations.
- Interpreting Data: Trends, patterns, and anomalies.
- Storytelling with Data: Communicating insights effectively.

Unit V: Applications and Ethical Considerations
- Big Data in Industry: Case studies in finance, healthcare, marketing, and supply chain management.
- Ethical and Legal Considerations: Privacy, security, and governance in big data.
- Challenges in Big Data Analytics: Data privacy, bias, and transparency.

- Future Trends in Big Data: AI integration, real-time analytics, and edge computing.

TEXT BOOKS:

- Mayer-Schönberger, V., & Cukier, K. (2013). *Big Data: A Revolution That Will Transform How We Live, Work, and Think.* Houghton Mifflin Harcourt.
- Provost, F., & Fawcett, T. (2013). *Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking.* O'Reilly Media.
- Zikopoulos, P. C., Eaton, C., deRoos, D., Deutsch, T., & Lapis, G. (2012). *Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data.* McGraw-Hill Osborne Media.

Note: Latest edition of readings may be used

Teaching Learning Process

Interactive class room sessions with the help of power point presentations, case discussions and groupdiscussions to ensure active participation and continuous learning.

Assessment Methods

Class tests/Assignments, Class participation, Presentations, End-semester examination

Keywords: Big Data, Data Analytics, Hadoop, Machine Learning, Data Visualization, Predictive Analytics, Data Ethics, Data Warehousing, NoSQL.

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)

RAFFELS UNIVERSITY, NEEMRANA

B.Sc. (CBZ) (3 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

2023-24

RAFFLES
UNIVERSITY

Raffles University Neemrana

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Vision: To evolve as an Institution of Excellence, where scholars develop informed and inquiring minds and broaden the frontiers of pure and applied knowledge.

Mission: In graining the capacity to usher in change by discovering nurturing and expanding individual skills talents and interests while standing forth as leader and path breaker in their future carrier.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. **PEO 1.** To provide subjective and practical knowledge as well as developing practical solutions and connections between theory.
2. **PEO 2.** Hearten individual growth among the students and enhance their confidence by providing them an opportunity to become a part of the science-industry.
3. **PEO 3.** To make Science subjects interesting technically, scientifically and experimentally.
4. **PEO 4.** To develop problem-solving skills through practical applications and research

PROGRAMME OUTCOMES (PO)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Provide students with fundamental knowledge and the ability to expertise in Computer Science.
PO 2	Provide insight to problem solving to succeed in Technical Profession through precise education and to prepare students to excel in postgraduate programs.
PO 3	To inculcate in students professional, effective communication skills, team work, multidisciplinary approach and an ability to relate issues to broader social context.
PO 4	Prepare students to be aware of excellence, leadership, written ethical codes and guidelines and lifelong learning needed for successful professional career by providing them with an excellent academic environment.
PO 5	Empower the students in academic, social, psychological and economic arenas by developing relevant competencies.
PO 6	Interpret and apply the implications of environment awareness initiatives incorporated in curriculum.
PO 7	Participation and contribution to community development activities through NCC, NSS etc.
PO 8	Acquire sufficient knowledge base in the Domain Specific area leading to the pursuit of advanced level of study in the chosen Domain Specific area.
PO 9	Adaptability and capacity building to the ever-changing needs of industry and employment opportunities.
PO 10	Inculcate human values through curricular, co-curricular and extracurricular activities.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The Department of Science, offers Three Year (comprising 6 semesters) Undergraduate Program in Science with objective of empowering students to acquire all-inclusive understanding of Computer Knowledge is both theoretical and practical as an academic discipline. Upon completion of B. Sc. Computer Science Degree Program successfully, the students shall acquire the following skills and competencies.

PSO 1	- Gain the knowledge of Chemistry through theory and practical s.
PSO 2	- Develop research-oriented skills.
PSO 3	- The students will graduate with proficiency in Botany.
PSO 4	- The students will be able to start ventures related to plants viz. horticulture units, agonist (mushroom cultivation, plant-tissue culture, Hi-Tech Nursery etc.), plant exploration, and conservation NGO. - The students equipped with the basics of plant science will be able to apply the knowledge in practicing agriculture with a scientific outlook thereby increasing production and profits.
PSO 5	- Understand the basics of Zoology, Botany
PSO 6	- Develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Zoology.
PSO 7	- Perform job in various fields like science, environment, education, banking, business and public service, etc. or be an entrepreneur with precision, analytical mind, innovative thinking, clarity of thought, expression, and systematic approach.

SCHOOL OF BASIC AND APPLIED SCIENCES

(CBCS Scheme of Studies & Examinations w. e. f. 2023-26 onwards)

B.Sc. (CBZ) I Year

I Semester

(Chemistry, Botany and Zoology)

Scheme 1st semester

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	**Chemistry**	CH-101	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-103	Organic Chemistry	2	0	20	30	50	3	2
3		CH-105	Physical Chemistry	2	0	20	30	50	3	2
4		CH-107	Chemistry Lab-I	0	3/6	20	30	50	4	3
5	**Botany**	BOT-101	Diversity of microbes and plant pathology	3	0	20	30	50	3	3
6		BOT-103	Plant Ecology	3	0	20	30	50	3	3
7		BOT-105	Botany Lab-I	0	2/4	20	30	50	4	2
8	**Zoology**	ZOO-101	Life and Diversity from Protozoa to Helminthes	3	0	20	30	50	3	3
9		ZOO-103	Cell Biology	3	0	20	30	50	3	3
10		ZOO-105	Zoology Lab-I	0	2/4	20	30	50	3	2
11	Open Elective/Skill Enhancement Course (SEC)*	-	-	2	0	20	30	50	3	2
	TOTAL			20	14			550		27

SCHOOL OF BASIC & APPLIED SCIENCES

(Syllabus & Scheme of Studies w.e.f. 2023-26)

B.Sc. (CBZ) I Year (I semester)

Chemistry

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1. Inorganic Chemistry (CH-101)

Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts of atomic structure.
2. Students will be able to understand the basic principle of classifications of elements and their periodic properties
3. Students will have thorough knowledge of different kinds bonding, hybridization in diatomic molecules.
4. Students can gain thorough knowledge about the structures of ionic solids, coordination no and lattice energy.

2. Organic Chemistry (CH-103)

Course Outcomes:

1. Have comprehensive knowledge of the basic organic chemistry like different electronic effects with suitable examples
2. Get information about the types of structural and stereoisomers, optical isomerism, and different nomenclature like D/L, R/S, cis/trans, E/Z etc. of various organic compounds.
3. Learn nomenclature of various types of alkanes and cycloalkanes, preparation and their chemical reactions.
4. Sound knowledge of alkenes, alkynes, dienes and their chemical reactions.

3.Physical Chemistry (CH-105)

Course Outcomes:

1. To understand the Maxwell distribution law and various parameters associated with collisions ideal gas molecules

2. To learn about Role of temperature and pressure to establish the state of gases and describe the Concept of critical temperature, pressure and volume of real gases
3. To study the Physical properties of liquids like surface tension, viscosity and their measurements
4. To have knowledge about various types of symmetries present in different solids and and Bragg's law of X-ray diffraction

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Botany

Diversity of microbes and Plant Pathology (BOT-101)

Course Outcomes:

1. Evaluate the trend of evolution from unicellular to multicellular organisms.
2. Describe the all-introductory terms concerned with cryptogams.
3. Determine significance of thallus organization and alternation of generation among different groups studied.
4. Utilize different studied groups for various environmental issues and assessments
5. Evaluate different studied groups for several bio- prospection studies
6. Develop various methodologies to recognize pathogenic and non-pathogenic associations among organisms.

Plant Ecology (BOT-103)

Course Outcomes:

1. Explain various Ecosystems & relationships between Organisms and environment.
2. State plant population and community ecology
3. Describe energy flow and biomass transfer in different ecosystems
4. Describe the correlations between balanced ecosystem and cycling of minerals and nutrients
5. Identify Phyto geographical Regions of India, Plant Biodiversity and its importance using additional OE resources available in the internet using modern ICT tools.
6. Analysis the effect of pollution on environment, their causes and measures

Zoology

Life and Diversity from Protozoa to Helminthes (ZOO-101)

Course Outcomes:

1. Students will be able to describe unique characters, Life history, mode of infection and pathogenicity of parasitic protozoans of Phylum Protozoa.
2. Students will be able to identify the diversity and ecological role, Canal system and spicules in sponges of Phylum Arthropoda especially of Porifera.
3. Students will be able to describe the general characteristics and classification biodiversity, economic importance, Corals and coral reefs, polymorphism belonging to Phylum Coelenterate.
4. Students will be able to understand the unique characteristics, economic importance, Brief account of life history, mode of infection and pathogenicity of helminth parasites, parasitic adaptations belonging to Phylum Platyhelminthes.
5. Students will be able to describe the general characteristics and classification, Brief account of life history, mode of infection and pathogenicity of helminth parasites, parasitic adaptations of Phylum Aschelminths.

Cell Biology (Z00-103)

Course Outcomes:

1. Students will understand the basic structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelle.
2. Students will understand how these cellular components are used to generate and utilize energy in cells
3. Students will understand the cellular components underlying mitotic cell division.
4. Students will apply their knowledge of cell biology to selected examples of changes or losses in cell function.
5. Students will understand the basics of cancer, different microscopic and centrifugal techniques.

CO-PO MAPPING

CHEMISTRY

CH-101											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	2	1	3	2	2	1

CH-103											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	3	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	3	2	2	1

CH-105											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	1	2	2	1

CO-PO MAPPING

BOTANY

BOT-101											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1
	CO6	2	2	1	2	1	2	1	2	1	2

BOT-103											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	√	2	2	1
	CO6	2	1	2	1	3	2	2	2	1	2

BOT-105											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

CO-PO MAPPING

ZOOLOGY

ZOO-101											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-103											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-105											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

PSO-PO Mapping

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PSO-01	PSO-02	PSO-03
Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment	2.20	1.59	1.34	0.73	1.34	0.37	1.47	1.10	0.98	0.98	1.96	2.20	1.83	1.10

Lesson Plan for Zoology - ZOO-101

Unit 1: Phylum- Protozoa (12 Lectures)

1. Lecture 1: Introduction to Protozoa - General Characteristics
2. Lecture 2: Classification of Protozoa up to Order Level
3. Lecture 3: Biodiversity of Protozoa - Overview
4. Lecture 4: Economic Importance of Protozoa
5. Lecture 5: Parasitic Protozoans - Introduction and Overview
6. Lecture 6: Life History of Entamoeba - Mode of Infection
7. Lecture 7: Pathogenicity of Entamoeba
8. Lecture 8: Life History of Plasmodium - Mode of Infection
9. Lecture 9: Pathogenicity of Plasmodium
10. Lecture 10: Life History of Trypanosoma - Mode of Infection
11. Lecture 11: Pathogenicity of Trypanosoma
12. Lecture 12: Life Histories of Leishmania and Giardia - Pathogenicity

Unit 2: Phylum- Porifera (10 Lectures)

13. Lecture 13: Introduction to Porifera - General Characteristics
14. Lecture 14: Classification of Porifera up to Order Level
15. Lecture 15: Biodiversity of Porifera - Overview
16. Lecture 16: Economic Importance of Porifera

17. Lecture 17: Type Study - Sycon: Structure and Function
18. Lecture 18: Canal System in Sponges - Types and Function
19. Lecture 19: Spicules in Sponges - Structure and Function
20. Lecture 20: Reproduction in Sponges - Asexual and Sexual
21. Lecture 21: Ecological Roles of Sponges
22. Lecture 22: Porifera in Research and Industry

Unit 3: Phylum - Coelenterata (10 Lectures)

23. Lecture 23: Introduction to Coelenterata - General Characteristics
24. Lecture 24: Classification of Coelenterata up to Order Level
25. Lecture 25: Biodiversity of Coelenterata - Overview
26. Lecture 26: Economic Importance of Coelenterata
27. Lecture 27: Type Study - Obelia: Structure and Function
28. Lecture 28: Corals and Coral Reefs - Formation and Types
29. Lecture 29: Polymorphism in Siphonophores - Concept and Examples
30. Lecture 30: Reproduction in Coelenterata - Asexual and Sexual
31. Lecture 31: Ecological Roles of Coelenterata
32. Lecture 32: Threats to Coral Reefs and Conservation Efforts

Unit 4: Helminths (13 Lectures)

33. Lecture 33: Introduction to Helminths - General Characteristics
34. Lecture 34: Classification of Platyhelminthes up to Order Level
35. Lecture 35: Classification of Aschelminthes up to Order Level
36. Lecture 36: Type Study - Fasciola hepatica: Structure and Function
37. Lecture 37: Type Study - Ascaris: Structure and Function
38. Lecture 38: Helminth Parasites - Overview
39. Lecture 39: Life History of Schistosoma - Mode of Infection and Pathogenicity
40. Lecture 40: Life History of Taenia - Mode of Infection and Pathogenicity
41. Lecture 41: Life History of Ancylostoma - Mode of Infection and Pathogenicity
42. Lecture 42: Life History of Trichinella - Mode of Infection and Pathogenicity
43. Lecture 43: Life History of Wuchereria - Mode of Infection and Pathogenicity
44. Lecture 44: Life History of Oxyuris - Mode of Infection and Pathogenicity
45. Lecture 45: Parasitic Adaptations in Helminths

Unit 1: Ultrastructure of Different Cell Organelles & Plasma Membrane (12 Lectures)

1. Lecture 1: Introduction to Cell Biology and Overview of the Animal Cell
2. Lecture 2: Ultrastructure of the Nucleus: Nuclear Envelope, Nucleolus, Chromatin
3. Lecture 3: Ultrastructure of Mitochondria: Structure, Functions, and Mitochondrial DNA
4. Lecture 4: Ultrastructure of Endoplasmic Reticulum: Rough and Smooth ER
5. Lecture 5: Ultrastructure of Golgi Complex: Structure, Function, and Role in Secretion
6. Lecture 6: Ultrastructure of Lysosomes: Structure, Enzymes, and Role in Digestion
7. Lecture 7: Ultrastructure of Ribosomes: Types, Biogenesis, and Role in Protein Synthesis
8. Lecture 8: Ultrastructure of Peroxisomes and Glyoxysomes: Structure and Functions
9. Lecture 9: Ultrastructure of Cytoskeleton: Microtubules, Microfilaments, and Intermediate Filaments
10. Lecture 10: Plasma Membrane: Structure and Fluid Mosaic Model
11. Lecture 11: Various Modes of Transport Across the Plasma Membrane
12. Lecture 12: Mechanism of Active and Passive Transport, Endocytosis, and Exocytosis

Unit 2: Endoplasmic Reticulum, Ribosomes, and Lysosomes (10 Lectures)

13. Lecture 13: Endoplasmic Reticulum (ER): Types and Structure
14. Lecture 14: Role of ER in Protein Synthesis and Transportation
15. Lecture 15: Ribosomes: Types, Structure, and Functions in Protein Synthesis
16. Lecture 16: Biogenesis of Ribosomes: Assembly and Function
17. Lecture 17: Lysosomes: Enzymes and Their Functions
18. Lecture 18: Polymorphism in Lysosomes: Primary, Secondary, Residual Bodies
19. Lecture 19: Autophagy and Heterophagy: Mechanisms and Importance
20. Lecture 20: Cellular Digestion: Role of Lysosomes in Intracellular Digestion
21. Lecture 21: Role of ER in Lipid Synthesis and Calcium Storage
22. Lecture 22: Disorders Associated with Lysosomal Dysfunction

Unit 3: Mitochondria, Cytoskeleton, and Nucleus (12 Lectures)

23. Lecture 23: Mitochondria: Structure and Role as Semiautonomous Organelles
24. Lecture 24: Mitochondrial DNA: Structure, Function, and Inheritance

25. Lecture 25: Biogenesis of Mitochondria and Its Enzymes
26. Lecture 26: Cytoskeleton: Microtubules - Structure, Formation, and Functions
27. Lecture 27: Cytoskeleton: Microfilaments - Structure, Formation, and Functions
28. Lecture 28: Cytoskeleton: Intermediate Filaments - Types and Functions
29. Lecture 29: Cilia and Flagella: Structure, Types, and Mechanisms of Movement
30. Lecture 30: Nucleus: Structure of Nuclear Membrane and Nuclear Lamina
31. Lecture 31: Nucleolus: Structure and Role in Ribosome Production
32. Lecture 32: Chromosome Structure: Euchromatin and Heterochromatin
33. Lecture 33: Nucleosome Concept: Histones and DNA Packaging
34. Lecture 34: Special Chromosomes: Lampbrush and Polytene Chromosomes

Unit 4: Cell Division, Cancer, and Microscopy (11 Lectures)

35. Lecture 35: Mitosis: Phases, Mechanism, and Significance
36. Lecture 36: Meiosis: Phases, Mechanism, and Genetic Variability
37. Lecture 37: Comparison Between Mitosis and Meiosis
38. Lecture 38: Regulation of Cell Cycle: Checkpoints and Control Mechanisms
39. Lecture 39: Brief Account of Causes of Cancer: Genetic and Environmental Factors
40. Lecture 40: Mechanism of Cancer Progression: Tumor Suppressors and Oncogenes
41. Lecture 41: Basics of Light Microscopy: Principles and Applications
42. Lecture 42: Fluorescent Microscopy: Principles and Applications
43. Lecture 43: Electron Microscopy: Transmission and Scanning Electron Microscopes
44. Lecture 44: Centrifugation Techniques: Principles and Types
45. Lecture 45: Applications of Microscopy and Centrifugation in Cell Biology Research

Lesson Plan for Chemistry - CH-101

UNIT-I: Atomic Structure (9 Lectures)

1. Lecture 1: Introduction to Atomic Structure: de-Broglie Matter Waves, Heisenberg's Uncertainty Principle
2. Lecture 2: Atomic Orbitals: Concepts and Types
3. Lecture 3: Quantum Numbers: Definitions and Significance
4. Lecture 4: Aufbau and Pauli Exclusion Principles
5. Lecture 5: Hund's Rule of Maximum Multiplicity: Electronic Configurations
6. Lecture 6: Radial and Angular Wave Functions: Concepts and Applications
7. Lecture 7: Probability Distribution Curves for s, p, and d Orbitals
8. Lecture 8: Shapes of Atomic Orbitals: s, p, d
9. Lecture 9: Summary and Review of Atomic Structure

UNIT-II: Periodic Table (9 Lectures)

10. Lecture 10: General Principles of the Periodic Table: Introduction and Overview
11. Lecture 11: Effective Nuclear Charge: Slater's Rules and Applications
12. Lecture 12: Atomic and Ionic Radii: Trends in the Periodic Table
13. Lecture 13: Ionization Energy: Definition, Determination, and Trends
14. Lecture 14: Electron Affinity: Definition, Determination, and Trends
15. Lecture 15: Electronegativity: Methods of Evaluation and Trends
16. Lecture 16: Comparative Analysis of s & p Block Elements in the Periodic Table
17. Lecture 17: Summary of Periodic Table Trends and Their Applications
18. Lecture 18: Review and Problem-Solving Session on Periodic Table Trends

UNIT-III: Covalent Bond (10 Lectures)

19. Lecture 19: Introduction to Covalent Bond: Valence Bond Theory (VBT)

20. Lecture 20: Limitations of Valence Bond Theory and Directional Characteristics of Covalent Bonds

21. Lecture 21: Hybridization: Types and Examples (BeF2, BF3, CH4)

22. Lecture 22: Shapes of Simple Inorganic Molecules and Ions: PF5, SF6, IF7

23. Lecture 23: Valence Shell Electron Pair Repulsion (VSEPR) Theory: Introduction and Applications

24. Lecture 24: VSEPR Theory Applied to NH3, H3O+, SF4

25. Lecture 25: VSEPR Theory Applied to ClF3, ICl−, H2O

26. Lecture 26: Molecular Orbital (MO) Theory: Heteronuclear Diatomic Molecules (CO, NO)

27. Lecture 27: Bond Strength and Bond Energy: Concepts and Calculations

28. Lecture 28: Percentage Ionic Character from Dipole Moment and Electronegativity Difference

UNIT-IV: Ionic Solids (9 Lectures)

29. Lecture 29: Introduction to Ionic Solids: Structures of NaCl, CsCl, ZnS, CaF2

30. Lecture 30: Radius Ratio Effect and Coordination Number in Ionic Structures

31. Lecture 31: Limitations of Radius Ratio Rule: Analysis and Examples

32. Lecture 32: Lattice Defects: Types and Their Effects on Properties

33. Lecture 33: Semiconductors: Introduction and Applications

34. Lecture 34: Lattice Energy: Concepts and Born-Haber Cycle (Mathematical Derivation Excluded)

35. Lecture 35: Solvation Energy and Its Relation with Solubility of Ionic Solids

36. Lecture 36: Polarizing Power and Polarisability of Ions: Fajan's Rule

37. Lecture 37: Summary and Review of Ionic Solids and Their Properties

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Lesson Plan for Chemistry - CH-103

UNIT-I: Structure and Bonding

Lecture 1: Localized and Delocalized Chemical Bond

Lecture 2: van der Waals' Interactions

Lecture 3: Resonance: Conditions, Effect, and Applications

Lecture 4: Hyperconjugation and Inductive Effect

Lecture 5: Electromeric Effect & Comparisons

Stereochemistry of Organic Compounds-I

6. Lecture 6: Isomerism: Concepts and Types

7. Lecture 7: Optical Isomerism: Elements of Symmetry, Molecular Chirality

8. Lecture 8: Enantiomers: Properties and Stereogenic Centers

9. Lecture 9: Chiral and Achiral Molecules with Two Stereogenic Centers

10. Lecture 10: Diastereomers: Threo, Erythro, and Meso Compounds

11. Lecture 11: Resolution of Enantiomers, Inversion, Retention, Racemization

UNIT-II: Stereochemistry of Organic Compounds-II

12. Lecture 12: Relative and Absolute Configuration: Sequence Rules

13. Lecture 13: R & S System of Nomenclature

14. Lecture 14: Geometric Isomerism: Configuration and E & Z System

15. Lecture 15: Conformational Analysis of Ethane and n-Butane

16. Lecture 16: Conformations of Cyclohexane: Axial and Equatorial Bonds

17. Lecture 17: Newman Projection, Sawhorse Formulae, Configuration vs. Conformation

UNIT-III: Mechanism of Organic Reactions

18. Lecture 18: Curved Arrow Notation: Drawing Electron Movements

19. Lecture 19: Homolytic and Heterolytic Bond Breaking

20. Lecture 20: Electrophiles and Nucleophiles: Types of Reagents

21. Lecture 21: Types of Organic Reactions: Energy Considerations

22. Lecture 22: Reactive Intermediates: Carbocations, Carbanions, Free Radicals

23. Lecture 23: Carbenes, Arynes, Nitrenes: Formation, Structure & Stability

UNIT-IV: Alkanes and Cycloalkanes

24. Lecture 24: IUPAC Nomenclature of Alkanes and Alkyl Groups
25. Lecture 25: Isomerism in Alkanes: Sources and Methods of Formation
26. Lecture 26: Wurtz, Kolbe, Corey-House Reactions, Decarboxylation of Acids
27. Lecture 27: Cycloalkanes: Nomenclature and Synthesis
28. Lecture 28: Photochemical Cycloaddition, Dehalogenation, Pyrolysis
29. Lecture 29: Baeyer's Strain Theory and Strainless Rings

Lesson Plan for Chemistry - CH-105

Unit 1: Gaseous States (11 Lectures)

1. Lecture 1: Introduction to Gaseous States: General Characteristics
2. Lecture 2: Maxwell's Distribution of Velocities: Overview and Calculations
3. Lecture 3: Calculation of Root Mean Square, Average, and Most Probable Velocities
4. Lecture 4: Collision Parameters: Collision Diameter, Number, Frequency, Mean Free Path
5. Lecture 5: Real Gases vs Ideal Gases: Deviations and Causes
6. Lecture 6: Vander Waal's Equation of State: Derivation and Applications
7. Lecture 7: Boyle's Temperature: Calculation and Significance
8. Lecture 8: Behavior of Real Gases: Explanation Using Vander Waal's Equation
9. Lecture 9: PV Isotherms of Real Gases: Continuity of States
10. Lecture 10: The Laws of Corresponding States: Concepts and Applications
11. Lecture 11: Review and Problem-Solving Session on Gaseous States

Unit 2: Critical Phenomenon (7 Lectures)

12. Lecture 12: Critical Phenomenon: Definitions and Concepts

13. Lecture 13: Determination of Critical Temperature, Pressure, and Volume

14. Lecture 14: PV Isotherms of Real Gases: Analysis and Interpretation

15. Lecture 15: Continuity of States: Explanation Using Isotherms

16. Lecture 16: Critical Constants and Vander Waal's Constants: Relationship

17. Lecture 17: Liquefaction of Gases: Methods and Applications

18. Lecture 18: Review and Discussion on Critical Phenomena

Unit 3: Liquid States (7 Lectures)

19. Lecture 19: Structure of Liquids: Overview and Importance

20. Lecture 20: Surface Tension: Concept and Determination

21. Lecture 21: Viscosity: Definition, Measurement, and Applications

22. Lecture 22: Vapour Pressure: Principles and Measurement Techniques

23. Lecture 23: Optical Rotations: Concept and Determination

24. Lecture 24: Properties of Liquids: Summary and Problem-Solving

25. Lecture 25: Review and Discussion on Liquid States

Unit 4: Solid States and Liquid Crystals (10 Lectures)

26. Lecture 26: Classification of Solids: Overview and Examples

27. Lecture 27: Laws of Crystallography: Constancy of Interfacial Angles, Rationality of Indices, Symmetry

28. Lecture 28: Symmetry Elements in Crystals: Explanation and Examples

29. Lecture 29: Unit Cell and Space Lattice: Definitions and Concepts

30. Lecture 30: Bravais Lattices and Crystal Systems: Classification and Properties

31. Lecture 31: X-Ray Diffraction by Crystals: Principles and Techniques

2. Lecture 32: Bragg's Equation: Derivation and Applications

33. Lecture 33: Determination of Crystal Structure: NaCl and KCl Case Studies

34. Lecture 34: Liquid Crystals: Types, Properties, and Applications

35. Lecture 35: Summary and Review of Solid States and Liquid Crystals

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Lesson Plan for Botany - BOT-101

Unit I: Bacteria and Cyanobacteria – (12 Lectures)

1. **Lecture 1: Introduction to Bacteria**

- Overview of bacterial classification
- Importance in various ecosystems

2. **Lecture 2: Bacterial Structure and Function**

- Cell wall structure, membranes, and organelles
- Differences between gram-positive and gram-negative bacteria

3. **Lecture 3: Bacterial Nutrition and Metabolism**

- Types of nutrition (autotrophic, heterotrophic)
- Metabolic pathways

4. **Lecture 4: Bacterial Reproduction**

- Binary fission
- Other modes of reproduction (e.g., conjugation, transformation)

5. **Lecture 5: Economic Importance of Bacteria**

- Role in industry (e.g., fermentation, bioremediation)
- Medical significance (e.g., probiotics, pathogenic bacteria)

6. **Lecture 6: Introduction to Cyanobacteria**

- General characteristics and classification
- Importance in ecosystems

7. **Lecture 7: Structure and Function of Cyanobacteria**

- Cellular organization
- Photosynthesis and nitrogen fixation

8. **Lecture 8: Cyanobacteria: Nostoc**

- Detailed study of Nostoc

- Morphology and life cycle

9. **Lecture 9: Ecological and Economic Importance of Cyanobacteria**

- Role in nitrogen fixation and soil fertility
- Applications in agriculture and biotechnology

10. **Lecture 10: Review of Bacteria and Cyanobacteria**

- Recap of key concepts
- Discussion and Q&A

11. **Lecture 11: Case Studies and Current Research**

- Recent advancements in bacterial research
- Practical examples of cyanobacteria applications

12. **Lecture 12: Assessment and Integration**

- Quiz or assessment
- Integration of concepts across the unit

Unit II: Algae – (12 Lectures)

13. **Lecture 1: Introduction to Algae**

- General characteristics and classification
- Importance in various ecosystems

14. **Lecture 2: Classification of Algae (Lee 1980)**

- Overview of algal classes
- Key features distinguishing each class

15. **Lecture 3: Economic Importance of Algae**

- Applications in food, medicine, and industry

16. **Lecture 4: Volvox (Chlorophyceae)**

- Morphology and structure
- Life-history overview

17. **Lecture 5: Chara (Charophyceae)**

- Morphology and structure
- Life-history overview

18. **Lecture 6: Vaucheria (Xanthophyceae)**

- Morphology and structure
- Life-history overview

19. **Lecture 7: Ectocarpus (Phaeophyceae)**

- Morphology and structure
- Life-history overview

20. **Lecture 8: Polysiphonia (Rhodophyceae)**

- Morphology and structure
- Life-history overview

21. **Lecture 9: Comparative Study of Algae**

- Comparative features of studied algae
- Functional and ecological significance

22. **Lecture 10: Review of Algae**

- Recap of key concepts
- Discussion and Q&A

23. **Lecture 11: Current Research and Applications**

- Recent advancements in algal research
- Practical examples of algal applications

24. **Lecture 12: Assessment and Integration**

- Quiz or assessment
- Integration of concepts across the unit

Unit III: Viruses and Lichens – (12 Lectures)

25. **Lecture 1: Introduction to Viruses**

- General characteristics and classification
- Importance in health and disease

26. **Lecture 2: Structure of Viruses**

- Structure of Tobacco Mosaic Virus (TMV)
- Structure of Bacteriophages

27. **Lecture 3: Viral Replication and Pathogenesis**

- Replication cycles of viruses
- Effects on host organisms

28. **Lecture 4: Economic and Medical Importance of Viruses**

- Role in medicine (vaccines, antiviral drugs)
- Economic impact of viral diseases

29. **Lecture 5: Introduction to Lichens**

- General characteristics and classification
- Symbiosis between fungi and algae/cyanobacteria

30. **Lecture 6: Structure and Function of Lichens**

- Morphology and growth forms
- Reproduction and survival strategies

31. **Lecture 7: Economic and Ecological Importance of Lichens**

- Uses in medicine, pollution monitoring, and cultural practices

32. **Lecture 8: Lichens in Ecosystems**

- Role in biodiversity and ecological balance
- Case studies of lichen communities

33. **Lecture 9: Review of Viruses**

- Recap of key concepts
- Discussion and Q&A

34. **Lecture 10: Review of Lichens**

- Recap of key concepts
- Discussion and Q&A

35. **Lecture 11: Current Research and Applications**

- Recent advancements in virology and lichenology
- Practical applications and implications

Unit IV: Fungi – (12 Lectures)

36. **Lecture 1: Introduction to Fungi**

- General characteristics and classification
- Importance in ecosystems and industry

37. **Lecture 2: Classification of Fungi (Ainsworth 1971)**

- Overview of fungal classes
- Key features distinguishing each class

38. **Lecture 3: Economic Importance of Fungi**

- Applications in food, medicine, and industry

39. **Lecture 4: Phytophthora (Mastigomycotina)**

- Morphology and structure
- Life-history overview

40. **Lecture 5: Mucor (Zygomycotina)**

- Morphology and structure
- Life-history overview

41. **Lecture 6: Penicillium (Ascomycotina)**

- Morphology and structure
- Life-history overview

42. **Lecture 7: Puccinia (Basidiomycotina)**

- Morphology and structure

- Life-history overview

43. **Lecture 8: Colletotrichum (Deuteromycotina)**

- Morphology and structure
- Life-history overview

44. **Lecture 9: Comparative Study of Fungi**

- Comparative features of studied fungi
- Functional and ecological significance

45. **Lecture 10: Review of Fungi**

- Recap of key concepts
- Discussion and Q&A

Lesson Plan for Botany - BOT-103

Unit 1: Introduction to Ecology and Environmental Factors

Lecture 1: Introduction to Ecology

- Definition of Ecology
- Scope and importance
- Levels of organization (individual, population, community, ecosystem, biome, biosphere)

Lecture 2: Environmental Factors Overview

- Introduction to environmental factors
- Classification into climatic, edaphic, topographic, and biotic factors

Lecture 3: Climatic Factors I - Water and Humidity

- Impact of water and humidity on ecosystems
- Adaptations to water availability

Lecture 4: Climatic Factors II - Wind, Light, and Temperature

- Effects of wind, light, and temperature on organisms
- Examples of adaptation to these factors

Lecture 5: Edaphic Factors I - Soil Profile

- Soil horizons and their characteristics

- Soil types and their properties

Lecture 6: Edaphic Factors II - Physico-Chemical Properties of Soil

- Soil texture, pH, and nutrient content
- Impact on plant growth and distribution

Lecture 7: Topographic Factors

- Influence of topography on ecosystems (e.g., altitude, slope)
- Effects on climate and vegetation

Lecture 8: Biotic Factors

- Species interactions (competition, predation, mutualism, etc.)
- Role of biotic factors in shaping ecosystems

Lecture 9: Adaptations to Water Stress - Hydrophytes

- Morphological and anatomical features of hydrophytes
- Examples and case studies

Lecture 10: Adaptations to Water Stress - Xerophytes

- Morphological and anatomical features of xerophytes
- Examples and case studies

Lecture 11: Adaptations to Water Stress - Halophytes

- Morphological and anatomical features of halophytes
- Examples and case studies

Lecture 12: Summary and Integration

- Review of key concepts from the unit
- Integration of different types of environmental factors and adaptations

Unit 2: Population and Community Ecology

Lecture 1: Introduction to Population Ecology

- Basic concepts and definitions
- Population characteristics (density, distribution, age structure)

Lecture 2: Biotic Potential and Growth Curves

- Concepts of biotic potential
- Types of growth curves (exponential and logistic)

Lecture 3: Ecotypes and Ecads

- Definitions and differences
- Examples and ecological significance

Lecture 4: Introduction to Community Ecology

- Concepts and definitions
- Importance of community interactions

Lecture 5: Characteristics of Ecological Communities

- Qualitative and quantitative aspects
- Analytical and synthetic characteristics

Lecture 6: Methods of Community Analysis I

- Sampling methods and techniques
- Data collection and interpretation

Lecture 7: Methods of Community Analysis II

- Analytical methods (e.g., diversity indices, evenness)
- Synthetic methods (e.g., ordination, classification)

Lecture 8: Ecological Succession I

- Definition and types of ecological succession
- Primary vs. secondary succession

Lecture 9: Ecological Succession II

- Stages of succession and climax communities
- Case studies and examples

Lecture 10: Community Dynamics

- Factors influencing community dynamics
- Disturbance and recovery processes

Lecture 11: Human Impact on Communities

- Effects of human activities on ecological communities
- Examples and case studies

Lecture 12: Summary and Integration

- Review of key concepts from the unit
- Integration of population and community ecology

Unit 3: Ecosystem and Biogeochemical Cycles

Lecture 1: Introduction to Ecosystems

- Definition and components of ecosystems
- Types of ecosystems

Lecture 2: Ecosystem Structure

- Biotic and abiotic components
- Key elements of ecosystem structure

Lecture 3: Trophic Levels

- Concept of trophic levels
- Producers, consumers, and decomposers

Lecture 4: Food Chains and Food Webs

- Definition and examples of food chains
- Complexities of food webs

Lecture 5: Ecological Pyramids

- Types of ecological pyramids (numbers, biomass, energy)
- Interpretation and examples

Lecture 6: Energy Flow in Ecosystems

- Energy transfer and efficiency
- Laws of thermodynamics in ecosystems

Lecture 7: Carbon Cycle I

- Overview of the carbon cycle
- Carbon sources and sinks

Lecture 8: Carbon Cycle II

- Human impact on the carbon cycle
- Case studies and implications

Lecture 9: Nitrogen Cycle I

- Overview of the nitrogen cycle
- Nitrogen fixation and assimilation

Lecture 10: Nitrogen Cycle II

- Nitrification, denitrification, and human impacts
- Case studies and implications

Lecture 11: Hydrological Cycle I

- Overview of the hydrological cycle
- Key processes (evaporation, condensation, precipitation)

Lecture 12: Hydrological Cycle II

- Human impacts on the water cycle
- Case studies and implications

Unit 4: Phyto-geography, Environmental Pollution, and Global Change

Lecture 1: Introduction to Phyto-geography

- Definition and scope
- Importance of phyto-geographical studies

Lecture 2: Phyto-geographical Regions of India

- Major phyto-geographical regions
- Characteristics and significance

Lecture 3: Vegetation Types of India - Forests

- Types of forests in India
- Forest ecosystems and their importance

Lecture 4: Introduction to Environmental Pollution

- Definition and types of pollution (air, water, soil)

Lecture 5: Air Pollution Sources and Control

- Major sources of air pollution
- Control measures and technologies

Lecture 6: Water Pollution Sources and Control

- Major sources of water pollution
- Control measures and technologies

Lecture 7: Impacts of Air and Water Pollution

- Environmental and health impacts
- Case studies and examples

Lecture 8: Global Change Overview

- Introduction to global environmental changes
- Key issues and drivers

Lecture 9: Greenhouse Effect and Greenhouse Gases

- Mechanisms of the greenhouse effect
- Major greenhouse gases and their sources

Lecture 10: Impacts of Global Warming and Carbon Trading

- Effects on climate, ecosystems, and human societies
- Case studies and projections
- Carbon trading and mitigation strategies

SCHOOL OF BASIC AND APPLIED SCIENCES

(CBCS Scheme of Studies & Examinations w. e. f. 2023-26 onwards)

B.Sc. (CBZ) I Year

II Semester

(Chemistry, Botany and Zoology)

Scheme 2nd semester

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	**Chemistry**	CH-102	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-104	Organic Chemistry	2	0	20	30	50	3	2
3		CH-106	Physical Chemistry	2	0	20	30	50	3	2
4		CH-108	Chemistry Lab-II	0	3/6	20	30	50	4	3
5	**Botany**	BOT-102	Biodiversity (Archegoniate)	3	0	20	30	50	3	3
6		BOT-104	Plant Taxonomy	3	0	20	30	50	3	3
7		BOT-106	Botany Lab-II	0	2/4	20	30	50	4	2
8	**Zoology**	ZOO-102	Life and Diversity from Annelida to Hemichordate	3	0	20	30	50	3	3
9		ZOO-104	Developmental Biology	3	0	20	30	50	3	3
10		ZOO-106	Zoology Lab-II	0	2/4	20	30	50	3	2
11	Open Elective/Skill Enhancement Course (SEC)*	-	-	2	0	20	30	50	3	2
		TOTAL		20	14			550		27

SCHOOL OF BASIC & APPLIED SCIENCES

(Syllabus & Scheme of Studies w.e.f. 2023-26)

B.Sc. (CBZ) I Year (II semester)

Chemistry

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1. Inorganic Chemistry (CH-102)

Course Outcomes:

1. To know the conception of different types of hydrogen bonding and the effects of these. To learn about van der Waals forces on properties of substances.
2. To know about the diagonal relationship among s- block elements and about hydrides, oxides, hydroxides and halides of s-block elements.
3. Learn about chemistry of noble gases with emphasizing to xenon.
4. To know about the physical and chemical properties of p-block elements and have knowledge about the boron family elements their structure, preparation and properties of diborane and borazine.
5. Students can gain thorough knowledge about elements of carbon and nitrogen family and concept of catenation, carbides and fluorocarbons. They will know about the elements of oxygen family and have knowledge about the chemical properties of oxides of sulphur.

2. Organic Chemistry (CH-104)

Course Outcomes:

1. To have sound knowledge in alkenes and their properties.
2. Learn the basics of aromaticity and Huckel's rule. To know preparation and chemical reactions of different aromatic hydrocarbons.
3. Sound knowledge of dienes and their chemical reactions.
4. Get knowledge about the mechanism of SN1 and SN2 reactions and other various chemical reactions of alkyl and aryl halides.
5. Understand cyclo alkanes.

3.Physical Chemistry (CH-106)

Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts in Chemical Kinetics.
2. Students will be able to understand the causes behind the different types of chemical reactions and the temperature dependence of reaction rate.
3. Students will be able to understand the basic principle of the electrical conduction in liquid state and how is it measured.
4. Students will learn the principles of equipment and instruments used in the chemistry laboratory. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state and its' application in different cases.

Botany

Biodiversity (Archegoniates) (BOT-102)

Course Outcomes:

1. Recognize, and describe the morphological characteristics of bryophytes and pteridophytes.
2. Draw and describe the gametophytic and sporophytic life cycle of bryophytes and pteridophytes.
3. Identify the given specimens in laboratory and field-based study.
4. Understand the origin and evolution of Land plants.
5. Understand the affinities of thallophytes with higher plants.
6. Evaluate the importance of Archegoniate.

Plant Taxonomy (BOT-104)

Course Outcomes:

1. Employ various taxonomic resources for plant identification and herbarium collections.
2. 2.Outline and describe the different parameters of classification
3. 3.Identify, and describe the morphological characteristics of Dicotyledons and Monocotyledonous families.
4. 4.Draw and describe floral formulas and diagrams of Angiosperms.
5. 5.Recognize the economic importance (Medicinal as well as Industrial uses) of important members of Angiosperms.

6. 6.Design, carry out, and present a laboratory-based study in flowering plants.

Zoology

Life and Diversity of Annelida to Hemichordate (ZOO-102)

Course Outcomes:

1. Students will be able to describe unique characters, metamerism mechanism and recognize life functions of Phylum Annelida.
2. Students will be able to identify the diversity and ecological role of Phylum Arthropoda especially of cockroach.
3. Students will be able to describe the general characteristics and classification biodiversity, economic importance, torsion and detorsion mechanism and evolutionary relationship belonging to Phylum Mollusca.
4. Students will be able to understand the unique characteristics, economic importance, concept of
5. Echinoderm larvae and Aristotle's latern belonging to Phylum Echinodermata.
6. Students will be able to describe the general characteristics and classification of Phylum Hemichordata.

Developmental Biology(Z00-104)

Course Outcomes:

1. Students will be able to understand different classical and experimental developmental theories
2. Students will be able to describe the events that lead up to fertilization, its stages and cellular mechanisms for gastrulation, and embryonic development.
3. Students will be able to understand the concept of extra-embryonic membranes, implantation of embryo.
4. Students will be able to describe the process of blastulation and gastrulation of frog and chick.
5. Students will be able to understand the phenomenon of regeneration, competence, determination and cell differentiation, neural induction and its genetic basis.

CO-PO MAPPING

CHEMISTRY

CH-102											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	2	1	3	2	2	1

CH-104											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	3	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	3	2	2	1

CH-106											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	1	2	2	1

CO-PO MAPPING

BOTANY

BOT-102											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1
	CO6	2	2	1	2	1	2	1	2	1	2

BOT-104											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	√	2	2	1
	CO6	2	1	2	1	3	2	2	2	1	2

BOT-106											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

CO-PO MAPPING

ZOOLOGY

ZOO-102											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-104											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-106											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

PSO-PO Mapping

	PO01	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PSO-01**	**PSO-02**	**PSO-03**
Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment	2.20	1.59	1.34	0.73	1.34	0.37	1.47	1.10	0.98	0.98	1.96	2.20	1.83	1.10

Lesson Plan for Zoology - ZOO-102

Unit 1: Phylum – Annelida (12 Lectures)

1. Lecture 1: Introduction to Annelida - General Characteristics
2. Lecture 2: Classification of Annelida up to Order Level
3. Lecture 3: Biodiversity of Annelida - Overview
4. Lecture 4: Economic Importance of Annelida
5. Lecture 5: Type Study: Pheretima (Earthworm) - External Morphology
6. Lecture 6: Pheretima (Earthworm) - Digestive System
7. Lecture 7: Pheretima (Earthworm) - Circulatory and Respiratory Systems
8. Lecture 8: Pheretima (Earthworm) - Nervous System and Reproduction
9. Lecture 9: Metamerism in Annelida - Concept and Significance
10. Lecture 10: Trochophore Larva: Structure and Development
11. Lecture 11: Trochophore Larva: Affinities and Evolutionary Significance

12. Lecture 12: Ecological and Environmental Roles of Annelids

Unit 2: Phylum - Arthropoda (10 Lectures)

13. Lecture 13: Introduction to Arthropoda - General Characteristics
14. Lecture 14: Classification of Arthropoda up to Order Level
15. Lecture 15: Biodiversity of Insects - Overview
16. Lecture 16: Economic Importance of Insects
17. Lecture 17: Type Study: Periplaneta (Cockroach) - External Morphology
18. Lecture 18: Periplaneta (Cockroach) - Digestive System
19. Lecture 19: Periplaneta (Cockroach) - Respiratory and Circulatory Systems
20. Lecture 20: Periplaneta (Cockroach) - Nervous System and Reproduction
21. Lecture 21: Social Insects: Characteristics and Examples (Bees, Ants, Termites)
22. Lecture 22: Arthropods as Vectors of Diseases

Unit 3: Phylum – Mollusca (12 Lectures)

23. Lecture 23: Introduction to Mollusca - General Characteristics
24. Lecture 24: Classification of Mollusca up to Order Level
25. Lecture 25: Biodiversity of Mollusca - Overview
26. Lecture 26: Economic Importance of Mollusca (Pearls, Food, Industry)
27. Lecture 27: Type Study: Pila (Apple Snail) - External Morphology
28. Lecture 28: Pila (Apple Snail) - Digestive System and Feeding Mechanism
29. Lecture 29: Pila (Apple Snail) - Respiratory System: Gills and Lungs
30. Lecture 30: Pila (Apple Snail) - Reproductive System
31. Lecture 31: Torsion and Detorsion in Gastropoda - Concept and Significance
32. Lecture 32: Molluscan Shells: Structure, Types, and Formation
33. Lecture 33: Respiration and Foot in Mollusca - Adaptations and Functions
34. Lecture 34: Molluscan Larvae: Types and Development

Unit 4: Phylum - Echinodermata & Hemichordata (11 Lectures)

35. Lecture 35: Introduction to Echinodermata - General Characteristics
36. Lecture 36: Classification of Echinodermata up to Order Level
37. Lecture 37: Biodiversity of Echinodermata - Overview
38. Lecture 38: Economic Importance of Echinodermata (Fisheries, Biomedicine)

39. Lecture 39: Type Study: Asterias (Sea Star) - External Morphology
40. Lecture 40: Asterias (Sea Star) - Water Vascular System and Locomotion
41. Lecture 41: Echinoderm Larvae: Structure and Development
42. Lecture 42: Aristotle's Lantern: Structure and Function in Echinoidea
43. Lecture 43: Introduction to Hemichordata: General Characteristics and Classification
44. Lecture 44: Type Study: Balanoglossus - Structure and Function
45. Lecture 45: Hemichordates and Their Evolutionary Significance

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Lesson Plan for Zoology - ZOO-104

Unit 1: History and Basic Concepts (10 Lectures)

1. Lecture 1: Introduction to Developmental Biology: Definition and Scope
2. Lecture 2: Historical Review of Developmental Biology: Key Discoveries and Theories
3. Lecture 3: Preformation vs. Epigenesis: Historical Perspectives and Modern Understanding
4. Lecture 4: Mosaic and Regulative Development: Concepts and Mechanisms
5. Lecture 5: Branches of Developmental Biology: Embryology, Teratology, and Evolutionary Developmental Biology
6. Lecture 6: Significance of Developmental Biology: Applications in Medicine and Research
7. Lecture 7: The Role of Genetics in Development: Gene Expression and Regulation
8. Lecture 8: Developmental Biology and Evolution: Evo-Devo Concepts
9. Lecture 9: Experimental Embryology: Key Techniques and Discoveries
10. Lecture 10: Introduction to Model Organisms in Developmental Biology: Examples and Importance

Unit 2: Gametogenesis, Fertilization, and Early Embryonic Development (12 Lectures)

11. Lecture 11: Generalized Structure of Mammalian Ovum: Structure and Components
12. Lecture 12: Generalized Structure of Mammalian Sperm: Structure and Function
13. Lecture 13: Spermatogenesis: Process and Hormonal Regulation
14. Lecture 14: Oogenesis: Process and Hormonal Regulation
15. Lecture 15: Types of Eggs: Classification Based on Yolk Content and Distribution
16. Lecture 16: Egg Membranes: Types and Functions
17. Lecture 17: Fertilization: Mechanism, Monospermy, and Polyspermy

18. Lecture 18: Parthenogenesis: Types, Mechanisms, and Examples
19. Lecture 19: Cleavage: Planes and Patterns in Different Animal Groups
20. Lecture 20: Formation and Types of Blastula: Fate of Germ Layers
21. Lecture 21: Extra-Embryonic Membranes in Mammals: Structure and Functions
22. Lecture 22: Implantation of the Embryo in Humans: Process and Types of Placenta

Unit 3: Gastrulation and Embryonic Induction (13 Lectures)

23. Lecture 23: Gastrulation: Process and Mechanisms in Amphibians (Frog)
24. Lecture 24: Gastrulation: Process and Mechanisms in Birds (Chick)
25. Lecture 25: Formation of Three Germinal Layers: Ectoderm, Mesoderm, and Endoderm
26. Lecture 26: Fate Map Construction: Techniques and Importance
27. Lecture 27: Neurulation in Frog and Chick: Formation of Neural Tube
28. Lecture 28: Embryonic Induction: Concepts and Historical Perspective
29. Lecture 29: Primary Organizers: Spemann and Mangold's Experiment
30. Lecture 30: Neural Induction: Role of the Grey Crescent and Notochord
31. Lecture 31: Regional Specificity of Primary Inductors: Mechanisms and Examples
32. Lecture 32: Secondary Induction: Eye and Lens Induction in Vertebrates
33. Lecture 33: Chemical and Genetic Basis of Embryonic Induction
34. Lecture 34: Pattern Formation and Morphogen Gradients: Concepts and Examples
35. Lecture 35: Teratogenesis: Causes and Mechanisms of Developmental Disorders

Unit 4: Cell Differentiation, Regeneration, and Experimental Techniques (10 Lectures)

36. Lecture 36: Concepts of Competence, Determination, and Differentiation
37. Lecture 37: Molecular Mechanisms of Cell Differentiation: Gene Expression and Regulation
38. Lecture 38: Stem Cells: Types, Potency, and Role in Development
39. Lecture 39: Repair and Regeneration: Concepts and Mechanisms
40. Lecture 40: Degree of Regenerative Ability in Non-Chordates: Examples and Mechanisms
41. Lecture 41: Degree of Regenerative Ability in Chordates: Examples and Mechanisms
42. Lecture 42: Categories and Mechanisms of Regeneration: Epimorphosis, Morphallaxis, and Compensatory Regeneration
43. Lecture 43: Control of Regeneration: Role of Genes and Hormones
44. Lecture 44: Physiological Processes Involved in Regeneration: Wound Healing and Tissue Repair

45. Lecture 45: Experimental Techniques in Developmental Biology: Microscopy, Fate Mapping, and Genetic Manipulation

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Lesson Plan for Chemistry - CH-102

Unit 1: Hydrogen Bonding, Vander Waals Forces, and Metallic Bond

1. Lecture 1: Introduction to Hydrogen Bonding: Definition and Types
2. Lecture 2: Effects of Hydrogen Bonding on Physical Properties
3. Lecture 3: Applications of Hydrogen Bonding in Chemistry
4. Lecture 4: Overview of Vander Waals Forces: Types and Significance
5. Lecture 5: Introduction to Metallic Bond: Basic Concepts
6. Lecture 6: Band Theory of Metallic Bond
7. Lecture 7: Types and Applications of Semiconductors

Unit 2: s-Block Elements and Noble Gases

8. Lecture 8: Comparative Study of s-Block Elements

9. Lecture 9: Diagonal Relationships in s-Block Elements
10. Lecture 10: Hydrides of s-Block Elements: Properties and Functions
11. Lecture 11: Solvation and Complexation Tendencies in s-Block Elements
12. Lecture 12: Chemical Properties and Low Reactivity of Noble Gases
13. Lecture 13: Chemistry of Xenon: Fluorides, Oxides, and Oxyfluorides

Unit 3: p-Block Elements

14. Lecture 14: Comparative Study of p-Block Elements

15. Lecture 15: Boron Family: Diborane - Properties and Structure
16. Lecture 16: Borazine: Chemical Properties and Structure

17. Lecture 17: Trihalides of Boron: Acid Character and Structure

18. Lecture 18: Carbon Family: Catenation and p–d Bonding

19. Lecture 19: Carbides and Fluorocarbons

20. Lecture 20: Silicates and Silicones: Structural Aspects and Uses

Unit 4: Nitrogen, Oxygen, and Halogen Families

21. Lecture 21: Nitrogen Family: Structures of Oxides and Oxyacids

22. Lecture 22: Phosphorus: White, Yellow, and Red Allotropes

23. Lecture 23: Oxygen Family: Oxyacids of Sulfur - Structures and Acid Strength

24. Lecture 24: Hydrogen Peroxide: Structure, Properties, and Uses

25. Lecture 25: Halogen Family: Basic Properties and Types of Interhalogens

26. Lecture 26: Hydro and Oxyacids of Chlorine: Structure and Acid Strength

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Lesson Plan for Chemistry - CH-104

UNIT-I: Alkenes (11 Lectures)

1. Lecture 1: Nomenclature of Alkenes
2. Lecture 2: Mechanisms of Dehydration of Alcohols
3. Lecture 3: Dehydrohalogenation of Alkyl Halides
4. Lecture 4: The Saytzeff Rule
5. Lecture 5: Hofmann Elimination
6. Lecture 6: Physical Properties and Relative Stabilities of Alkenes
7. Lecture 7: Hydrogenation: Mechanism and Reactions
8. Lecture 8: Electrophilic and Free Radical Additions
9. Lecture 9: Markownikoff's Rule and Hydroboration-Oxidation

10. Lecture 10: Oxymercuration-Reduction and Ozonolysis

11. Lecture 11: Hydration, Hydroxylation, and Oxidation with KMnO4

UNIT-II: Arenes and Aromaticity (10 Lectures)

12. Lecture 12: Nomenclature of Benzene Derivatives

13. Lecture 13: Aromatic Nucleus and Side Chain

14. Lecture 14: Huckel Rule and Aromaticity

15. Lecture 15: Aromatic, Antiaromatic, and Non-Aromatic Compounds

16. Lecture 16: Aromatic Electrophilic Substitution: General Mechanism

17. Lecture 17: Nitration and Halogenation of Arenes

18. Lecture 18: Sulphonation and Friedel-Crafts Reaction

19. Lecture 19: Energy Profile Diagrams in Aromatic Substitution

20. Lecture 20: Activating and Deactivating Substituents

21. Lecture 21: Orientation in Aromatic Electrophilic Substitution

UNIT-III: Dienes and Alkynes (9 Lectures)

22. Lecture 22: Nomenclature and Classification of Dienes

23. Lecture 23: Structure of Butadiene and 1,2 and 1,4 Additions

24. Lecture 24: Electrophilic and Free Radical Mechanism in Dienes

25. Lecture 25: Diels-Alder Reaction: Mechanism and Examples

26. Lecture 26: Nomenclature, Structure, and Bonding in Alkynes

27. Lecture 27: Methods of Formation of Alkynes

28. Lecture 28: Chemical Reactions of Alkynes

29. Lecture 29: Acidity of Alkynes

30. Lecture 30: Electrophilic and Nucleophilic Addition Reactions

UNIT-IV: Alkyl and Aryl Halides (9 Lectures)

31. Lecture 31: Nomenclature and Classes of Alkyl Halides

32. Lecture 32: Methods of Formation of Alkyl Halides

33. Lecture 33: Chemical Reactions of Alkyl Halides

34. Lecture 34: Mechanisms and Stereochemistry of SN2 Reactions

35. Lecture 35: Mechanisms and Stereochemistry of SN1 Reactions

36. Lecture 36: Energy Profile Diagrams for SN2 and SN1 Reactions

37. Lecture 37: Formation and Reactions of Aryl Halides

38. Lecture 38: Addition-Elimination Mechanism in Nucleophilic Aromatic Substitution

39. Lecture 39: Elimination-Addition Mechanism in Nucleophilic Aromatic Substitution

40. Lecture 40: Reactivity of Alkyl, Allyl, Vinyl, and Aryl Halides

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Lesson Plan for Chemistry - CH-106

Unit 1: Kinetics-I (7 Lectures)

1. Lecture 1: Introduction to Reaction Kinetics: Rate, Rate Equation
2. Lecture 2: Factors Influencing Reaction Rates: Concentration, Temperature
3. Lecture 3: Pressure, Solvent, Light, and Catalyst Effects
4. Lecture 4: Reaction Order: Definitions and Concepts
5. Lecture 5: Integrated Rate Expressions: Zero, First Order
6. Lecture 6: Second and Third Order Reactions: Half-life Period
7. Lecture 7: Methods for Determining Reaction Order

Unit 2: Kinetics-II (6 Lectures)

8. Lecture 8: Temperature's Effect on Reaction Rate: Arrhenius Equation

9. Lecture 9: Simple Collision Theory: Unimolecular Collisions

10. Lecture 10: Bimolecular Collisions: Theoretical Concepts

11. Lecture 11: Transition State Theory: Overview

12. Lecture 12: Transition State Theory: Bimolecular Reactions

13. Lecture 13: Comparative Analysis of Theories

Unit 3: Electrochemistry-I (8 Lectures)

14. Lecture 14: Electrolytic Conduction: Factors and Concepts

15. Lecture 15: Conductance Types: Specific, Molar, Equivalent

16. Lecture 16: Variation of Conductance with Concentration

17. Lecture 17: Arrhenius Theory of Ionization

18. Lecture 18: Ostwald's Dilution Law and Applications

19. Lecture 19: Debye-Huckel-Onsager's Equation: Introduction

20. Lecture 20: Transport Number: Definition and Determination

21. Lecture 21: Numerical Problems on Conductance and Transport Numbers

Unit 4: Electrochemistry-II (9 Lectures)

22. Lecture 22: Kohlrausch's Law: Definition and Applications

23. Lecture 23: Molar Ionic Conductance: Effects of Viscosity, Temperature

24. Lecture 24: Calculation of Conductance: Weak Electrolytes

25. Lecture 25: Conductometry: Applications in Chemistry

26. Lecture 26: Degree of Dissociation: Determination Methods

27. Lecture 27: Solubility Product of Sparingly Soluble Salts

28. Lecture 28: Conductometric Titrations: Overview and Examples

29. Lecture 29: pH and pKa: Definitions, Buffer Solutions

30. Lecture 30: Buffer Mechanisms and Henderson-Hasselbalch Equation

Unit-I: Bryophyta

Lecture 1: Introduction to Bryophyta

- General characteristics of Bryophytes
- Evolutionary significance and ecological roles

Lecture 2: Classification of Bryophyta (Smith, 1935)

- Overview of the classification system
- Key features of major classes

Lecture 3: Alternation of Generations in Bryophytes

- Definition and importance
- Comparison of gametophyte and sporophyte generations

Lecture 4: Marchantia (Hepaticopsida) – Structure

- Morphology of thalloid liverworts
- Special structures (e.g., gemma cups)

Lecture 5: Marchantia (Hepaticopsida) – Reproduction

- Asexual reproduction (e.g., gemmae)
- Sexual reproduction (e.g., archegonia and antheridia)

Lecture 6: Anthoceros (Anthocerotopsida) – Structure

- Morphological features
- Unique characteristics compared to other Bryophytes

Lecture 7: Anthoceros (Anthocerotopsida) – Reproduction

- Asexual reproduction mechanisms
- Sexual reproduction and sporophyte development

Lecture 8: Funaria (Bryopsida) – Structure

- Morphological characteristics of mosses
- Specialized structures (e.g., protonema)

Lecture 9: Funaria (Bryopsida) – Reproduction

- Asexual reproduction (e.g., fragmentation)
- Sexual reproduction (e.g., sporophyte structure and spore formation)

Lecture 10: Comparison of Bryophytes

- Comparative analysis of Marchantia, Anthoceros, and Funaria
- Key similarities and differences

Lecture 11: Ecological Significance of Bryophytes

- Roles in ecosystems (e.g., soil formation, habitat for organisms)
- Applications in environmental monitoring

Lecture 12: Review and Discussion

- Recap of key concepts
- Q&A and discussion of challenging topics

Unit-II: Pteridophyta and Gymnosperms

Lecture 1: Introduction to Pteridophyta

- General characteristics of Pteridophytes
- Evolutionary significance and ecological roles

Lecture 2: Classification of Pteridophyta (Proskauer, 1957)

- Overview of the classification system
- Key features of major classes

Lecture 3: Alternation of Generations in Pteridophytes

- Detailed examination of the life cycle
- Differences from Bryophytes

Lecture 4: Introduction to Gymnosperms

- General characteristics of Gymnosperms
- Evolutionary importance

Lecture 5: Classification of Gymnosperms (Smith, 1955)

- Overview of the classification system up to family
- Key features of major families

Lecture 6: Rhynia (Psilopsida) – Structure

- Morphological features and significance
- Comparison with other early vascular plants

Lecture 7: Rhynia (Psilopsida) – Reproduction

- Reproductive structures and processes
- Comparison with other Pteridophytes

Lecture 8: Selaginella (Lycopsida) – Structure

- Morphology and adaptations
- Comparison with other lycophytes

Lecture 9: Selaginella (Lycopsida) – Reproduction

- Reproductive structures and mechanisms
- Comparison with other Pteridophytes

Lecture 10: Equisetum (Sphenopsida) – Structure

- Morphological characteristics and adaptations
- Unique features (e.g., silica deposits)

Lecture 11: Equisetum (Sphenopsida) – Reproduction

- Reproductive structures and processes
- Comparison with other Pteridophytes

Lecture 12: Pteridophyte Review and Ecological Importance

- Recap of key concepts for Rhynia, Selaginella, and Equisetum
- Ecological and economic significance of Pteridophytes

Unit-III: Pteridophyta - Detailed Study

Lecture 1: Introduction to Pteridophyta Structures

- Overview of structure and function in Pteridophytes

Lecture 2: Rhynia (Psilopsida) – Detailed Structure

- In-depth examination of morphology and anatomical features

Lecture 3: Rhynia (Psilopsida) – Detailed Reproduction

- Detailed study of reproductive mechanisms and structures

Lecture 4: Selaginella (Lycopsida) – Detailed Structure

- In-depth examination of morphology and anatomical features

Lecture 5: Selaginella (Lycopsida) – Detailed Reproduction

- Detailed study of reproductive mechanisms and structures

Lecture 6: Equisetum (Sphenopsida) – Detailed Structure

- In-depth examination of morphology and anatomical features

Lecture 7: Equisetum (Sphenopsida) – Detailed Reproduction

- Detailed study of reproductive mechanisms and structures

Lecture 8: Pteris (Pteropsida) – Structure

- Morphological features and adaptations
- Comparison with other Pteridophytes

Lecture 9: Pteris (Pteropsida) – Reproduction

- Detailed study of reproductive structures and processes

Lecture 10: Comparative Analysis of Pteridophytes

- Comparison of Rhynia, Selaginella, Equisetum, and Pteris
- Key similarities and differences

Lecture 11: Ecological and Economic Importance of Pteridophytes

- Roles in ecosystems and human uses
- Conservation issues

Lecture 12: Review and Discussion

- Recap of key concepts
- Q&A and discussion of challenging topics

Unit-IV: Gymnosperms

Lecture 1: Introduction to Gymnosperms

- Overview of morphology, anatomy, and reproduction

Lecture 2: Cycas – Morphology

- Detailed examination of the structure of Cycas

Lecture 3: Cycas – Anatomy

- In-depth study of anatomical features and adaptations

Lecture 4: Cycas – Reproduction

- Detailed study of reproductive structures and processes

Lecture 5: Pinus – Morphology

- Detailed examination of the structure of Pinus

Lecture 6: Pinus – Anatomy

- In-depth study of anatomical features and adaptations

Lecture 7: Pinus – Reproduction

- Detailed study of reproductive structures and processes

Lecture 8: Ephedra – Morphology

- Detailed examination of the structure of Ephedra

Lecture 9: Ephedra – Anatomy

- In-depth study of anatomical features and adaptations

Lecture 10: Ephedra – Reproduction

- Detailed study of reproductive structures and processes

Lecture 11: Ecological and Economic Importance of Gymnosperms

- Roles in ecosystems and human uses
- Conservation issues

Lecture 12: Review and Discussion

- Recap of key concepts
- Q&A and discussion of challenging topics

Unit-I: Taxonomy and Systematics

Lecture 1: Introduction to Taxonomy and Systematics

- Definitions and importance
- Historical development and scope

Lecture 2: Fundamental Components of Taxonomy

- Identification: Methods and techniques
- Classification: Principles and systems

Lecture 3: Description and Nomenclature

- Writing taxonomic descriptions
- Principles and rules of botanical nomenclature

Lecture 4: Phylogeny and Its Role in Taxonomy

- Understanding phylogenetic relationships
- Methods to determine evolutionary relationships

Lecture 5: Chemotaxonomy

- Definition and importance
- Applications in plant identification and classification

Lecture 6: Cytotaxonomy

- Definition and role in taxonomy
- Cytological methods and their application

Lecture 7: Botanical Nomenclature: Principles and Rules

- Principle of priority
- Rules of nomenclature and their application

Lecture 8: Type Concept in Nomenclature

- Concept of type specimens
- Types of types (holotype, isotype, etc.)

Lecture 9: Author Citation and Taxonomic Ranks

- How to cite authors correctly
- Understanding and applying taxonomic ranks

Lecture 10: Keys to Plant Identification

- Types of identification keys (dichotomous, multi-access)
- Constructing and using keys for plant identification

Lecture 11: Review of Taxonomy and Systematics

- Summary of key concepts
- Discussion and clarification of complex topics

Lecture 12: Practical Application of Taxonomy

- Case studies and real-world applications
- Practical exercises in plant identification and classification

Unit-II: Herbarium, Botanical Gardens, and Documentation

Lecture 1: Introduction to Herbarium

- Definition, purpose, and history
- Structure and organization of herbaria

Lecture 2: Importance of Herbaria

- Role in taxonomy and research
- Examples of major herbaria

Lecture 3: Botanical Gardens: Overview

- Definition and historical development
- Types of botanical gardens and their functions

Lecture 4: Importance of Botanical Gardens

- Conservation, research, and education
- Examples and case studies

Lecture 5: Documentation of Floristic Diversity

- Purpose and importance of floras
- Overview of monographs and their role

Lecture 6: Botanical Journals

- Types of botanical journals and their significance
- How to use and access botanical literature

Lecture 7: Flower Structure and Types of Inflorescences

- Basic flower structure and functions
- Types of inflorescences and their characteristics

Lecture 8: Inflorescence Types: Detailed Examination

- Racemose and cymose inflorescences
- Examples and identification

Lecture 9: Documentation Techniques for Floristic Diversity

- Methods for documenting plant species
- Importance of accurate documentation

Lecture 10: Herbarium Techniques and Preservation

- Techniques for collecting and preserving specimens
- Preparing herbarium specimens

Lecture 11: Review of Herbaria and Botanical Gardens

- Summary of key concepts
- Discussion of practical applications

Lecture 12: Practical Session on Herbarium Techniques

- Hands-on activities related to herbarium preparation
- Fieldwork or virtual herbarium exploration

Unit-III: Classification Systems

Lecture 1: Introduction to Classification Systems

- Overview of classification methods
- Importance and applications

Lecture 2: Artificial Classification

- Characteristics and examples
- Advantages and limitations

Lecture 3: Natural Classification

- Principles and examples
- Comparison with artificial classification

Lecture 4: Phylogenetic Classification

- Definition and principles
- Methods used in phylogenetic classification

Lecture 5: Bentham and Hooker System of Classification

- Overview of their classification system
- Key features and organization up to series

Lecture 6: Detailed Study of Bentham and Hooker System

- Analysis of specific groups within the system
- Case studies and examples

Lecture 7: Introduction to Angiosperm Phylogeny Group (APG)

- Overview and significance of APG
- Key concepts and objectives

Lecture 8: APG Classification System

- General introduction and structure
- Major phylogenetic groups and their relationships

Lecture 9: Comparison of Classification Systems

- Differences and similarities between Bentham and Hooker, and APG
- Practical implications of each system

Lecture 10: Applications of Classification Systems

- How classification systems influence taxonomy and research
- Examples and case studies

Lecture 11: Review of Classification Systems

- Summary of key concepts
- Discussion and clarification of complex topics

Lecture 12: Practical Session on Classification

- Exercises in applying classification systems
- Case studies and problem-solving activities

Unit-IV: Diversity of Flowering Plants

Lecture 1: Introduction to Plant Diversity

- Overview of flowering plant diversity
- Importance of studying plant families

Lecture 2: Diagnostic Features of Ranunculaceae

- Morphological characteristics
- Economic and ecological importance

Lecture 3: Diagnostic Features of Brassicaceae

- Morphological characteristics
- Economic and ecological importance

Lecture 4: Diagnostic Features of Malvaceae

- Morphological characteristics
- Economic and ecological importance

Lecture 5: Diagnostic Features of Euphorbiaceae

- Morphological characteristics
- Economic and ecological importance

Lecture 6: Diagnostic Features of Rutaceae

- Morphological characteristics
- Economic and ecological importance

Lecture 7: Diagnostic Features of Leguminosae

- Morphological characteristics
- Economic and ecological importance

Lecture 8: Diagnostic Features of Apocynaceae

- Morphological characteristics
- Economic and ecological importance

Lecture 9: Diagnostic Features of Solanaceae

- Morphological characteristics
- Economic and ecological importance

Lecture 10: Diagnostic Features of Asteraceae

- Morphological characteristics
- Economic and ecological importance

Lecture 11: Diagnostic Features of Liliaceae

- Morphological characteristics
- Economic and ecological importance

Lecture 12: Diagnostic Features of Poaceae

- Morphological characteristics
- Economic and ecological importance

SCHOOL OF BASIC AND APPLIED SCIENCES

(CBCS Scheme of Studies & Examinations w. e. f. 2022-25 onwards)

B.Sc. (CBZ) II Year

III Semester

(Chemistry, Botany and Zoology)

Scheme 3rd semester

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	**Chemistry**	CH-201	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-203	Organic Chemistry	2	0	20	30	50	3	2
3		CH-205	Physical Chemistry	2	0	20	30	50	3	2
4		CH-207	Chemistry Lab-III	0	6	20	30	50	4	3
5	**Botany**	BOT-201	Plant Anatomy	3	0	20	30	50	3	3
6		BOT-203	Plant Embryology	3	0	20	30	50	3	3
7		BOT-205	Botany Lab-III	0	2/4	20	30	50	4	2
8	**Zoology**	ZOO-201	Life and Diversity of Chordates	3	0	20	30	50	3	3
9		ZOO-203	Mammalian Physiology -I	3	0	20	30	50	3	3
10		ZOO-205	Zoology Lab-III	0	2/4	20	30	50	3	2
11	Open Elective/Skill Enhancement Course (SEC)*	-	-	2	0	20	30	50	3	2
		TOTAL		20	14			550		27

SCHOOL OF BASIC & APPLIED SCIENCES

(Syllabus & Scheme of Studies w.e.f. 2022-25)

B.Sc. (CBZ) II Year (III semester)

Chemistry

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1. Inorganic Chemistry (CH-201)

Course Outcomes:

1. Have good knowledge about d-block elements particularly of transition elements.
2. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties of some compounds of transition elements.
3. To know about the basic concepts of coordination chemistry like EAN, Werner theory of coordination, nomenclature and isomerism in coordination complexes.
4. Students can gain knowledge about the properties and reactions in non-aqueous solvents like liquid NH3 and liquid SO2, and also the concept of Acids and Bases.

2. Organic Chemistry (CH-203)

Course Outcomes:

1. Have comprehensive knowledge of the synthesis and properties of alcohols and epoxides
2. Know about synthesis and properties of phenols and their chemical reactions.
3. Have knowledge of Beer-Lambert law, molar absorptivity, different electronic transitions, analysis UV spectra and application of UV spectroscopy in structure elucidation.
4. Knowledge about various methods for the preparation of carboxylic acid, carboxylic derivatives (ester, amide, acid chlorides, anhydrides) and their chemical reactions.

3.Physical Chemistry (CH-205)

Course Outcomes:

1. To know about different process, functions and 1st law of thermodynamics
2. To have knowledge about w, q, dU & dH and Kirchoffs equation

3. To understand the basic terms related to chemical equilibrium and derive the law thermodynamically, deduce relation between various equilibrium constants and determining partition coefficient of a solvent dissolved in two immiscible solvents
4. To have good knowledge about distribution law and its applications.

Botany

Plant Anatomy (BOT-201)

Course Outcomes:

1. Know the function and importance of various tissue systems.
2. Understand Apical meristem of root & shoot, types of tissues, vascular bundles, xylem, phloem, cambium, and periderm.
3. Distinguish monocots and dicots morphologically and anatomically.
4. Understand the physiological processing in plants through various apertures and appendages.
5. Understand the processing of secondary growth and its importance in plants.
6. Describe the modifications of plant parts in accordance with environmental conditions

Plant Embryology (BOT-203)

Course Outcomes:

1. Elaborate structure and functions of reproductive organs of flowering plants.
2. Design, carry out, and present a laboratory-based study in plant embryology.
3. Identify, and describe morphological adaptations of flowers linked with variety of pollinators.
4. Draw, identify, and describe different structural patters of ovules.
5. Outline and describe the developmental process of male and female gametophyte.
6. Outline and describe the fertilization process and understanding of the embryogenesis

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Zoology

Life and Diversity of Chordates (Z00-201)

Course Outcomes:

1. Students will be able to describe unique characters, Retrogressive metamorphosis belonging to subphylum urochordata, cepahalochordata and Phylum cyclostomata especially of petromyzon.
2. Students will be able to describe the general characteristics and classification biodiversity, economic importance, Osmoregulation, migration, Parental care belonging to class Pisces & Amphibia and paedomorphosis belonging to Phylum Amphibia.
3. Students will be able to describe unique characters, Poisonous and non- poisonous snakes in India, Biting mechanism in snakes of Phylum Reptilia and Origin of birds, Flight adaptations, Migration belonging to class Aves.
4. Students will be able to understand the unique characteristics, economic importance, classification, Origin of mammals, dentition belonging to class Mammalia.

Mammalian Physiology-I (Z00-203)

Course Outcomes:

1. It will make the students understand the physiology of digestive system, mechanism of buccal, gastric, intestinal, pancreatic digestion and absorption.
2. Students will be able to understand the concept of osmoregulation, physiology of excretion, structure of excretory system and mechanism of urine formation.
3. Students will be able to explain the mechanism of structure of respiratory system, different respiratory pigments, mechanism of external and internal respiration and transport of gases.
4. It will make the students understand the concept of circulatory system, origin and conduction of heart beat, Cardiac cycle, working of mammalian heart, Blood composition and function, Mechanism of blood clotting.

Lesson Plan for Zoology - ZOO-201

Unit 1: Chordates and Protochordates (11 Lectures)

1. Lecture 1: Introduction to Chordates: General Characteristics
2. Lecture 2: Classification of Chordates: Overview and Criteria
3. Lecture 3: Affinities and Origin of Chordates: Evolutionary Perspectives
4. Lecture 4: Overview of Protochordates: General Characteristics and Classification

5. Lecture 5: Hemichordata: Structure, Function, and Classification
6. Lecture 6: Urochordata: Structure, Function, and Classification
7. Lecture 7: Cephalochordata: Structure, Function, and Classification
8. Lecture 8: Retrogressive Metamorphosis in Urochordates: Process and Significance
9. Lecture 9: Type Study: Pteromyzon (Lamprey) - External Morphology
10. Lecture 10: Pteromyzon (Lamprey) - Internal Anatomy and Physiology
11. Lecture 11: Life History of Pteromyzon (Lamprey): Development and Reproduction

Unit 2: Pisces and Amphibia (12 Lectures)

12. Lecture 12: General Features of Pisces: Characteristics and Classification
13. Lecture 13: Types of Fins in Fishes: Structure and Function
14. Lecture 14: Osmoregulation in Fishes: Mechanisms and Adaptations
15. Lecture 15: Migration in Fishes: Types, Mechanisms, and Examples
16. Lecture 16: Parental Care in Fishes: Strategies and Examples
17. Lecture 17: Type Study: Scoliodon (Shark) - External Morphology
18. Lecture 18: Scoliodon (Shark) - Internal Anatomy: Digestive and Respiratory Systems
19. Lecture 19: Scoliodon (Shark) - Circulatory and Nervous Systems
20. Lecture 20: General Features of Amphibia: Characteristics and Classification up to Orders
21. Lecture 21: Origin and Evolution of Terrestrial Ectotherms/Tetrapods
22. Lecture 22: Parental Care in Amphibia: Mechanisms and Examples
23. Lecture 23: Paedomorphosis in Amphibians: Concept, Mechanisms, and Examples

Unit 3: Reptiles and Aves (11 Lectures)

24. Lecture 24: General Features of Reptiles: Characteristics and Classification up to Orders
25. Lecture 25: Origin of Reptiles: Evolutionary History and Significance
26. Lecture 26: Skull Types in Reptiles: Structure and Evolutionary Implications
27. Lecture 27: Poisonous and Non-Poisonous Snakes in India: Identification and Significance
28. Lecture 28: Biting Mechanism in Snakes: Structure and Function
29. Lecture 29: General Features of Aves: Characteristics and Classification up to Orders
30. Lecture 30: Origin of Birds: Evolution from Reptiles and Key Adaptations
31. Lecture 31: Flight Adaptations in Birds: Morphological and Physiological Adaptations
32. Lecture 32: Migration in Birds: Mechanisms, Routes, and Examples
33. Lecture 33: Role of Birds in Ecosystems: Ecological Importance and Conservation

34. Lecture 34: Courtship and Nesting Behaviors in Birds: Examples and Mechanisms

Unit 4: Mammals (11 Lectures)

35. Lecture 35: General Features of Mammals: Characteristics and Classification up to Orders
36. Lecture 36: Origin of Mammals: Evolutionary History and Adaptive Radiation
37. Lecture 37: Types of Dentition in Mammals: Structure, Function, and Adaptations
38. Lecture 38: Type Study: Rat - External Morphology and General Anatomy
39. Lecture 39: Rat: Digestive System and Feeding Mechanisms
40. Lecture 40: Rat: Respiratory and Circulatory Systems
41. Lecture 41: Rat: Reproductive System and Development
42. Lecture 42: Social Behavior in Mammals: Types and Examples
43. Lecture 43: Adaptations in Mammals for Different Habitats: Terrestrial, Aquatic, and Aerial
44. Lecture 44: Mammalian Reproductive Strategies: Monotremes, Marsupials, and Eutherians
45. Lecture 45: Conservation of Mammals: Threats, Protection, and Conservation Strategies

CO-PO MAPPING

CHEMISTRY

CH-201											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	2	1	3	2	2	1

CH-203											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	3	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	3	2	2	1

CH-205											
		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO 1	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	1	2	2	1

CO-PO MAPPING

BOTANY

BOT-201											
		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO 1	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1
	CO6	2	2	1	2	1	2	1	2	1	2

BOT-203											
		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO 1	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	√	2	2	1
	CO6	2	1	2	1	3	2	2	2	1	2

BOT-205											
		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO 1	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

CO-PO MAPPING

ZOOLOGY

ZOO-201											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-203											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-205											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

PSO-PO Mapping

	PO01	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PSO-01**	**PSO-02**	**PSO-03**
Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment	2.20	1.59	1.34	0.73	1.34	0.37	1.47	1.10	0.98	0.98	1.96	2.20	1.83	1.10

Unit 1: Chordates and Protochordates (11 Lectures)

1. Lecture 1: Introduction to Chordates: General Characteristics
2. Lecture 2: Classification of Chordates: Overview and Criteria
3. Lecture 3: Affinities and Origin of Chordates: Evolutionary Perspectives
4. Lecture 4: Overview of Protochordates: General Characteristics and Classification
5. Lecture 5: Hemichordata: Structure, Function, and Classification
6. Lecture 6: Urochordata: Structure, Function, and Classification
7. Lecture 7: Cephalochordata: Structure, Function, and Classification
8. Lecture 8: Retrogressive Metamorphosis in Urochordates: Process and Significance
9. Lecture 9: Type Study: Pteromyzon (Lamprey) - External Morphology
10. Lecture 10: Pteromyzon (Lamprey) - Internal Anatomy and Physiology
11. Lecture 11: Life History of Pteromyzon (Lamprey): Development and Reproduction

Unit 2: Pisces and Amphibia (12 Lectures)

12. Lecture 12: General Features of Pisces: Characteristics and Classification
13. Lecture 13: Types of Fins in Fishes: Structure and Function
14. Lecture 14: Osmoregulation in Fishes: Mechanisms and Adaptations
15. Lecture 15: Migration in Fishes: Types, Mechanisms, and Examples
16. Lecture 16: Parental Care in Fishes: Strategies and Examples
17. Lecture 17: Type Study: Scoliodon (Shark) - External Morphology
18. Lecture 18: Scoliodon (Shark) - Internal Anatomy: Digestive and Respiratory Systems
19. Lecture 19: Scoliodon (Shark) - Circulatory and Nervous Systems
20. Lecture 20: General Features of Amphibia: Characteristics and Classification up to Orders
21. Lecture 21: Origin and Evolution of Terrestrial Ectotherms/Tetrapods
22. Lecture 22: Parental Care in Amphibia: Mechanisms and Examples
23. Lecture 23: Paedomorphosis in Amphibians: Concept, Mechanisms, and Examples

Unit 3: Reptiles and Aves (11 Lectures)

24. Lecture 24: General Features of Reptiles: Characteristics and Classification up to Orders

25. Lecture 25: Origin of Reptiles: Evolutionary History and Significance
26. Lecture 26: Skull Types in Reptiles: Structure and Evolutionary Implications
27. Lecture 27: Poisonous and Non-Poisonous Snakes in India: Identification and Significance
28. Lecture 28: Biting Mechanism in Snakes: Structure and Function
29. Lecture 29: General Features of Aves: Characteristics and Classification up to Orders
30. Lecture 30: Origin of Birds: Evolution from Reptiles and Key Adaptations
31. Lecture 31: Flight Adaptations in Birds: Morphological and Physiological Adaptations
32. Lecture 32: Migration in Birds: Mechanisms, Routes, and Examples
33. Lecture 33: Role of Birds in Ecosystems: Ecological Importance and Conservation
34. Lecture 34: Courtship and Nesting Behaviors in Birds: Examples and Mechanisms

Unit 4: Mammals (11 Lectures)

35. Lecture 35: General Features of Mammals: Characteristics and Classification up to Orders
36. Lecture 36: Origin of Mammals: Evolutionary History and Adaptive Radiation
37. Lecture 37: Types of Dentition in Mammals: Structure, Function, and Adaptations
38. Lecture 38: Type Study: Rat - External Morphology and General Anatomy
39. Lecture 39: Rat: Digestive System and Feeding Mechanisms
40. Lecture 40: Rat: Respiratory and Circulatory Systems
41. Lecture 41: Rat: Reproductive System and Development
42. Lecture 42: Social Behavior in Mammals: Types and Examples
43. Lecture 43: Adaptations in Mammals for Different Habitats: Terrestrial, Aquatic, and Aerial
44. Lecture 44: Mammalian Reproductive Strategies: Monotremes, Marsupials, and Eutherians
45. Lecture 45: Conservation of Mammals: Threats, Protection, and Conservation Strategies

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Lesson Plan for Zoology - ZOO-203

Unit 1: Digestion (12 Lectures)

1. Lecture 1: Introduction to Mammalian Physiology and Overview of the Digestive System
2. Lecture 2: Buccal Cavity: Structure and Function, Role of Saliva in Digestion
3. Lecture 3: Mechanism of Salivary Secretion: Composition and Regulation
4. Lecture 4: Process of Buccal Digestion: Mastication and Enzymatic Breakdown

5. Lecture 5: Gastric Digestion: Structure and Function of the Stomach
6. Lecture 6: Gastric Secretions: Composition and Regulation
7. Lecture 7: Mechanism of Gastric Digestion: Role of Pepsin and Hydrochloric Acid
8. Lecture 8: Small Intestine: Structure and Role in Digestion and Absorption
9. Lecture 9: Pancreatic Secretions: Composition and Regulation
10. Lecture 10: Bile Secretion and Its Role in Digestion: Mechanism and Function
11. Lecture 11: Intestinal Digestion: Enzymes and Their Functions
12. Lecture 12: Digestion and Absorption in the Large Intestine: Mechanism and Processes

Unit 2: Osmoregulation and Excretion (11 Lectures)

13. Lecture 13: Introduction to Osmoregulation: Concept and Importance
14. Lecture 14: Mammalian Excretory System: Overview and Function
15. Lecture 15: Structure of Kidney: Anatomy and Blood Supply
16. Lecture 16: Structure of the Nephron: Types and Functions
17. Lecture 17: Process of Urine Formation: Filtration, Reabsorption, and Secretion
18. Lecture 18: Mechanism of Ultrafiltration: Glomerular Filtration Rate (GFR)
19. Lecture 19: Selective Reabsorption in the Nephron: Mechanisms and Significance
20. Lecture 20: Tubular Secretion: Mechanism and Role in Homeostasis
21. Lecture 21: Counter Current Multiplier System: Mechanism and Importance
22. Lecture 22: Regulation of Kidney Function: Hormonal Control (ADH, Aldosterone)
23. Lecture 23: Disorders of the Excretory System: Kidney Stones, Uremia, and Nephritis

Unit 3: Respiration (12 Lectures)

24. Lecture 24: Introduction to the Respiratory System: Structure and Function
25. Lecture 25: Respiratory Organs in Mammals: Lungs and Airways
26. Lecture 26: Mechanism of Breathing: Inspiration and Expiration
27. Lecture 27: Respiratory Volumes and Capacities: Definitions and Measurements
28. Lecture 28: Respiratory Pigments: Types, Properties, and Functions
29. Lecture 29: Hemoglobin: Structure, Function, and Oxygen Transport
30. Lecture 30: Oxygen Dissociation Curve: Factors Affecting Oxygen Binding
31. Lecture 31: External Respiration: Gas Exchange in the Lungs
32. Lecture 32: Internal Respiration: Gas Exchange at the Tissue Level
33. Lecture 33: Transport of Gases in Blood: Oxygen and Carbon Dioxide

34. Lecture 34: Regulation of Respiration: Neural and Chemical Control
35. Lecture 35: Respiratory Disorders: Asthma, COPD, and Respiratory Acidosis

Unit 4: Circulation (10 Lectures)

36. Lecture 36: Introduction to the Circulatory System: Components and Function
37. Lecture 37: Structure of the Mammalian Heart: Chambers, Valves, and Blood Flow
38. Lecture 38: Origin and Conduction of Heartbeat: Sinoatrial Node and Pacemaker Activity
39. Lecture 39: Cardiac Cycle: Phases and Mechanical Events
40. Lecture 40: Electrocardiogram (ECG): Interpretation and Clinical Significance
41. Lecture 41: Blood Pressure: Definition, Measurement, and Regulation
42. Lecture 42: Working of the Mammalian Heart: Cardiac Output and Stroke Volume
43. Lecture 43: Composition and Functions of Blood: Cells, Plasma, and Hematopoiesis
44. Lecture 44: Mechanism of Blood Clotting: Pathways and Factors Involved
45. Lecture 45: Circulatory Disorders: Hypertension, Atherosclerosis, and Heart Failure

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Lesson Plan for Chemistry - CH-201

UNIT–I: Chemistry of Elements of I Transition Series (6 Lectures)

1. Lecture 1: Introduction to Transition Elements
2. Lecture 2: Position in Periodic Table
3. Lecture 3: General Characteristics & Properties
4. Lecture 4: Structures & Properties of TiO_2
5. Lecture 5: Structures & Properties of $VOCl_2$
6. Lecture 6: Structures & Properties of $FeCl_3$, $CuCl_2$, $Ni(CO)_4$

UNIT–II: Elements of IInd & IIIrd Transition Series (7 Lectures)

7. Lecture 7: Characteristics of IInd & IIIrd Transition Elements
8. Lecture 8: Comparison of 3d, 4d & 5d Elements

9. Lecture 9: Ionic Radii Comparison
10. Lecture 10: Oxidation State Comparison
11. Lecture 11: Magnetic Properties
12. Lecture 12: Spectral Properties
13. Lecture 13: Stereochemistry of Transition Elements

UNIT–III: Coordination Compounds (9 Lectures)

14. Lecture 14: Werner's Coordination Theory
15. Lecture 15: Effective Atomic Number Concept
16. Lecture 16: Introduction to Chelates
17. Lecture 17: Nomenclature of Coordination Compounds
18. Lecture 18: Isomerism in Coordination Compounds I
19. Lecture 19: Isomerism in Coordination Compounds II
20. Lecture 20: Valence Bond Theory I
21. Lecture 21: Valence Bond Theory II
22. Lecture 22: Application of Valence Bond Theory

UNIT–IV: Non-Aqueous Solvents (4 Lectures)

23. Lecture 23: Physical Properties of Solvents
24. Lecture 24: Types & Characteristics of Solvents
25. Lecture 25: Reactions in Liquid NH_3
26. Lecture 26: Reactions in Liquid SO_2

UNIT–V: Acids and Bases, HSAB Concept (4 Lectures)

27. Lecture 27: Arrhenius & Bronsted-Lowry Concepts

28. Lecture 28: Lux-Flood, Solvent System, Lewis Concepts

29. Lecture 29: Relative Strength of Acids & Bases

30. Lecture 30: HSAB Concept, Symbiosis, Electronegativity

Lesson Plan for Chemistry - CH-203

Unit 1: Alcohols and Epoxides (7 Lectures)

1. Lecture 1: Monohydric Alcohols: Nomenclature and Formation
2. Lecture 2: Reduction of Aldehydes and Ketones to Alcohols
3. Lecture 3: Hydrogen Bonding and Acidic Nature of Alcohols
4. Lecture 4: Reactions of Alcohols: Overview
5. Lecture 5: Dihydric Alcohols: Nomenclature and Formation
6. Lecture 6: Oxidative Cleavage of Glycols (Pb(OAc)4 and HIO4)
7. Lecture 7: Pinacol-Pinacolone Rearrangement

Unit 2: Phenols (7 Lectures)

8. Lecture 8: Nomenclature, Structure, and Bonding of Phenols

9. Lecture 9: Preparation and Properties of Phenols

10. Lecture 10: Acidic Character of Phenols vs. Alcohols

11. Lecture 11: Resonance Stabilization of Phenoxide Ion

12. Lecture 12: Electrophilic Aromatic Substitution in Phenols

13. Lecture 13: Mechanisms: Fries and Claisen Rearrangements

14. Lecture 14: Reimer-Tiemann, Kolbe's, Schotten-Baumann Reactions

Unit 3: UV Absorption Spectroscopy (8 Lectures)

15. Lecture 15: Absorption Laws: Beer-Lambert Law and Molar Absorptivity

16. Lecture 16: UV Spectra: Presentation and Analysis

17. Lecture 17: Types of Electronic Transitions

18. Lecture 18: Effect of Conjugation on Absorption

19. Lecture 19: Chromophores and Auxochromes: Concepts

20. Lecture 20: Spectral Shifts: Bathochromic, Hypsochromic, Hyperchromic

21. Lecture 21: UV Spectra of Conjugated Enes and Enones

22. Lecture 22: Woodward-Fieser Rules: Calculation of λmax

Unit 4: Carboxylic Acids & Derivatives (8 Lectures)

23. Lecture 23: Nomenclature, Structure, and Bonding of Carboxylic Acids

24. Lecture 24: Acidity and Substituent Effects on Carboxylic Acids

25. Lecture 25: Preparation and Reactions of Carboxylic Acids

26. Lecture 26: Hell-Volhard Zelinsky Reaction

27. Lecture 27: Reduction and Decarboxylation of Carboxylic Acids

28. Lecture 28: Acid Derivatives: Nomenclature and Preparation

29. Lecture 29: Stability and Interconversion of Acyl Derivatives

30. Lecture 30: Esterification and Hydrolysis Mechanisms (Acidic/Basic)

Lesson Plan for Chemistry - CH-205

Unit 1: Thermodynamics-I (8 Lectures)

1. **Lecture 1:** Introduction to Thermodynamics: Basic Terms
2. Lecture 2: Types of Systems: Intensive vs. Extensive Properties
3. Lecture 3: State and Path Functions: Differentials

4. Lecture 4: Thermodynamic Processes: Concepts of Heat and Work
5. Lecture 5: Zeroth Law: Temperature and Thermal Equilibrium
6. Lecture 6: First Law of Thermodynamics: Internal Energy
7. Lecture 7: Enthalpy: Heat Capacities and Their Relationship
8. Lecture 8: Applications: First Law and Thermodynamic Processes

Unit 2: Thermodynamics-II (8 Lectures)

9. **Lecture 9**: Joule's Law: Ideal and Real Gases
10. Lecture 10: Joule-Thomson Effect: Coefficient and Inversion Temp.
11. Lecture 11: Work and Heat Calculations for Ideal Gases
12. Lecture 12: Isothermal and Adiabatic Expansion: Reversible Processes
13. Lecture 13: Temperature Dependence of Enthalpy: Kirchoff's Equation
14. Lecture 14: Bond Energies: Calculation and Applications
15. Lecture 15: Applications: Expansion Processes and Bond Energy
16. Lecture 16: Review of Thermodynamics: Key Concepts

Unit 3: Chemical Equilibrium (7 Lectures)

17. Lecture 17: Equilibrium Constant and Free Energy: Definitions
18. Lecture 18: Chemical Potential: Thermodynamic Derivation
19. Lecture 19: Law of Chemical Equilibrium: Derivation and Concepts
20. Lecture 20: Temperature Dependence: Van't Hoff Isochore
21. Lecture 21: Van't Hoff Isotherm: Applications
22. Lecture 22: Le-Chatelier's Principle: Clausius-Clapeyron Equation
23. Lecture 23: Applications: Equilibrium in Reactions

Unit 4: Distribution Law (7 Lectures)

24. Lecture 24: Nernst Distribution Law: Derivation

25. Lecture 25: Modifications: Dissociation, Association, Chemical Comb.

26. Lecture 26: Application: Hydrolysis of Aniline Hydrochloride

27. Lecture 27: Application: Potassium Triiodide Complex

28. Lecture 28: Process of Extraction: Distribution Law

29. Lecture 29: Review of Distribution Law: Key Concepts

30. Lecture 30: Summary and Review: Thermodynamics and Equilibrium

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Lesson Plan for Botany - BOT-201

Unit-I: Plant Forms and Tissues

Lecture 1: Introduction to Plant Forms

- Overview of plant life cycles
- Definitions and examples of annuals, biennials, and perennials

Lecture 2: Meristematic Tissues

- Definition and role of meristematic tissues
- Types of meristems (apical, lateral, intercalary) and their functions

Lecture 3: Permanent Tissues: Simple

- Definition and types of simple tissues (parenchyma, collenchyma, sclerenchyma)
- Structure and functions of each type

Lecture 4: Permanent Tissues: Complex

- Definition and types of complex tissues (xylem and phloem)
- Structure and functions of xylem and phloem

Lecture 5: Epidermis: Uniseriate and Multiseriate

- Characteristics of uniseriate and multiseriate epidermis
- Functions and adaptations

Lecture 6: Epidermal Appendages

- Types of epidermal appendages (trichomes, glands, etc.)
- Morphological types and functions

Lecture 7: Anatomy of Epidermal Structures

- Detailed examination of epidermal structure and function
- Role in protection and environmental adaptation

Lecture 8: Comparative Study of Plant Forms

- Comparing annuals, biennials, and perennials
- Impact on plant morphology and adaptation

Lecture 9: Plant Tissue Adaptations

- Adaptations of meristematic and permanent tissues in different environments
- Case studies and examples

Lecture 10: Practical Identification of Tissues

- Laboratory techniques for identifying and examining plant tissues
- Microscopic examination of tissue samples

Lecture 11: Review of Tissues and Plant Forms

- Summary of key concepts
- Discussion and clarification of complex topics

Lecture 12: Practical Exercises and Q&A

- Hands-on exercises for identifying and classifying plant tissues
- Q&A session to address any remaining questions

Unit-II: Leaf Anatomy and Stomatal Apparatus

Lecture 1: Introduction to Leaf Types

- Simple vs. compound leaves
- Examples and characteristics of each type

Lecture 2: Phyllotaxy

- Definitions and types of phyllotaxy (alternate, opposite, whorled)
- Adaptive significance of different phyllotaxy patterns

Lecture 3: Anatomy of Monocot Leaves

- Structure and features of monocot leaves
- Comparative anatomy with dicot leaves

Lecture 4: Anatomy of Dicot Leaves

- Structure and features of dicot leaves
- Comparative anatomy with monocot leaves

Lecture 5: Cell Inclusions in Leaves

- Types of cell inclusions (e.g., pigments, crystals)
- Functions and significance

Lecture 6: Leaf Abscission

- Mechanism and process of leaf abscission
- Environmental and physiological factors affecting abscission

Lecture 7: Stomatal Apparatus

- Structure and function of stomata
- Types of stomatal apparatus (paracytic, anisocytic, etc.)

Lecture 8: Morphological Types of Stomata

- Detailed examination of stomatal types and their adaptations
- Functional significance in different environments

Lecture 9: Adaptations in Leaf Structure

- Adaptations in leaves for different environmental conditions
- Examples of xerophytes, hydrophytes, and halophytes

Lecture 10: Practical Examination of Leaf Structures

- Laboratory techniques for examining leaf anatomy and stomatal types
- Microscopic analysis and identification

Lecture 11: Review of Leaf Anatomy and Stomatal Apparatus

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 12: Practical Exercises and Q&A

- Hands-on activities for leaf identification and anatomical examination
- Q&A session to address any remaining questions

Unit-III: Shoot System and Secondary Growth

Lecture 1: Shoot Apical Meristem

- Structure and function of shoot apical meristem
- Histological organization in monocots and dicots

Lecture 2: Monocot vs. Dicot Stem Anatomy

- Comparative anatomy of monocot and dicot stems
- Key differences and similarities

Lecture 3: Cambium: Structure and Functions

- Role of cambium in secondary growth
- Types of cambium (vascular and cork cambium)

Lecture 4: Secondary Growth in Dicot Stem

- Process of secondary growth and formation of vascular tissues
- Role of cambium and development of secondary tissues

Lecture 5: Growth Rings, Sapwood, and Heartwood

- Formation and significance of growth rings
- Differences between sapwood and heartwood

Lecture 6: Periderm

- Structure and function of periderm
- Formation and role in protecting plant tissues

Lecture 7: Anomalous Secondary Growth in Achyranthes

- Characteristics and examples of anomalous growth
- Mechanisms and adaptive significance

Lecture 8: Anomalous Secondary Growth in Boerhaavia

- Detailed study of Boerhaavia's secondary growth
- Comparative analysis with other plants exhibiting anomalous growth

Lecture 9: Practical Examination of Secondary Growth

- Laboratory techniques for examining secondary growth and anomalous structures
- Microscopic analysis and identification

Lecture 10: Review of Shoot System and Secondary Growth

- Summary of key concepts
- Discussion and clarification of complex topics

Lecture 11: Practical Exercises and Case Studies

- Hands-on activities for analyzing stem anatomy and secondary growth
- Case studies of plants with unique growth patterns

Lecture 12: Q&A and Comprehensive Review

- Q&A session to address any remaining questions
- Comprehensive review of Unit-III topics

Unit-IV: Root System and Structural Modifications

Lecture 1: Root Apical Meristem

- Structure and function of root apical meristem
- Differences between monocot and dicot roots

Lecture 2: Histological Organization of Monocot Roots

- Structure and features of monocot roots
- Comparison with dicot roots

Lecture 3: Histological Organization of Dicot Roots

- Structure and features of dicot roots
- Comparison with monocot roots

Lecture 4: Secondary Growth in Dicot Root

- Mechanisms of secondary growth in roots
- Role of cambium and formation of secondary tissues

Lecture 5: Structural Modifications in Roots: Storage Roots

- Examples (e.g., Beta)
- Anatomy and adaptive significance

Lecture 6: Structural Modifications in Roots: Respiratory Roots

- Examples (e.g., Rhizophora)
- Anatomy and adaptive significance

Lecture 7: Structural Modifications in Roots: Epiphytic Roots

- Examples (e.g., Vanda)
- Anatomy and adaptive significance

Lecture 8: Adaptations in Xerophytes

- Anatomical adaptations to dry environments
- Examples and case studies

Lecture 9: Adaptations in Hydrophytes

- Anatomical adaptations to aquatic environments
- Examples and case studies

Lecture 10: Adaptations in Halophytes

- Anatomical adaptations to saline environments
- Examples and case studies

Lecture 11: Review of Root System and Structural Modifications

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 12: Practical Exercises and Q&A

- Hands-on activities for examining root anatomy and modifications
- Q&A session to address any remaining questions

Lesson Plan for Botany - BOT-203

Unit-I: Flower Structure and Pollination

Lecture 1: Introduction to the Flower

- Definition and role of flowers
- Flowers as modified shoots

Lecture 2: Functions of Various Floral Parts

- Detailed function of sepals, petals, stamens, and carpels

- Overview of floral symmetry and its significance

Lecture 3: Types of Pollination

- Self-pollination vs. cross-pollination
- Mechanisms and advantages of different pollination types

Lecture 4: Pollination Agencies

- Biotic agents (e.g., insects, birds) and abiotic agents (e.g., wind, water)
- Role of each agency in pollination

Lecture 5: Pollen Germination (Microgametogenesis)

- Process of pollen germination
- Formation of pollen tube and sperm cells

Lecture 6: Pollen-Pistil Interaction

- Mechanisms of pollen recognition and germination
- Factors influencing successful pollen-pistil interaction

Lecture 7: Self-Incompatibility

- Definition and mechanisms of self-incompatibility
- Examples and significance in plant breeding

Lecture 8: Review of Flower Structure and Pollination

- Summary of key concepts
- Discussion of complex topics and practical examples

Lecture 9: Practical Identification of Floral Parts

- Laboratory techniques for examining floral structures
- Microscopic analysis of flowers

Lecture 10: Case Studies on Pollination Mechanisms

- Examples of different pollination strategies
- Analysis of case studies in various plant species

Lecture 11: Practical Exercises on Pollination

- Hands-on activities related to pollination mechanisms
- Observational studies of pollination in the field or lab

Lecture 12: Q&A and Comprehensive Review

- Recap of key concepts
- Q&A session to address any remaining questions

Unit-II: Male Gametophyte and Ovule Structure

Lecture 1: Structure and Function of Microsporangium

- Anatomy of microsporangium (pollen sac)
- Wall structure and dehiscence mechanisms

Lecture 2: Microsporogenesis

- Process of microspore formation
- Development of pollen grains

Lecture 3: Structure of Pollen Grains

- Detailed structure of pollen wall
- Types of pollen grains and their functions

Lecture 4: Structure of Megasporangium (Ovule)

- Anatomy and curvatures of ovule
- Function and importance of different ovule structures

Lecture 5: Megasporogenesis

- Process of megaspore formation
- Development and differentiation of megaspores

Lecture 6: Megagametogenesis

- Formation and development of the embryo sac (female gametophyte)
- Key stages and cellular differentiation

Lecture 7: Review of Male Gametophyte and Ovule Structure

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 8: Practical Examination of Microsporangium and Ovule

- Laboratory techniques for examining pollen and ovule structure
- Microscopic analysis of male and female gametophytes

Lecture 9: Case Studies on Microsporogenesis and Megagametogenesis

- Examples of diverse reproductive strategies
- Analysis of case studies in various plant species

Lecture 10: Practical Exercises on Gametophyte Structures

- Hands-on activities related to microsporangium and ovule structure
- Observational studies and dissections

Lecture 11: Q&A and Discussion

- Q&A session to clarify complex topics
- Discussion of practical implications and applications

Lecture 12: Comprehensive Review

- Recap of Unit-II topics
- Review session with focus on challenging concepts

Unit-III: Female Gametophyte and Fertilization

Lecture 1: Female Gametophyte Types

- Monosporic, bisporic, and tetrasporic development
- Examples and differences between types

Lecture 2: Organization and Ultrastructure of Mature Embryo Sac

- Detailed structure and function of the embryo sac
- Cellular organization and significance

Lecture 3: Double Fertilization

- Process of double fertilization
- Role and importance in seed development

Lecture 4: Types of Endosperm

- Types of endosperm (e.g., nuclear, cellular, and helobial)
- Biological significance of each type

Lecture 5: Biological Importance of Endosperm

- Role of endosperm in seed development and germination
- Examples and case studies

Lecture 6: Review of Female Gametophyte and Fertilization

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 7: Practical Examination of Female Gametophyte Structures

- Laboratory techniques for examining embryo sac
- Microscopic analysis of female gametophyte

Lecture 8: Case Studies on Fertilization Mechanisms

- Examples of fertilization processes in various plant species
- Analysis of case studies and research findings

Lecture 9: Practical Exercises on Fertilization and Endosperm

- Hands-on activities related to fertilization and endosperm types
- Observational studies and experiments

Lecture 10: Q&A and Discussion

- Q&A session to address any remaining questions
- Discussion of practical applications and implications

Lecture 11: Comprehensive Review of Unit-III

- Recap of key concepts
- Review session with focus on challenging concepts

Lecture 12: Final Q&A and Practical Exercises

- Final review and Q&A session
- Practical exercises and case study discussions

Unit-IV: Embryogenesis, Seed Structure, and Fruit Dispersal

Lecture 1: Embryogenesis in Dicot and Monocot

- Overview of embryogenesis processes in dicots and monocots
- Key differences and developmental stages

Lecture 2: Polyembryony

- Definition and types of polyembryony
- Examples and significance in plant reproduction

Lecture 3: Apomixis

- Definition and mechanisms of apomixis
- Examples and implications for plant breeding

Lecture 4: Structure of Dicot Seeds

- Anatomy and components of dicot seeds
- Development and function of seed parts

Lecture 5: Structure of Monocot Seeds

- Anatomy and components of monocot seeds
- Development and function of seed parts

Lecture 6: Fruit Types

- Classification of fruit types (e.g., simple, aggregate, multiple)
- Examples and significance of each type

Lecture 7: Dispersal Mechanisms in Fruits and Seeds

- Types of dispersal mechanisms (e.g., wind, water, animal)
- Adaptations for effective seed dispersal

Lecture 8: Review of Embryogenesis and Seed Structure

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 9: Practical Examination of Seeds and Fruits

- Laboratory techniques for examining seed and fruit structures
- Microscopic analysis and identification

Lecture 10: Case Studies on Fruit Dispersal Mechanisms

- Examples of diverse dispersal strategies
- Analysis of case studies and research findings

Lecture 11: Practical Exercises on Seed and Fruit Dispersal

- Hands-on activities related to seed structure and dispersal
- Observational studies and experiments

SCHOOL OF BASIC AND APPLIED SCIENCES

(CBCS Scheme of Studies & Examinations w. e. f. 2022-25 onwards)

B.Sc. (CBZ) II Year

IV Semester

(Chemistry, Botany and Zoology)

Scheme 4th semester

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	**Chemistry**	CH-202	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-204	Organic Chemistry	2	0	20	30	50	3	2
3		CH-206	Physical Chemistry	2	0	20	30	50	3	2
4		CH-208	Chemistry Lab-IV	0	6	20	30	50	4	3
5	**Botany**	BOT-202	Plant Physiology	3	0	20	30	50	3	3
6		BOT-204	Plant Metabolism	3	0	20	30	50	3	3
7		BOT-206	Botany Lab-IV	0	2/4	20	30	50	4	2
8	**Zoology**	ZOO-202	Genetics and Immunology	3	0	20	30	50	3	3
9		ZOO-204	Mammalian Physiology -II	3	0	20	30	50	3	3
10		ZOO-206	Zoology Lab-IV	0	2/4	20	30	50	3	2
11	Open Elective/Skill Enhancement Course (SEC)*	-	-	2	0	30	20	50	3	2
		TOTAL		20	14			550		27

SCHOOL OF BASIC & APPLIED SCIENCES

(Syllabus & Scheme of Studies w.e.f. 2023-26)

B.Sc. (CBZ) II Year (IV semester)

Chemistry

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1. Inorganic Chemistry (CH-202)

Course Outcomes:

1. Have good knowledge about d-block elements particularly of transition elements.
2. To study the bonding of 3d elements. To recapitulate the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbital's in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters. Students will be able to calculate the spectroscopic terms for various metal ions.
3. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties some compounds of transition elements.
4. To know about position of f block elements in periodic table and their general characteristics. To study the occurrence and separation of lanthanides and lanthanide compounds. Have knowledge of actinides their existence and general properties.
5. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

2. Organic Chemistry (CH-204)

Course Outcomes:

1. Have good knowledge about d-block elements particularly of transition elements.
2. To study the bonding of 3d elements. To recapitulate the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbital's in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters. Students will be able to calculate the spectroscopic terms for various metal ions.

3. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties some compounds of transition elements.
4. To know about position of f block elements in periodic table and their general characteristics. To study the occurrence and separation of lanthanides and lanthanide compounds. Have knowledge of actinides their existence and general properties.
5. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

3.Physical Chemistry (CH-206)

Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts in Physical chemistry.
2. Students will be able to understand the fundamentals of thermodynamics and electrochemistry.
3. Students will be able to understand the solve problems using the properties and relationships of thermodynamic equations. Students will have understanding of thermodynamic fundamentals for application in applied thermodynamics.
4. Students will gain the knowledge of instrumentation in electrochemistry. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state.

Botany

Plant Physiology (BOT-202)

Course Outcomes:

1. Describe the all introductory terms concerned with plant physiology and plant Biochemistry like osmosis, transpiration, diffusion and Imbibitions etc.
2. Understand the basic information about principles of physiology and biochemistry of plants, their application in daily life and industry.
3. Describe the various types of plant hormones and plant growth regulators and their origin, distribution, physiological description, brief idea of their action and economic uses of PGRs.
4. Analyse the behaviour of chemical processes of behind the plant movement and their significance for the crops belongs to various taxonomic families.

5. Evaluate the significance of the physiological processes involved in the manufacturing of the dyes, tannins, beverages, timber and rubbers in the body of plants.
6. Create the comparative knowledge of commercial application of the physiological and biochemical processes.

Plant Metabolism (BOT-204)

Course Outcomes:

1. Enrich themselves with the phenomenon of metabolism of primary and secondary metabolites and their role in plants.
2. Upgraded in analytical skills and instrumentation.
3. Distinguish anabolic and catabolic processes in their importance in plants.
4. Understand the physiological processing of plant organelles.
5. Understand the processing of storage and utilization of energy rich compounds.
6. Describe the utility of enzymes.

Zoology

Genetics and Immunology (Z00-202)

Course Outcomes:

1. Students will be able to understand the concept of genetics, its basic principles & theories and genetic interactions.
2. Students will have acquaintance with respect to variations, mutations and sex linked inheritance.
3. Students will be able to get knowledge about several chromosomal abnormalities involving autosomes and sex chromosomes along with some implications of applied genetics.
4. Students will be able to understand the concept of immune system, blood transfusion, autoimmune disorders and transplanting of tissues and organs.

Mammalian Physiology-I (Z00-204)

Course Outcomes:

1. It will make the students understand the appropriate functioning of various body systems in animals and mechanism of working.
2. Students will be able to understand the structure of various muscle fibres and mechanism of muscle contraction.

3. Students will be able to explain the mechanism of nerve conduction and related neurotransmitters involved in its physiological processes.
4. It will make the students understand the structure and function of various endocrine glands as well as their secretion.
5. Students will be able to understand the control of hormones on reproductive physiology mechanism that is essential for the continuance of the human species.

CO-PO MAPPING

CHEMISTRY

CH-202											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	2	1	3	2	2	1

CH-204											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	3	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	3	2	2	1

CH-206											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	1	2	2	1

CO-PO MAPPING

BOTANY

BOT-202											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1
	CO6	2	2	1	2	1	2	1	2	1	2

BOT-204											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	√	2	2	1
	CO6	2	1	2	1	3	2	2	2	1	2

BOT-206											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

CO-PO MAPPING

ZOOLOGY

ZOO-202											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-204											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-206											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

PSO-PO Mapping

	PO01	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PSO-01**	**PSO-02**	**PSO-03**
Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment	2.20	1.59	1.34	0.73	1.34	0.37	1.47	1.10	0.98	0.98	1.96	2.20	1.83	1.10

Unit 1: Principles of Heredity and Chromosomal Theory (12 Lectures)

1. Lecture 1: Introduction to Genetics: Scope and Basic Concepts
2. Lecture 2: Mendelian Genetics: Laws of Inheritance
3. Lecture 3: Extensions and Modifications of Mendelian Principles: Incomplete Dominance, Codominance
4. Lecture 4: Epistasis and Polygenic Inheritance: Examples and Mechanisms
5. Lecture 5: Multiple Alleles: ABO Blood Group System as a Case Study
6. Lecture 6: Chromosomal Theory of Inheritance: Historical Perspective and Evidence
7. Lecture 7: Linkage: Concept, Types, and Evidence from Drosophila
8. Lecture 8: Recombination: Mechanism and Calculation of Recombination Frequency
9. Lecture 9: Coupling and Repulsion Hypothesis: Explanation with Examples
10. Lecture 10: Crossing Over: Mechanism and Cytological Evidence
11. Lecture 11: Chiasma Formation: Significance in Genetic Recombination
12. Lecture 12: Genetic Maps: Construction and Applications

Unit 2: Variation, Mutation, and Sex-Linked Inheritance (11 Lectures)

13. Lecture 13: Introduction to Genetic Variation: Types and Sources
14. Lecture 14: Mutation: Definition, Types, and Causes
15. Lecture 15: Chromosomal Mutations: Deletions, Duplications, Inversions, and Translocations
16. Lecture 16: Gene Mutations: Point Mutations, Frameshift Mutations, and Their Consequences
17. Lecture 17: Implications of Mutations: From Genetic Disorders to Evolution
18. Lecture 18: Sex-Linked Inheritance: Overview and Patterns
19. Lecture 19: Chromosomal System of Sex Determination: XY, ZW, and Haplodiploidy Systems
20. Lecture 20: Sex-Linked Disorders: Haemophilia and Colour Blindness in Humans
21. Lecture 21: Eye Color Inheritance in Drosophila: Case Study of X-Linkage
22. Lecture 22: Non-Disjunction of Sex Chromosomes in Drosophila: Mechanisms and Outcomes
23. Lecture 23: Genetic Counseling for Sex-Linked Disorders: Concepts and Case Studies

Unit 3: Human Genetics and Applied Genetics (11 Lectures)

24. Lecture 24: Human Karyotype: Structure, Nomenclature, and Abnormalities
25. Lecture 25: Chromosomal Abnormalities: Autosomes and Sex Chromosomes
26. Lecture 26: Genetic Counseling: Principles, Techniques, and Ethical Considerations
27. Lecture 27: Inborn Errors of Metabolism: Alcaptonuria, Phenylketonuria, Albinism, and Sickle-Cell Anemia
28. Lecture 28: Twins Studies: Monozygotic and Dizygotic Twins in Genetic Research
29. Lecture 29: DNA Fingerprinting: Techniques and Applications in Forensics and Paternity Testing
30. Lecture 30: Genetic Engineering: Tools and Techniques (Recombinant DNA Technology)
31. Lecture 31: Transgenic Animals: Creation, Examples, and Applications
32. Lecture 32: Ethical Issues in Genetic Engineering: Pros and Cons
33. Lecture 33: Eugenics, Euthenics, and Euphenics: Definitions, Historical Context, and Modern Views
34. Lecture 34: Applications of Genetics in Medicine: Gene Therapy and Personalized Medicine

Unit 4: Immunology (11 Lectures)

35. Lecture 35: Introduction to Immunology: Definition and Historical Development
36. Lecture 36: Innate Immunity: Physical, Chemical, and Cellular Barriers
37. Lecture 37: Acquired Immunity: Humoral and Cell-Mediated Responses
38. Lecture 38: Antigen and Antibody: Structure, Types, and Functions
39. Lecture 39: Antigen-Antibody Interactions: Principles and Applications in Diagnostics
40. Lecture 40: Immunological Memory and Vaccination: Mechanisms and Types
41. Lecture 41: Blood Groups and Transfusions: ABO and Rh Systems, Compatibility, and Cross-Matching
42. Lecture 42: Tissue and Organ Transplants: Immunological Challenges and Solutions
43. Lecture 43: Allergies: Mechanisms, Types, and Treatment
44. Lecture 44: Autoimmune Diseases: Overview, Examples, and Mechanisms
45. Lecture 45: Immunodeficiency Diseases: Types, Causes, and Treatment (e.g., AIDS)

Lesson Plan for Zoology - ZOO-204

Unit 1: Muscle Physiology (12 Lectures)

1. Lecture 1: Introduction to Muscle Physiology: Types of Muscles (Skeletal, Cardiac, Smooth)

2. Lecture 2: Ultrastructure of Skeletal Muscle: Myofibrils, Sarcomere, and Filament Arrangement
3. Lecture 3: Ultrastructure of Smooth Muscle: Structure, Function, and Differences from Skeletal Muscle
4. Lecture 4: Ultrastructure of Cardiac Muscle: Structure, Function, and Unique Features
5. Lecture 5: Mechanism of Muscle Contraction: Sliding Filament Theory
6. Lecture 6: Role of Calcium in Muscle Contraction: Excitation-Contraction Coupling
7. Lecture 7: Neuromuscular Junction: Structure and Function
8. Lecture 8: Types of Muscle Contractions: Isometric, Isotonic, and Tonic
9. Lecture 9: Muscle Twitch, Summation, and Tetanus: Mechanisms and Implications
10. Lecture 10: Fatigue in Muscles: Causes and Mechanisms
11. Lecture 11: Energetics of Muscle Contraction: ATP, Creatine Phosphate, and Metabolic Pathways
12. Lecture 12: Muscle Disorders: Myopathies, Dystrophies, and Myasthenia Gravis

Unit 2: Nerve Physiology (11 Lectures)

13. Lecture 13: Introduction to Nerve Physiology: Structure of Neurons
14. Lecture 14: Types of Neurons: Sensory, Motor, and Interneurons
15. Lecture 15: Resting Membrane Potential: Concept and Mechanisms
16. Lecture 16: Action Potential: Generation, Propagation, and Refractory Periods
17. Lecture 17: Synapses: Structure, Types, and Function
18. Lecture 18: Synaptic Transmission: Chemical and Electrical Synapses
19. Lecture 19: Neurotransmitters: Types, Functions, and Mechanisms
20. Lecture 20: Excitatory and Inhibitory Synapses: Mechanisms and Examples
21. Lecture 21: Reflex Action: Types, Pathways, and Importance
22. Lecture 22: Nerve Impulse Conduction: Saltatory vs. Continuous Conduction
23. Lecture 23: Disorders of the Nervous System: Multiple Sclerosis, Parkinson's Disease

Unit 3: Endocrinology (12 Lectures)

24. Lecture 24: Introduction to Endocrine System: Hormones and Their Functions
25. Lecture 25: Pituitary Gland: Structure, Hormones, and Their Functions
26. Lecture 26: Thyroid Gland: Structure, Hormones, and Their Functions
27. Lecture 27: Parathyroid Gland: Structure, Hormones, and Calcium Regulation
28. Lecture 28: Adrenal Gland: Structure, Hormones (Cortex and Medulla), and Their Functions
29. Lecture 29: Pancreas: Islets of Langerhans, Structure, Hormones, and Regulation of Blood Sugar

30. Lecture 30: Hormonal Control of Metabolism: Anabolism and Catabolism
31. Lecture 31: Mechanisms of Hormone Action: Receptors, Second Messengers, and Signal Transduction
32. Lecture 32: Feedback Mechanisms in Endocrine Regulation: Negative and Positive Feedback
33. Lecture 33: Disorders of the Endocrine System: Hyperthyroidism, Hypothyroidism, Diabetes Mellitus
34. Lecture 34: Neuroendocrine Regulation: Integration of Nervous and Endocrine Systems
35. Lecture 35: Pineal Gland and Biological Rhythms: Role in Circadian Regulation

Unit 4: Physiology of Reproduction (10 Lectures)

36. Lecture 36: Introduction to Reproductive Physiology: Overview of Male and Female Systems
37. Lecture 37: Male Reproductive System: Structure and Function of Testes, Spermatogenesis
38. Lecture 38: Hormonal Control of Male Reproduction: Testosterone and Other Androgens
39. Lecture 39: Female Reproductive System: Structure and Function of Ovaries, Oogenesis
40. Lecture 40: Hormonal Control of Female Reproduction: Estrogens, Progesterone, and the Menstrual Cycle
41. Lecture 41: Fertilization and Early Embryonic Development: Mechanisms and Stages
42. Lecture 42: Implantation, Placenta Formation, and Functions
43. Lecture 43: Parturition: Hormonal Control and Mechanisms of Childbirth
44. Lecture 44: Lactation: Hormonal Regulation and Physiological Processes
45. Lecture 45: Reproductive Disorders: Infertility, Polycystic Ovary Syndrome (PCOS), Erectile Dysfunction

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Lesson Plan for Chemistry - CH-202

UNIT-I: Chemistry of f-block elements (10 Lectures)

1. Lecture 1: Introduction to f-block elements: Overview and significance.
2. Lecture 2: Lanthanides: Electronic structure and oxidation states.
3. Lecture 3: Lanthanide Contraction: Causes and consequences.
4. Lecture 4: Ionic radii and complex formation in lanthanides.
5. Lecture 5: Occurrence and isolation of lanthanides.

6. Lecture 6: Important compounds of lanthanides.
7. Lecture 7: Actinides: General features and electronic structure.
8. Lecture 8: Comparison of Lanthanides and Actinides.
9. Lecture 9: Separation techniques for Np, Pu, and Am from U.
10. Lecture 10: Actinides vs. Transition Elements: Properties.

UNIT-II: Theory of Qualitative and Quantitative Inorganic Analysis-I (10 Lectures)

11. Lecture 11: Introduction to inorganic analysis: Acidic radicals.

12. Lecture 12: Identification of common acidic radicals.
13. Lecture 13: Chemistry of analysis: Typical combinations of acid radicals.
14. Lecture 14: Interference in acidic radicals: Causes.
15. Lecture 15: Removal of interference: Methods and techniques.
16. Lecture 16: Chemistry of basic radicals: An overview.
17. Lecture 17: Precipitation: Theory and types.
18. Lecture 18: Co-precipitation: Mechanisms and examples.
19. Lecture 19: Post-precipitation: Factors and effects.
20. Lecture 20: Purification of precipitates: Methods.

UNIT-III: Theory of Qualitative and Quantitative Inorganic Analysis-II (10 Lectures)

21. Lecture 21: Group analysis of basic radicals: Principles.

22. Lecture 22: Separation of cations: Group-wise analysis.
23. Lecture 23: Precipitation reactions: Key concepts.
24. Lecture 24: Co-precipitation in analysis: Practical aspects.
25. Lecture 25: Handling post-precipitation in experiments.
26. Lecture 26: Identifying interfering radicals: Case studies.

27. Lecture 27: Advanced techniques in purification.
28. Lecture 28: Application of qualitative analysis in industry.
29. Lecture 29: Quantitative analysis: Introduction and importance.
30. Lecture 30: Final review and application in inorganic chemistry.

Lesson Plan for Chemistry - CH-204

Unit 1: Infrared (IR) Absorption Spectroscopy (7 Lectures)

1. Lecture 1: Introduction to IR Spectroscopy: Molecular Vibrations
2. Lecture 2: Hooke's Law: Selection Rules and IR Band Positions
3. Lecture 3: Intensity and Measurement of IR Spectra
4. Lecture 4: Fingerprint Region and Characteristic Absorptions
5. Lecture 5: Interpretation of IR Spectra: Simple Organic Compounds
6. Lecture 6: Functional Groups in IR Spectroscopy
7. Lecture 7: Applications of IR in Structure Elucidation

Unit 2: Amines (8 Lectures)

8. Lecture 8: Structure and Nomenclature of Amines
9. Lecture 9: Physical Properties of Amines
10. Lecture 10: Separation Techniques for Amines
11. Lecture 11: Structural Features Affecting Amines' Basicity
12. Lecture 12: Preparation of Alkyl Amines: Methods and Reactions
13. Lecture 13: Preparation of Aryl Amines: Techniques and Examples
14. Lecture 14: Electrophilic Aromatic Substitution in Aryl Amines
15. Lecture 15: Reactions of Amines with Nitrous Acid

Unit 3: Diazonium Salts and Nitro Compounds (8 Lectures)

16. Lecture 16: Diazotization Mechanism and Structure of Benzene Diazonium Chloride
17. Lecture 17: Replacement of Diazo Group by Various Groups
18. Lecture 18: Reduction of Diazonium Salts and Coupling Reactions
19. Lecture 19: Preparation and Reactions of Nitro Alkanes
20. Lecture 20: Preparation and Reactions of Nitro Arenes
21. Lecture 21: Electrophilic Substitution in Nitro Arenes
22. Lecture 22: Reduction of Nitro Compounds: Mechanisms and Media
23. Lecture 23: Synthetic Applications of Diazonium Salts and Nitro Compounds

Unit 4: Aldehydes and Ketones (7 Lectures)

24. Lecture 24: Nomenclature and Structure of Carbonyl Group
25. Lecture 25: Synthesis of Aldehydes: Methods and Applications
26. Lecture 26: Synthesis of Ketones: Techniques and Importance
27. Lecture 27: Reactivity Comparison of Aldehydes and Ketones
28. Lecture 28: Nucleophilic Additions: Mechanisms and Examples
29. Lecture 29: Oxidation and Reduction Reactions in Aldehydes and Ketones
30. Lecture 30: Key Reactions: Wittig, Mannich, Perkin, and Cannizaro

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Lesson Plan for Chemistry - CH-206

Unit 1: Thermodynamics-III (7 Lectures)

1. Lecture 1: Second Law of Thermodynamics: Introduction and Need
2. Lecture 2: Statements of the Second Law
3. Lecture 3: Carnot's Cycle: Efficiency and Theorem
4. Lecture 4: Thermodynamic Scale of Temperature

5. Lecture 5: Concept of Entropy: Definition and State Function
6. Lecture 6: Entropy Changes in Physical Processes
7. Lecture 7: Entropy as Criteria of Spontaneity and Equilibrium

Unit 2: Thermodynamics-IV (7 Lectures)

8. Lecture 8: Third Law of Thermodynamics: Nernst Heat Theorem

9. Lecture 9: Residual Entropy and Absolute Entropy
10. Lecture 10: Gibbs and Helmholtz Functions: Definitions
11. Lecture 11: Criteria for Equilibrium and Spontaneity: A and G
12. Lecture 12: Variation of G and A with Pressure and Volume
13. Lecture 13: Variation of G and A with Temperature
14. Lecture 14: Applications and Advantages of G and A

Unit 3: Electrochemistry-III (8 Lectures)

15. Lecture 15: Electrolytic and Galvanic Cells: Basics

16. Lecture 16: Reversible and Irreversible Cells
17. Lecture 17: EMF of Cells: Measurement and Significance
18. Lecture 18: Standard Cell and Thermodynamic Quantities
19. Lecture 19: Nernst Equation and Electrode Reactions
20. Lecture 20: Standard Hydrogen Electrode and Reference Electrodes
21. Lecture 21: Electrochemical Series: Definition and Applications
22. Lecture 22: Metal-Metal Ion and Redox Electrodes

Unit 4: Electrochemistry-IV (8 Lectures)

23. Lecture 23: Concentration Cells with Transference

24. Lecture 24: Concentration Cells without Transference
25. Lecture 25: Liquid Junction Potential
26. Lecture 26: Application of EMF Measurements: Valency of Ions
27. Lecture 27: Solubility Product and Activity Coefficient

28. Lecture 28: Potentiometric Titrations: Acid-Base
29. Lecture 29: Potentiometric Titrations: Redox
30. Lecture 30: Determination of pH: Hydrogen and Glass Electrodes

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Lesson Plan for Botany - BOT-202

Unit-I: Plant-Water Relations and Transpiration

Lecture 1: Importance of Water to Plant Life

- Role of water in plant physiology
- Water as a solvent, nutrient transporter, and temperature regulator

Lecture 2: Physical Properties of Water

- Cohesion, adhesion, surface tension, and capillarity
- Effects on plant structure and function

Lecture 3: Imbibition

- Definition and process of imbibition
- Role in seed germination and cell expansion

Lecture 4: Diffusion

- Principles of diffusion
- Importance in nutrient uptake and gas exchange

Lecture 5: Osmosis

- Definition and mechanisms of osmosis
- Osmotic pressure and its effects on plant cells

Lecture 6: Plasmolysis

- Definition and process of plasmolysis
- Effects on plant cells and implications for water management

Lecture 7: Absorption and Transport of Water

- Mechanisms of water absorption (root uptake)
- Pathways of water transport (apoplastic and symplastic)

Lecture 8: Transpiration Types

- Types of transpiration (stomatal, cuticular, lenticular)
- Mechanisms and significance

Lecture 9: Physiology of Stomata

- Structure and function of stomata
- Regulation of stomatal opening and closing

Lecture 10: Factors Affecting Transpiration

- Environmental factors (temperature, humidity, light)
- Internal factors (stomatal density, leaf structure)

Lecture 11: Importance of Transpiration

- Role in nutrient transport and cooling
- Impact on plant water balance and ecosystem

Lecture 12: Practical Exercises and Review

- Laboratory techniques for studying transpiration and water uptake
- Review of key concepts and Q&A

Unit-II: Mineral Nutrition and Transport of Organic Substances

Lecture 1: Essential Macro and Micro Elements

- Overview of essential nutrients (N, P, K, Ca, Mg, S, Fe, Mn, Zn, Cu, Mo, B)
- Functions and significance of each element

Lecture 2: Criteria of Essentiality of Elements

- Criteria for determining nutrient essentiality
- Methods for testing essentiality

Lecture 3: Role of Essential Elements

- Functions of macro and micro elements in plant growth and development
- Examples of nutrient interactions

Lecture 4: Mineral Uptake

- Mechanisms of mineral absorption (active and passive transport)

- Role of root hairs and mycorrhizae

Lecture 5: Deficiency Symptoms

- Symptoms and effects of nutrient deficiencies
- Diagnosis and treatment of deficiencies

Lecture 6: Mechanism of Phloem Transport

- Structure and function of phloem
- Process of translocation (pressure flow hypothesis)

Lecture 7: Source-Sink Relationship

- Definition and examples of source and sink tissues
- Role in nutrient distribution and growth

Lecture 8: Factors Affecting Translocation

- Environmental and physiological factors influencing phloem transport
- Impact on plant growth and development

Lecture 9: Review of Mineral Nutrition

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 10: Practical Examination of Mineral Nutrition

- Laboratory techniques for analyzing nutrient content and deficiencies
- Microscopic analysis of root structures and nutrient uptake

Lecture 11: Case Studies on Phloem Transport

- Examples of various phloem transport mechanisms in different plants
- Analysis of research findings and case studies

Lecture 12: Practical Exercises and Q&A

- Hands-on activities related to mineral nutrition and phloem transport
- Q&A session to address any remaining questions

Unit-III: Growth, Development, and Plant Movements

Lecture 1: Seed Dormancy

- Definition and types of seed dormancy

- Mechanisms and physiological basis

Lecture 2: Overcoming Seed Dormancy

- Methods for breaking dormancy (e.g., scarification, stratification)
- Importance for seed germination and propagation

Lecture 3: Plant Movements

- Types of plant movements (tropisms, nastic movements)
- Mechanisms and examples

Lecture 4: Concept of Photoperiodism

- Definition and importance of photoperiodism
- Types of photoperiodic responses (short-day, long-day, day-neutral)

Lecture 5: Physiology of Flowering

- Mechanisms regulating flowering
- Role of light and temperature

Lecture 6: Florigen Concept

- Definition and role of florigen in flowering
- Evidence and studies supporting the florigen hypothesis

Lecture 7: Physiology of Senescence

- Definition and stages of senescence
- Cellular and molecular mechanisms

Lecture 8: Fruit Ripening

- Physiological and biochemical processes of fruit ripening
- Role of hormones and environmental factors

Lecture 9: Growth and Development: Definitions

- Definitions of growth and development
- Differences between growth and development

Lecture 10: Phases of Growth and Development

- Phases of plant growth (lag, exponential, stationary)
- Stages of development (seedling, vegetative, reproductive)

Lecture 11: Review of Growth and Development

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 12: Practical Exercises and Q&A

- Hands-on activities related to seed dormancy, plant movements, and growth phases
- Q&A session to address any remaining questions

Unit-IV: Plant Hormones and Photo-morphogenesis

Lecture 1: Introduction to Plant Hormones

- Definition and role of plant hormones
- Overview of major plant hormones

Lecture 2: Auxins

- Discovery, structure, and functions of auxins
- Mechanism of action and applications

Lecture 3: Gibberellins

- Discovery, structure, and functions of gibberellins
- Mechanism of action and applications

Lecture 4: Cytokinins

- Discovery, structure, and functions of cytokinins
- Mechanism of action and applications

Lecture 5: Abscisic Acid (ABA)

- Discovery, structure, and functions of ABA
- Mechanism of action and applications

Lecture 6: Ethylene

- Discovery, structure, and functions of ethylene
- Mechanism of action and applications

Lecture 7: Historical Perspective of Hormone Discovery

- History and milestones in hormone research
- Key experiments and discoveries

Lecture 8: Photo-morphogenesis

- Definition and importance of photo-morphogenesis
- Mechanisms of light perception and response

Lecture 9: Phytochromes

- Discovery, structure, and function of phytochromes
- Physiological role and mechanism of action

Lecture 10: Mechanism of Action of Phytochromes

- Detailed mechanism of phytochrome action
- Role in regulating plant growth and development

Lecture 11: Review of Plant Hormones and Photo-morphogenesis

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 12: Practical Exercises and Q&A

- Hands-on activities related to hormone effects and photo-morphogenesis
- Q&A session to address any remaining questions

Unit-IV: Root System and Structural Modifications

Lecture 1: Root Apical Meristem

- Structure and function of root apical meristem
- Differences between monocot and dicot roots

Lecture 2: Histological Organization of Monocot Roots

- Structure and features of monocot roots
- Comparison with dicot roots

Lecture 3: Histological Organization of Dicot Roots

- Structure and features of dicot roots
- Comparison with monocot roots

Lecture 4: Secondary Growth in Dicot Root

- Mechanisms of secondary growth in roots

- Role of cambium and formation of secondary tissues

Lecture 5: Structural Modifications in Roots: Storage Roots

- Examples (e.g., Beta)
- Anatomy and adaptive significance

Lecture 6: Structural Modifications in Roots: Respiratory Roots

- Examples (e.g., Rhizophora)
- Anatomy and adaptive significance

Lecture 7: Structural Modifications in Roots: Epiphytic Roots

- Examples (e.g., Vanda)
- Anatomy and adaptive significance

Lecture 8: Adaptations in Xerophytes

- Anatomical adaptations to dry environments
- Examples and case studies

Lecture 9: Adaptations in Hydrophytes

- Anatomical adaptations to aquatic environments
- Examples and case studies

Lecture 10: Adaptations in Halophytes

- Anatomical adaptations to saline environments
- Examples and case studies

Lecture 11: Review of Root System and Structural Modifications

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 12: Practical Exercises and Q&A

- Hands-on activities for examining root anatomy and modifications
- Q&A session to address any remaining questions

Unit-I: Photosynthesis

Lecture 1: Significance of Photosynthesis

- Overview of photosynthesis
- Importance in plant growth and global ecosystems

Lecture 2: Historical Aspects of Photosynthesis

- Key discoveries and experiments (e.g., van Helmont, Priestley, Ingenhousz)
- Development of the photosynthesis model

Lecture 3: Photosynthetic Pigments

- Types of pigments (chlorophylls, carotenoids, phycobilins)
- Role and absorption spectra of each pigment

Lecture 4: Action Spectra and Enhancement Effects

- Definition and importance of action spectra
- Enhancement effects and their significance in photosynthesis

Lecture 5: Concept of Two Photosystems

- Structure and function of Photosystem I and Photosystem II
- Role in the light-dependent reactions

Lecture 6: The Z-Scheme of Photosynthesis

- Detailed explanation of the Z-scheme
- Electron flow and energy conversion

Lecture 7: Photophosphorylation

- Mechanism of photophosphorylation
- Role in ATP formation during photosynthesis

Lecture 8: Calvin Cycle

- Phases of the Calvin cycle (carbon fixation, reduction, regeneration)
- Enzymes involved and overall process

Lecture 9: C4 Pathway

- Overview of C4 photosynthesis
- Differences from C3 pathway and advantages in certain environments

Lecture 10: CAM Plants

- Definition and mechanism of Crassulacean Acid Metabolism (CAM)
- Adaptations and examples of CAM plants

Lecture 11: Photorespiration

- Concept of photorespiration
- Impact on photosynthesis and plant productivity

Lecture 12: Review and Practical Exercises

- Summary of key concepts
- Laboratory techniques and exercises related to photosynthesis

Unit-II: Respiration

Lecture 1: ATP – The Biological Energy Currency

- Structure and function of ATP
- Role of ATP in cellular processes

Lecture 2: Aerobic Respiration

- Overview and stages of aerobic respiration (glycolysis, Krebs cycle, electron transport chain)
- Energy yield and importance

Lecture 3: Anaerobic Respiration

- Mechanisms of anaerobic respiration
- Comparison with aerobic respiration and examples

Lecture 4: Krebs Cycle (Citric Acid Cycle)

- Detailed steps and enzymes of the Krebs cycle
- Role in energy production and metabolic intermediates

Lecture 5: Electron Transport Mechanism

- Overview of the electron transport chain
- Chemiosmotic theory and ATP synthesis

Lecture 6: Redox Potential

- Concept of redox reactions and potentials
- Importance in respiration and energy production

Lecture 7: Oxidative Phosphorylation

- Mechanism and significance in ATP production
- Role of the electron transport chain and ATP synthase

Lecture 8: Pentose Phosphate Pathway

- Overview and significance of the pentose phosphate pathway
- Functions and metabolic intermediates

Lecture 9: Review of Respiration

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 10: Practical Examination of Respiration

- Laboratory techniques for studying respiration and energy production
- Microscopic and biochemical analyses

Lecture 11: Case Studies on Respiration

- Examples of respiration processes in different organisms
- Analysis of research findings and case studies

Lecture 12: Practical Exercises and Q&A

- Hands-on activities related to respiration and energy metabolism
- Q&A session to address any remaining questions

Unit-III: Nitrogen Metabolism and Lipid Metabolism

Lecture 1: Biology of Nitrogen Fixation

- Overview of nitrogen fixation
- Role of nitrogen-fixing bacteria and symbiotic relationships

Lecture 2: Importance of Nitrate Reductase

- Function and regulation of nitrate reductase
- Role in nitrogen assimilation

Lecture 3: Ammonium Assimilation

- Processes of ammonium assimilation
- Role in nitrogen metabolism and plant nutrition

Lecture 4: Structure and Functions of Lipids

- Types and structures of lipids (fats, oils, phospholipids)
- Functions and importance in cells

Lecture 5: Fatty Acid Biosynthesis

- Overview of fatty acid biosynthesis
- Enzymes and processes involved

Lecture 6: β-Oxidation

- Mechanism of β-oxidation
- Role in fatty acid breakdown and energy production

Lecture 7: Saturated and Unsaturated Fatty Acids

- Differences and functions of saturated and unsaturated fatty acids
- Impact on health and metabolism

Lecture 8: Storage and Mobilization of Fatty Acids

- Mechanisms of fatty acid storage and mobilization
- Role in energy homeostasis

Lecture 9: Review of Nitrogen Metabolism

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 10: Review of Lipid Metabolism

- Summary of key concepts
- Discussion of complex topics and practical implications

Lecture 11: Practical Examination of Metabolism

- Laboratory techniques for studying nitrogen and lipid metabolism
- Microscopic and biochemical analyses

Lecture 12: Q&A and Comprehensive Review

- Final review of Unit-III topics
- Q&A session to address any remaining questions

Unit-IV: Basics of Enzymology

Lecture 1: Discovery and Nomenclature of Enzymes

- Historical discovery of enzymes
- Enzyme classification and naming conventions

Lecture 2: Characteristics of Enzymes

- Properties of enzymes (specificity, efficiency, regulation)
- Types of enzyme reactions

Lecture 3: Concept of Holoenzyme and Apoenzyme

- Definitions and differences between holoenzyme and apoenzyme
- Role of coenzymes and cofactors

Lecture 4: Coenzymes and Cofactors

- Types and functions of coenzymes (e.g., vitamins)
- Role of metal ions as cofactors

Lecture 5: Enzyme Regulation

- Mechanisms of enzyme regulation (e.g., allosteric regulation, covalent modification)
- Importance in metabolic control

Lecture 6: Enzyme Kinetics

- Michaelis-Menten kinetics
- Determination of kinetic parameters (Km, Vmax)

Lecture 7: Enzyme Inhibition

- Types of enzyme inhibition (competitive, non-competitive, uncompetitive)
- Effects on enzyme activity and applications

Lecture 8: Enzyme Catalysis Mechanism

- Mechanisms of enzyme catalysis (induced fit, transition state theory)
- Examples and models

Lecture 9: Review of Enzymology

- Summary of key concepts

- Discussion of complex topics and practical implications

Lecture 10: Practical Examination of Enzymes

- Laboratory techniques for studying enzyme activity and kinetics
- Microscopic and biochemical analyses

Lecture 11: Case Studies in Enzymology

- Examples of enzyme functions and applications
- Analysis of research findings and case studies

Lecture 12: Practical Exercises and Q&A

- Hands-on activities related to enzyme studies
- Final Q&A session to address any remaining questions

SCHOOL OF BASIC AND APPLIED SCIENCES

(CBCS Scheme of Studies & Examinations w. e. f. 2021-24 onwards)

B.Sc. (CBZ) III Year

V Semester

(Chemistry, Botany and Zoology)

Scheme 5th semester

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	**Chemistry**	CH-301	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-303	Organic Chemistry	2	0	20	30	50	3	2
3		CH-305	Physical Chemistry	2	0	20	30	50	3	2
4		CH-307	Chemistry Lab-V	0	6	20	30	50	4	3
5	**Botany**	BOT-301	Economic Botany	3	0	20	30	50	3	3
6		BOT-303	Plant Biotechnology	3	0	20	30	50	3	3
7		BOT-305	Botany Lab-V	0	2/4	20	30	50	4	2
8	**Zoology**	ZOO-301	Biochemistry	3	0	20	30	50	3	3
9		ZOO-303	Ecology & Evolution	3	0	20	30	50	3	3
10		ZOO-305	Zoology Lab-V	0	2/4	20	30	50	3	2
11	ECA	ECA-301	Seminar/ Project/ Internship	2	0	-	-	50	-	2
		TOTAL		20	14			500		27

SCHOOL OF BASIC & APPLIED SCIENCES

(Syllabus & Scheme of Studies w.e.f. 2021-24)

B.Sc. (CBZ) III Year (V semester)

Chemistry

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1. Inorganic Chemistry (CH-301)

Course Outcomes:

1. Have good knowledge about d-block elements particularly of transition elements.
2. To study the bonding of 3d elements. To recapitulate the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbital's in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters. Students will be able to calculate the spectroscopic terms for various metal ions.
3. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties some compounds of transition elements.
4. To know about position of f block elements in periodic table and their general characteristics. To study the occurrence and separation of lanthanides and lanthanide compounds. Have knowledge of actinides their existence and general properties.
5. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

2. Organic Chemistry (CH-303)

Course Outcomes:

1. Have good knowledge about d-block elements particularly of transition elements.
2. To study the bonding of 3d elements. To recapitulate the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbital's in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters. Students will be able to calculate the spectroscopic terms for various metal ions.

3. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties some compounds of transition elements.
4. To know about position of f block elements in periodic table and their general characteristics. To study the occurrence and separation of lanthanides and lanthanide compounds. Have knowledge of actinides their existence and general properties.
5. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

3.Physical Chemistry (CH-305)

Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts in Physical chemistry.
2. Students will be able to understand the fundamentals of thermodynamics and electrochemistry.
3. Students will be able to understand the solve problems using the properties and relationships of thermodynamic equations. Students will have understanding of thermodynamic fundamentals for application in applied thermodynamics.
4. Students will gain the knowledge of instrumentation in electrochemistry. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state.

Botany

Economic Botany (BOT-301)

Course Outcomes:

1. Know the criteria of geological distribution of crops.
2. Determine the trend of migration of crops globally.
3. Know different methodologies for crop cultivation and their values.
4. Know the types of major traditional crops in India and their utility in mankind.
5. Know the economic importance of medicinally plants.
6. Determine the significance of energy plantation.

Plant Biotechnology (BOT-303)

Course Outcomes:

1. Describe the basic terminology in plant biotechnology.

2. Explain the methodology and mechanism of genesis of plant organs.
3. Explain the procedure of plant tissue culture and its utility.
4. Select and apply experimental procedures to the spectrum of fields making use of biotechnology.
5. Grow, maintain, and propagate different plant cell types in aseptic conditions.
6. Handle, store and analyse different culture and sub-cultures how these can be used for in vitro studies and secondary metabolite production for industries and agriculture.

Zoology

Genetics and Immunology (Z00-301)

Course Outcomes:

5. Students will be able to understand the concept of genetics, its basic principles & theories and genetic interactions.
6. Students will have acquaintance with respect to variations, mutations and sex linked inheritance.
7. Students will be able to get knowledge about several chromosomal abnormalities involving autosomes and sex chromosomes along with some implications of applied genetics.
8. Students will be able to understand the concept of immune system, blood transfusion, autoimmune disorders and transplanting of tissues and organs.

Mammalian Physiology-I (Z00-303)

Course Outcomes:

6. It will make the students understand the appropriate functioning of various body systems in animals and mechanism of working.
7. Students will be able to understand the structure of various muscle fibres and mechanism of muscle contraction.
8. Students will be able to explain the mechanism of nerve conduction and related neurotransmitters involved in its physiological processes.
9. It will make the students understand the structure and function of various endocrine glands as well as their secretion.

10. Students will be able to understand the control of hormones on reproductive physiology mechanism that is essential for the continuance of the human species.

CO-PO MAPPING

CHEMISTRY

CH-301											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	2	1	3	2	2	1

CH-303											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	3	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	3	2	2	1

CH-305											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	1	2	2	1

CO-PO MAPPING

BOTANY

BOT-301											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1
	CO6	2	2	1	2	1	2	1	2	1	2

BOT-303											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	√	2	2	1
	CO6	2	1	2	1	3	2	2	2	1	2

BOT-305											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

CO-PO MAPPING

Zoology

ZOO-301											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-303											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-305											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

PSO-PO Mapping

	PO01	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PSO-01**	**PSO-02**	**PSO-03**
Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment	2.20	1.59	1.34	0.73	1.34	0.37	1.47	1.10	0.98	0.98	1.96	2.20	1.83	1.10

Unit 1: Carbohydrates (10 Lectures)

1. Lecture 1: Introduction to Biochemistry: Overview and Importance
2. Lecture 2: Structure of Carbohydrates: Monosaccharides, Disaccharides, and Polysaccharides
3. Lecture 3: Functions of Carbohydrates: Energy Storage, Structural Components
4. Lecture 4: Glycolysis: Pathway, Key Enzymes, and Regulation
5. Lecture 5: Krebs Cycle: Pathway, Key Enzymes, and Regulation
6. Lecture 6: Oxidative Phosphorylation: Electron Transport Chain and ATP Synthesis
7. Lecture 7: Gluconeogenesis: Pathway and Regulation
8. Lecture 8: Glycogen Metabolism: Glycogenesis and Glycogenolysis
9. Lecture 9: Role of Insulin and Glucagon in Carbohydrate Metabolism
10. Lecture 10: Disorders of Carbohydrate Metabolism: Diabetes Mellitus, Glycogen Storage Diseases

Unit 2: Lipids (10 Lectures)

11. Lecture 11: Structure of Lipids: Fatty Acids, Triglycerides, Phospholipids, and Steroids
12. Lecture 12: Functions of Lipids: Energy Storage, Membrane Structure, Signaling
13. Lecture 13: Beta-Oxidation of Fatty Acids: Pathway and Energy Yield
14. Lecture 14: Biosynthesis of Fatty Acids: Key Enzymes and Regulation
15. Lecture 15: Metabolism of Phospholipids and Sphingolipids: Pathways and Functions
16. Lecture 16: Cholesterol Metabolism: Biosynthesis, Regulation, and Clinical Significance
17. Lecture 17: Lipoproteins: Structure, Function, and Metabolism
18. Lecture 18: Ketogenesis and Ketolysis: Mechanisms and Physiological Role
19. Lecture 19: Essential and Non-Essential Fatty Acids: Functions and Dietary Sources
20. Lecture 20: Disorders of Lipid Metabolism: Atherosclerosis, Hyperlipidemia, Fatty Liver Disease

Unit 3: Proteins (10 Lectures)

21. Lecture 21: Structure of Proteins: Amino Acids, Peptide Bonds, and Levels of Protein Structure
22. Lecture 22: Functions of Proteins: Enzymatic, Structural, Transport, and Regulatory Roles
23. Lecture 23: Protein Synthesis: Translation Mechanism and Post-Translational Modifications
24. Lecture 24: Protein Folding and Stability: Chaperones, Misfolding, and Diseases

25. Lecture 25: Protein Degradation: Ubiquitin-Proteasome System and Autophagy
26. Lecture 26: Amino Acid Metabolism: Transamination, Deamination, and Urea Cycle
27. Lecture 27: Synthesis and Degradation of Heme: Pathways and Disorders
28. Lecture 28: Nitrogen Balance: Positive, Negative, and Equilibrium States
29. Lecture 29: Enzyme Kinetics: Michaelis-Menten Equation, Inhibition, and Regulation
30. Lecture 30: Disorders of Protein Metabolism: Phenylketonuria, Albinism, Maple Syrup Urine Disease

Unit 4: Vitamins, Minerals, and Nucleic Acids (10 Lectures)

31. Lecture 31: Vitamins: Classification, Sources, Functions, and Deficiency Diseases
32. Lecture 32: Water-Soluble Vitamins: B-Complex and Vitamin C – Functions and Deficiencies
33. Lecture 33: Fat-Soluble Vitamins: Vitamins A, D, E, and K – Functions and Deficiencies
34. Lecture 34: Minerals: Major and Trace Elements – Functions and Deficiencies
35. Lecture 35: Structure of Nucleic Acids: DNA and RNA
36. Lecture 36: DNA Replication: Mechanism, Enzymes, and Regulation
37. Lecture 37: Transcription and RNA Processing: Mechanism and Regulation
38. Lecture 38: Translation: Genetic Code, Mechanism, and Regulation
39. Lecture 39: Nucleotide Metabolism: Synthesis and Degradation of Purines and Pyrimidines
40. Lecture 40: Disorders of Nucleotide Metabolism: Gout, Lesch-Nyhan Syndrome, SCID

Lesson Plan for Zoology - ZOO-303

Unit 1: Introduction to Ecology (10 Lectures)

1. Lecture 1: Introduction to Ecology: Definition, Scope, and Importance
2. Lecture 2: History of Ecology: Key Concepts and Development
3. Lecture 3: Autecology and Synecology: Concepts and Differences
4. Lecture 4: Species Concept in Ecology: Sympatric, Parapatric, and Allopatric Species
5. Lecture 5: Abiotic Factors: Light and Temperature as Limiting Factors
6. Lecture 6: Soil Ecology: Types of Soil and Soil Erosion
7. Lecture 7: Liebig's Law of Minimum and Shelford's Law of Tolerance
8. Lecture 8: Ecological Niche: Concept, Types, and Examples
9. Lecture 9: Biomes of the World: Characteristics and Distribution

10. Lecture 10: Ecosystem Services: Types, Importance, and Examples

Unit 2: Population Ecology (10 Lectures)

11. Lecture 11: Introduction to Population Ecology: Definitions and Concepts
12. Lecture 12: Unitary and Modular Populations: Characteristics and Examples
13. Lecture 13: Population Density and Dispersion: Methods of Measurement and Patterns
14. Lecture 14: Population Demography: Life Tables, Survivorship Curves, and Age Structure
15. Lecture 15: Exponential Growth Model: Assumptions, Equations, and Examples
16. Lecture 16: Logistic Growth Model: Assumptions, Equations, and Carrying Capacity
17. Lecture 17: Population Regulation: Intrinsic and Extrinsic Mechanisms
18. Lecture 18: Human Population Growth: Age Pyramids and Demographic Transition
19. Lecture 19: r/K Selection Theory: Concepts and Applications
20. Lecture 20: Population Interactions: Competition, Predation, Mutualism, and Parasitism

Unit 3: Community and Ecosystem Ecology (10 Lectures)

21. Lecture 21: Introduction to Community Ecology: Structure and Dynamics
22. Lecture 22: Community Structure: Species Diversity, Dominance, and Abundance
23. Lecture 23: Ecotone and Edge Effect: Definitions, Examples, and Significance
24. Lecture 24: Ecological Succession: Types, Processes, and Examples
25. Lecture 25: Climax Community: Theories and Examples
26. Lecture 26: Energy Flow in Ecosystems: Trophic Levels, Food Chains, and Food Webs
27. Lecture 27: Biogeochemical Cycles: Carbon, Nitrogen, Phosphorus, and Water Cycles
28. Lecture 28: Ecosystem Productivity: Primary and Secondary Productivity, Measurement
29. Lecture 29: Ecological Pyramids: Types, Construction, and Significance
30. Lecture 30: Conservation Ecology: Biodiversity, Threats, and Conservation Strategies

Unit 4: Evolution (10 Lectures)

31. Lecture 31: Introduction to Evolution: Definitions and Historical Perspectives
32. Lecture 32: Theories of Evolution: Lamarckism, Darwinism, and Neo-Darwinism
33. Lecture 33: Natural Selection: Types, Mechanisms, and Examples
34. Lecture 34: Speciation: Types, Processes, and Examples
35. Lecture 35: Genetic Variations and Evolution: Sources and Mechanisms
36. Lecture 36: Isolation Mechanisms: Prezygotic and Postzygotic Barriers

37. Lecture 37: Adaptations: Types, Examples, and Significance in Evolution
38. Lecture 38: Fossils and Paleontology: Importance in Understanding Evolution
39. Lecture 39: Geological Time Scale: Divisions and Key Events in Evolution
40. Lecture 40: Human Evolution: Key Fossils, Major Discoveries, and Trends

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Lesson Plan for Chemistry - CH-301

Unit 1: Metal-Ligand Bonding in Transition Metal Complexes (7 Lectures)

1. Lecture 1: Introduction to Metal-Ligand Bonding: Overview
2. Lecture 2: Valence Bond Theory: Limitations and Challenges
3. Lecture 3: Introduction to Crystal-Field Theory: Basics
4. Lecture 4: Spectrochemical Series: Definition and Importance
5. Lecture 5: Crystal Field Splitting in Octahedral Complexes
6. Lecture 6: Tetrahedral Complexes: Crystal Field Splitting
7. Lecture 7: Square Planar Complexes: Crystal Field Splitting

Unit 2: Thermodynamic and Kinetic Aspects of Metal Complexes (8 Lectures)

8. Lecture 8: Jahn-Teller Effect: Overview and Significance
9. Lecture 9: Thermodynamic Stability of Metal Complexes: Basics
10. Lecture 10: Factors Influencing Stability: Key Concepts
11. Lecture 11: Substitution Reactions in Metal Complexes: Overview
12. Lecture 12: Pt(II) Complexes: Substitution Reactions
13. Lecture 13: Kinetic vs Thermodynamic Control in Reactions
14. Lecture 14: Ligand Substitution Mechanisms: Introduction
15. Lecture 15: Factors Affecting Reaction Rates in Complexes

Unit 3: Magnetic Properties of Transition Metal Complexes (7 Lectures)

16. Lecture 16: Types of Magnetic Behavior in Complexes

17. Lecture 17: Spin-Only Formula: Application and Examples

18. Lecture 18: Orbital Contribution to Magnetic Moments

19. Lecture 19: L-S Coupling: Concept and Importance

20. Lecture 20: Spectroscopic Ground States: Determination

21. Lecture 21: Magnetic Moment Data: Application in 3d Metals

22. Lecture 22: Interpretation of Magnetic Properties

Unit 4: Electron Spectra of Transition Metal Complexes (8 Lectures)

23. Lecture 23: Introduction to Electronic Transitions in Complexes

24. Lecture 24: Selection Rules for d-d Transitions: Explanation

25. Lecture 25: Appearance of Colour in Transition Metal Complexes

26. Lecture 26: Orgel Diagram: Energy Levels for d1 States

27. Lecture 27: Orgel Diagram: Energy Levels for d9 States

28. Lecture 28: Case Study: [Ti(H2O)6]+3 Spectrum Analysis

29. Lecture 29: Interpretation of Electronic Spectra: Basic Approach

30. Lecture 30: Summary and Review of Transition Metal Complexes

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Lesson Plan for Chemistry - CH-303

Unit 1: NMR Spectroscopy-I (7 Lectures)

1. Lecture 1: Principle of Nuclear Magnetic Resonance
2. Lecture 2: Introduction to Proton NMR
3. Lecture 3: Number of Signals, Peak Areas, and Integration
4. Lecture 4: Equivalent vs. Nonequivalent Protons
5. Lecture 5: Chemical Shift, Shielding, and Deshielding
6. Lecture 6: Proton Counting and Signal Splitting

7. Lecture 7: Coupling Constants

Unit 2: NMR Spectroscopy-II (8 Lectures)

8. Lecture 8: Factors Affecting Chemical Shift

9. Lecture 9: Ethyl Bromide NMR Spectrum

10. Lecture 10: NMR Spectra of n-Propyl and Isopropyl Bromide

11. Lecture 11: NMR of 1,1-Dibromoethane and 1,1,2-Tribromoethane

12. Lecture 12: NMR of Ethanol and Acetaldehyde

13. Lecture 13: NMR of Ethyl Acetate and Toluene

14. Lecture 14: NMR of Benzaldehyde and Acetophenone

15. Lecture 15: Introduction to Carbon NMR and Chemical Shift Values

Unit 3: Carbohydrates-I (8 Lectures)

16. Lecture 16: Classification and Nomenclature of Carbohydrates

17. Lecture 17: Monosaccharides and Osazone Formation

18. Lecture 18: Inter-conversion of Glucose and Fructose

19. Lecture 19: Chain Lengthening and Shortening of Aldoses

20. Lecture 20: Configuration of Monosaccharides and Diastereomers

21. Lecture 21: Conversion of Glucose into Mannose

22. Lecture 22: Formation of Glycosides, Ethers, and Esters

23. Lecture 23: Determination of Ring Size for Glucose and Fructose

Unit 4: Carbohydrates-II & Organometallic Compounds (7 Lectures)

24. Lecture 24: Structures of Ribose and Deoxyribose

25. Lecture 25: Introduction to Disaccharides: Maltose, Sucrose, Lactose

26. Lecture 26: Introduction to Polysaccharides: Starch, Cellulose

27. Lecture 27: Organomagnesium Compounds: Grignard Reagents

28. Lecture 28: Formation and Reactions of Grignard Reagents

29. Lecture 29: Organolithium and Organozinc Compounds: Formation

30. Lecture 30: Chemical Reactions of Organolithium and Organozinc Compounds

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Lesson Plan for Chemistry - CH-305

Unit I: Quantum Mechanics-I (7 Lectures)

1. Lecture 1: Introduction to Quantum Mechanics: Black-body Radiation, Planck's Law
2. Lecture 2: Photoelectric Effect: Concepts and Applications
3. Lecture 3: Heat Capacity of Solids and Compton Effect
4. Lecture 4: Wave Function: Significance and Interpretation
5. Lecture 5: Quantum Mechanical Operators: Commutation Relations
6. Lecture 6: Heisenberg Uncertainty Principle: Position and Momentum
7. Lecture 7: Particle in a 1D Box: Wave Function and Energy

Unit II: Physical Properties and Molecular Structure (7 Lectures)

8. Lecture 8: Optical Activity and Polarization: Clausius-Mossotti Equation

9. Lecture 9: Dipole Moment: Measurement and Structural Implications

10. Lecture 10: Magnetic Permeability and Susceptibility: Concepts and Determination

11. Lecture 11: Paramagnetism and Diamagnetism: Properties and Examples

12. Lecture 12: Ferromagnetism: Principles and Applications

13. Lecture 13: Application of Magnetic Susceptibility in Molecular Structure

14. Lecture 14: Orientation of Dipoles in Electric Fields

Unit III: Spectroscopy-I (8 Lectures)

15. Lecture 15: Introduction to Spectroscopy: Electromagnetic Spectrum and Regions

16. Lecture 16: Born-Oppenheimer Approximation: Statement and Importance

17. Lecture 17: Rotational Spectra of Diatomic Molecules: Rigid Rotator Model 18. Lecture

18: Selection Rules and Spectral Intensity Distribution

19. Lecture 19: Determination of Bond Length and Isotope Effect

20. Lecture 20: Non-Rigid Rotor: Qualitative Description

21. Lecture 21: Maxwell-Boltzmann Distribution: Population Distribution

22. Lecture 22: Degrees of Freedom: Translational, Rotational, Vibrational

Unit IV: Spectroscopy-II (8 Lectures)

23. Lecture 23: Infrared Spectra: Simple Harmonic Oscillator Model

24. Lecture 24: Selection Rules and Pure Vibrational Spectra

25. Lecture 25: Force Constant and Bond Energies: Determination

26. Lecture 26: Effects of Anharmonic Motion and Isotopic Substitution

27. Lecture 27: Raman Spectra: Polarizability and Quantum Theory

28. Lecture 28: Pure Rotational Raman Spectra: Selection Rules

29. Lecture 29: Pure Vibrational Raman Spectra: Diatomic Molecules

30. Lecture 30: Vibrational Frequencies of Functional Groups: Overview and Applications

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Lesson Plan for Botany - BOT-301

Unit-I: Food Plants

Lecture 1: Introduction to Food Plants

- Overview of food plants and their significance in human nutrition
- General principles of cultivation and use

Lecture 2: Cereals – Rice

- Origin and distribution of rice
- Botanical description and varieties
- Brief idea of cultivation and uses

Lecture 3: Cereals – Wheat

- Origin and distribution of wheat
- Botanical description and varieties
- Brief idea of cultivation and uses

Lecture 4: Cereals – Maize

- Origin and distribution of maize
- Botanical description and varieties
- Brief idea of cultivation and uses

Lecture 5: Pulses – Gram

- Origin and distribution of gram
- Botanical description and varieties
- Brief idea of cultivation and uses

Lecture 6: Pulses – Arhar

- Origin and distribution of arhar (pigeon pea)
- Botanical description and varieties
- Brief idea of cultivation and uses

Lecture 7: Pulses – Pea

- Origin and distribution of pea
- Botanical description and varieties
- Brief idea of cultivation and uses

Lecture 8: Vegetables – Potato

- Origin and distribution of potato
- Botanical description and varieties
- Brief idea of cultivation and uses

Lecture 9: Vegetables – Tomato

- Origin and distribution of tomato
- Botanical description and varieties
- Brief idea of cultivation and uses

Lecture 10: Vegetables – Onion

- Origin and distribution of onion
- Botanical description and varieties
- Brief idea of cultivation and uses

Lecture 11: Review of Food Plants

- Summary of key concepts
- Discussion of interrelationships and comparative aspects

Lecture 12: Practical Exercises and Q&A

- Hands-on activities related to the study of food plants
- Q&A session to address any remaining questions

Unit-II: Spices, Fibers, and Oils

Lecture 1: Introduction to Spices, Fibers, and Oils

- Overview of spices, fibers, and oils
- Importance in agriculture and industry

Lecture 2: Spices – Coriander

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 3: Spices – Ginger

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 4: Spices – Turmeric

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 5: Spices – Cloves

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 6: Fibers – Cotton

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 7: Fibers – Jute

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 8: Fibers – Flax

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 9: Oils – Groundnut

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 10: Oils – Mustard

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 11: Oils – Coconut

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 12: Review and Practical Exercises

- Summary of key concepts
- Laboratory exercises related to spices, fibers, and oils
- Q&A session to address any remaining questions

Unit-III: Medicinal Plants and Energy Plantations

Lecture 1: Introduction to Medicinal Plants

- Overview and importance of medicinal plants
- General principles of cultivation and use

Lecture 2: Medicinal Plants – Cinchona

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 3: Medicinal Plants – Rauwolfia

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 4: Medicinal Plants – Atropa

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 5: Medicinal Plants – Opium

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 6: Medicinal Plants – Cannabis

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 7: Medicinal Plants – Neem

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 8: Medicinal Plants – Withania

- Morphology of plant part used
- Brief idea of cultivation and uses

Lecture 9: Other Industrially Important Medicinal Plants

- Overview of additional medicinal plants with industrial significance
- Examples and uses

Lecture 10: Energy Plantations

- Overview of energy plantations
- Importance in sustainable energy production

Lecture 11: Bio-Fuels

- Types and production of bio-fuels
- Role of energy plantations in bio-fuel production

Lecture 12: Review and Practical Exercises

- Summary of key concepts
- Laboratory and field exercises related to medicinal plants and energy plantations
- Q&A session to address any remaining questions

Unit-IV: Beverages, Rubber, Sugar, and Timber

Lecture 1: Introduction to Beverages, Rubber, Sugar, and Timber

- Overview and significance of these products
- General principles of processing and use

Lecture 2: Beverages – Tea

- Botanical description and processing of tea
- Cultivation and uses

Lecture 3: Beverages – Coffee

- Botanical description and processing of coffee
- Cultivation and uses

Lecture 4: Rubber – Hevea

- Botanical description and processing of rubber from Hevea
- Cultivation and uses

Lecture 5: Sugar – Sugarcane

- Botanical description and processing of sugarcane
- Cultivation and uses

Lecture 6: Timber – General Account

- Overview of timber types and uses
- Importance of timber in construction and industry

Lecture 7: Sources of Timber

- Major sources and types of timber
- Sustainable practices and forestry management

Lecture 8: Review of Beverages and Rubber

- Summary of key concepts related to tea, coffee, and rubber
- Discussion of comparative aspects and industrial relevance

Lecture 9: Review of Sugar and Timber

- Summary of key concepts related to sugarcane and timber
- Discussion of processing and uses

Lecture 10: Practical Examination of Processing Techniques

- Laboratory and field techniques for studying beverage, rubber, and sugar processing
- Microscopic and biochemical analyses

Lecture 11: Case Studies and Industry Trends

- Analysis of case studies related to beverages, rubber, sugar, and timber
- Current trends and future prospects

Lecture 12: Practical Exercises and Q&A

- Hands-on activities related to the study of beverages, rubber, sugar, and timber
- Final Q&A session to address any remaining questions

Lesson Plan for Botany - BOT-303

Unit I: Plant Tissue Culture and Molecular Tools

Lecture 1: Historical Perspective of Plant Tissue Culture

- Overview of the development of plant tissue culture
- Key milestones and pioneers in the field

Lecture 2: Composition of Media in Plant Tissue Culture

- Basic components of tissue culture media (macronutrients, micronutrients, vitamins)
- Types of media (Murashige and Skoog, Gamborg's B5)

Lecture 3: Nutrient and Hormone Requirements

- Essential nutrients and their roles in plant tissue culture
- Plant hormones (auxins, cytokinins) and their functions

Lecture 4: Totipotency

- Concept of totipotency and its significance
- Examples and experiments demonstrating totipotency

Lecture 5: Organogenesis

- Process of organ formation in tissue culture
- Factors influencing organogenesis (hormone ratios, media composition)

Lecture 6: Embryogenesis

- Somatic embryogenesis and its mechanisms
- Applications and significance in plant regeneration

Lecture 7: Protoplast Culture

- Definition and process of protoplast isolation and culture
- Applications and challenges of protoplast culture

Lecture 8: Applications of Plant Tissue Culture

- Micropropagation techniques and their uses
- Androgenesis and its applications
- Virus elimination and secondary metabolite production

Lecture 9: Cryopreservation in Plant Tissue Culture

- Methods and principles of cryopreservation
- Importance in conservation and genetic resource management

Lecture 10: Restriction Endonucleases – Types and Role

- Overview of restriction endonucleases and their discovery
- Types (Type I, II, III) and their applications in molecular biology

Lecture 11: Review of Plant Tissue Culture

- Summary of key concepts
- Discussion of interrelationships and practical applications

Lecture 12: Practical Exercises and Q&A

- Hands-on activities related to plant tissue culture techniques
- Q&A session to address any remaining questions

Unit II: Cloning Vectors and Gene Cloning

Lecture 1: Cloning Vectors – Introduction

- Overview of cloning vectors and their importance in genetic engineering
- Basic principles and uses

Lecture 2: Ti Plasmid Vector

- Structure and function of Ti plasmid
- Applications in plant genetic engineering

Lecture 3: BAC (Bacterial Artificial Chromosome)

- Structure and function of BACs
- Applications in gene cloning and genomic studies

Lecture 4: Lambda Phage Vector

- Overview of Lambda phage vector
- Uses in gene cloning and expression studies

Lecture 5: M13 Phagemid Vector

- Structure and applications of M13 phagemid
- Role in sequencing and protein expression

Lecture 6: Cosmid Vector

- Overview and applications of cosmids
- Advantages for cloning large DNA fragments

Lecture 7: Shuttle Vector

- Definition and applications of shuttle vectors
- Use in yeast and bacterial systems

Lecture 8: Eukaryotic Vectors – YAC (Yeast Artificial Chromosome)

- Structure and function of YACs
- Applications in gene mapping and functional studies

Lecture 9: Recombinant DNA Technology

- Basics of recombinant DNA construction
- Techniques for DNA insertion and ligation

Lecture 10: Bacterial Transformation and Selection of Recombinant Clones

- Methods for bacterial transformation
- Selection techniques for recombinant clones (antibiotic resistance, blue/white screening)

Lecture 11: PCR-Mediated Gene Cloning

- Overview of PCR and its role in gene cloning
- Steps in PCR-based cloning and applications

Lecture 12: Genomic and cDNA Libraries

- Construction and use of genomic libraries
- cDNA libraries and their applications in gene expression studies

Unit III: Gene Transfer Methods and Industrial Enzymes

Lecture 1: Methods of Gene Transfer – Overview

- Introduction to different gene transfer methods
- Importance in genetic engineering

Lecture 2: Agrobacterium-Mediated Gene Transfer

- Mechanism and application of Agrobacterium tumefaciens
- Techniques for transformation and integration

Lecture 3: Electroporation

- Principles of electroporation
- Application in gene transfer and transformation efficiency

Lecture 4: Microinjection

- Techniques and applications of microinjection in gene transfer
- Pros and cons of microinjection

Lecture 5: Microprojectile Bombardment (Biolistics)

- Overview of microprojectile bombardment
- Applications in plant transformation and efficiency

Lecture 6: Selection of Transgenics – Selectable Markers

- Types of selectable markers (antibiotic resistance, herbicide resistance)
- Application and challenges in plant transformation

Lecture 7: Reporter Genes – Luciferase, GUS, GFP

- Role and applications of reporter genes
- Techniques for visualization and analysis

Lecture 8: Industrial Enzymes – Aspergillase

- Production and applications of Aspergillase
- Role in industry and biotechnology

Lecture 9: Industrial Enzymes – Protease

- Types and applications of proteases
- Industrial uses and production methods

Lecture 10: Industrial Enzymes – Lipase

- Production and applications of lipases
- Importance in food and detergent industries

Lecture 11: Biosafety Concerns in Genetic Engineering

- Overview of biosafety issues related to GMOs
- Regulatory frameworks and safety assessments

Lecture 12: Review and Practical Exercises

- Summary of key concepts
- Laboratory exercises related to gene transfer methods and enzyme production
- Q&A session to address any remaining questions

Unit IV: Applications of Biotechnology

Lecture 1: Introduction to Biotechnology Applications

- Overview of applications in agriculture, industry, and medicine
- Importance of biotechnology in modern society

Lecture 2: Pest-Resistant Plants – Bt Cotton

- Mechanism and applications of Bt cotton
- Benefits and challenges of pest resistance

Lecture 3: Herbicide-Resistant Plants – RoundUp Ready Soybean

- Overview of herbicide resistance in RoundUp Ready soybean
- Applications and impact on agriculture

Lecture 4: Transgenic Crops with Improved Quality Traits – Flavr Savr Tomato

- Development and applications of Flavr Savr tomato
- Impact on fruit quality and shelf life

Lecture 5: Transgenic Crops with Improved Quality Traits – Golden Rice

- Mechanism and benefits of Golden Rice
- Role in addressing vitamin A deficiency

Lecture 6: Improved Horticultural Varieties – Moondust Carnations

- Development and applications of Moondust carnations
- Impact on ornamental horticulture

Lecture 7: Applications in Medicine – Gene Therapy

- Overview of gene therapy techniques and applications
- Case studies and clinical trials

Lecture 8: Applications in Medicine – Recombinant Proteins

- Production and use of recombinant proteins (e.g., insulin, growth hormones)
- Impact on treatment of diseases

Lecture 9: Applications in Industry – Bioreactors and Bioprocessing

- Role of bioreactors in industrial biotechnology
- Techniques and applications in bioprocessing

Lecture 10: Environmental Applications – Bioremediation

- Principles and methods of bioremediation
- Case studies of environmental cleanup

Lecture 11: Ethical and Social Implications of Biotechnology

- Discussion of ethical issues related to GMOs and biotechnology
- Societal impacts and public perception

Lecture 12: Review and Practical Exercises

- Summary of key concepts
- Laboratory and field exercises related to biotechnology applications
- Final Q&A session to address any remaining questions

SCHOOL OF BASIC AND APPLIED SCIENCES

(CBCS Scheme of Studies & Examinations w. e. f. 2021-24 onwards)

B.Sc. (CBZ) III Year

VI Semester

(Chemistry, Botany and Zoology)

Scheme 6th semester

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	**Chemistry**	CH-302	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-304	Organic Chemistry	2	0	20	30	50	3	2
3		CH-306	Physical Chemistry	2	0	20	30	50	3	2
4		CH-308	Chemistry Lab-V	0	6	20	30	50	4	3
5	**Botany**	BOT-302	Cell Biology & Genetics	3	0	20	30	50	3	3
6		BOT-304	Plant Breeding	3	0	20	30	50	3	3
7		BOT-306	Botany Lab-V	0	2/4	20	30	50	4	2
8	**Zoology**	ZOO-302	Biochemistry	3	0	20	30	50	3	3
9		ZOO-304	Ecology & Evolution	3	0	20	30	50	3	3
10		ZOO-306	Zoology Lab-V	0	2/4	20	30	50	3	2
11	ECA	ECA-302	Seminar/ Project/ Internship	2	0	-	-	50	-	2
		TOTAL		20	14			500		27

SCHOOL OF BASIC & APPLIED SCIENCES

(Syllabus & Scheme of Studies w.e.f. 2021-24)

B.Sc. (CBZ) III Year (VI semester)

Chemistry

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1. Inorganic Chemistry (CH-302)

Course Outcomes:

6. Have good knowledge about d-block elements particularly of transition elements.
7. To study the bonding of 3d elements. To recapitulate the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbital's in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters. Students will be able to calculate the spectroscopic terms for various metal ions.
8. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties some compounds of transition elements.
9. To know about position of f block elements in periodic table and their general characteristics. To study the occurrence and separation of lanthanides and lanthanide compounds. Have knowledge of actinides their existence and general properties.
10. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

2. Organic Chemistry (CH-304)

Course Outcomes:

6. Have good knowledge about d-block elements particularly of transition elements.
7. To study the bonding of 3d elements. To recapitulate the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbital's in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters. Students will be able to calculate the spectroscopic terms for various metal ions.

8. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties some compounds of transition elements.
9. To know about position of f block elements in periodic table and their general characteristics. To study the occurrence and separation of lanthanides and lanthanide compounds. Have knowledge of actinides their existence and general properties.
10. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

3.Physical Chemistry (CH-306)

Course Outcomes:

5. Systematic and coherent understanding of the fundamental concepts in Physical chemistry.
6. Students will be able to understand the fundamentals of thermodynamics and electrochemistry.
7. Students will be able to understand the solve problems using the properties and relationships of thermodynamic equations. Students will have understanding of thermodynamic fundamentals for application in applied thermodynamics.
8. Students will gain the knowledge of instrumentation in electrochemistry. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state.

Botany

Cell Biology & Genetics (BOT-302)

Course Outcomes:

1. Co-relate cellular structure-function relationship in the context of cell growth and death.
2. DNA repair mechanism the students in understanding genetics and relate modern DNA technology for disease diagnostics and therapy
3. Apply the concepts of cell signalling to biofilm formation.
4. Apply the principles of Mendelian Genetics to understand gene interactions, multiple alleles and sexlinked inheritance.
5. Apply principles of Chromosome structure and gene frequencies in the context of inherited disorders and population genetics..

6. Design, carry out, and present a laboratory-based study in flowering plants.

Plant Breeding (BOT-304)

Course Outcomes:

1. Understand the role of population genetics in breeding plants
2. Understand the significance of different plant breeding systems
3. Understand the application of conventional breeding approaches and gene technology approaches in plant breeding programs
4. Appreciate the issues associated with breeding plants in a commercial setting.
5. Apply the technologies on commercial purposes.
6. Design the new methodologies for crop cultivation and hybridization.

Zoology

Genetics and Immunology (Z00-302)

Course Outcomes:

9. Students will be able to understand the concept of genetics, its basic principles & theories and genetic interactions.
10. Students will have acquaintance with respect to variations, mutations and sex linked inheritance.
11. Students will be able to get knowledge about several chromosomal abnormalities involving autosomes and sex chromosomes along with some implications of applied genetics.
12. Students will be able to understand the concept of immune system, blood transfusion, autoimmune disorders and transplanting of tissues and organs.

Mammalian Physiology-I (Z00-304)

Course Outcomes:

11. It will make the students understand the appropriate functioning of various body systems in animals and mechanism of working.
12. Students will be able to understand the structure of various muscle fibres and mechanism of muscle contraction.

13. Students will be able to explain the mechanism of nerve conduction and related neurotransmitters involved in its physiological processes.
14. It will make the students understand the structure and function of various endocrine glands as well as their secretion.
15. Students will be able to understand the control of hormones on reproductive physiology mechanism that is essential for the continuance of the human species.

CO-PO MAPPING

CHEMISTRY

CH-302											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	2	1	3	2	2	1

CH-304											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	3	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	3	2	2	1

CH-306											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	1	2	2	1

CO-PO MAPPING

BOTANY

BOT-302											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1
	CO6	2	2	1	2	1	2	1	2	1	2

BOT-304											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	√	2	2	1
	CO6	2	1	2	1	3	2	2	2	1	2

BOT-306											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

CO-PO MAPPING

Zoology

ZOO-302											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-304											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

ZOO-306											
		PO									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
CO	**CO 1**	3	3	3	3	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
	CO 4	2	2	1	2	2	1	1	2	1	1
	CO 5	1	1	2	1	1	1	2	2	2	1

PSO-PO Mapping

	PO01	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PSO-01**	**PSO-02**	**PSO-03**
Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment	2.20	1.59	1.34	0.73	1.34	0.37	1.47	1.10	0.98	0.98	1.96	2.20	1.83	1.10

Unit 1: Environmental Biology (10 Lectures)

1. Lecture 1: Introduction to Environmental Biology: Scope and Importance
2. Lecture 2: Components of the Environment: Hydrosphere, Lithosphere, Atmosphere
3. Lecture 3: Global Environment: Concepts, Current Issues, and Solutions
4. Lecture 4: Natural Resources: Types, Uses, and Sustainability
5. Lecture 5: Conservation and Management of Natural Resources: Forests, Wildlife, and Water
6. Lecture 6: Non-Renewable Resources: Soil, Minerals, and Energy - Conservation Strategies
7. Lecture 7: Wildlife Conservation: Endangered Species and Threats in India
8. Lecture 8: Role of Government and NGOs in Wildlife Conservation: Policies and Acts
9. Lecture 9: Environmental Ethics: Principles, Practices, and Case Studies
10. Lecture 10: Sustainable Development: Concepts and Applications in Environmental Management

Unit 2: Environmental Pollution (10 Lectures)

11. Lecture 11: Introduction to Environmental Pollution: Definition, Sources, and Types
12. Lecture 12: Water Pollution: Causes, Effects, and Control Measures
13. Lecture 13: Air Pollution: Causes, Effects, and Control Measures
14. Lecture 14: Soil Pollution: Causes, Effects, and Control Measures
15. Lecture 15: Noise Pollution: Sources, Impacts, and Mitigation
16. Lecture 16: Radiation Pollution: Sources, Effects, and Control
17. Lecture 17: Industrial and Chemical Pollutants: Agrochemicals, Pesticides, and Their Impact
18. Lecture 18: Greenhouse Effect and Global Warming: Causes, Impacts, and Solutions
19. Lecture 19: Ozone Layer Depletion: Causes, Consequences, and Control Measures
20. Lecture 20: Environmental Pollution and Public Health: Case Studies and Solutions

Unit 3: Urbanization and Space Ecology (10 Lectures)

21. Lecture 21: Urbanization: Concepts, Causes, and Impacts on the Environment
22. Lecture 22: Development and Distribution of Urban Centers: Environmental Consequences
23. Lecture 23: Factors Influencing Urbanization: Economic, Social, and Environmental
24. Lecture 24: Problems of Urbanization: Pollution, Overpopulation, and Resource Depletion

25. Lecture 25: Solutions to Urbanization Problems: Sustainable Urban Planning and Green Infrastructure
26. Lecture 26: Human Population Growth: Impacts on Environment and Resource Consumption
27. Lecture 27: Space Ecology: Concept, Ecosystems in Space, and Space Colonization
28. Lecture 28: Environmental Challenges in Space: Microgravity, Radiation, and Life Support
29. Lecture 29: Space Exploration and Environmental Impact: Satellites, Space Debris, and Mars Colonization
30. Lecture 30: Ethics of Space Colonization: Environmental and Social Considerations

Unit 4: Ethology (10 Lectures)

31. Lecture 31: Introduction to Ethology: Historical Background and Key Concepts
32. Lecture 32: Fixed Action Patterns and Sign Stimuli: Concepts and Examples
33. Lecture 33: Innate Behaviors: Instincts, Reflexes, and Their Adaptive Significance
34. Lecture 34: Learning in Animals: Imprinting, Conditioning, and Habituation
35. Lecture 35: Motivation in Animal Behavior: Drives, Needs, and Examples
36. Lecture 36: Pheromones and Chemical Communication: Roles and Mechanisms
37. Lecture 37: Social Behavior in Animals: Characteristics and Examples (Honeybees, Primates)
38. Lecture 38: Biological Rhythms and Clocks: Circadian, Circannual Rhythms, and Their Control
39. Lecture 39: Methods of Studying Animal Behavior: Observational and Experimental Techniques
40. Lecture 40: Application of Ethology in Conservation and Animal Welfare

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Lesson Plan for Zoology - ZOO-304

Unit 1: Principles and Practices of Applied Zoology (10 Lectures)

1. Lecture 1: Introduction to Applied Zoology: Scope and Importance
2. Lecture 2: Vermiculture: Principles, Techniques, and Applications
3. Lecture 3: Sericulture: Types of Silkworms, Life Cycle, and Silk Production
4. Lecture 4: Ericulture: Principles and Practices in Eri Silk Production
5. Lecture 5: Lac Culture: Life Cycle of Lac Insect, Cultivation, and Uses
6. Lecture 6: Apiculture: Honey Bee Biology, Beekeeping Techniques, and Honey Production
7. Lecture 7: Prawn Culture: Types, Breeding, and Management Techniques
8. Lecture 8: Pisciculture: Freshwater and Marine Fish Farming Practices

9. Lecture 9: Pearl Culture: Types of Pearls, Pearl Oyster Farming, and Pearl Harvesting
10. Lecture 10: Poultry Keeping: Breeds, Rearing Practices, and Disease Management

Unit 2: Pest Control and Crop Protection (10 Lectures)

11. Lecture 11: Introduction to Pests: Definition, Types, and Economic Importance
12. Lecture 12: Types of Pests: Insect Pests, Rodent Pests, and Plant Pests
13. Lecture 13: Insecticides: Types, Mechanisms of Action, and Environmental Impact
14. Lecture 14: Natural Pest Control Methods: Biological Control, Integrated Pest Management (IPM)
15. Lecture 15: Plant Protection Appliances: Sprayers, Dusters, and Other Equipment
16. Lecture 16: Major Crop Pests: Jowar Stem Borer, Midge Flies, and Their Control
17. Lecture 17: Cotton Pests: Red Cotton Bug, Pink Bollworm, and Their Management
18. Lecture 18: Pesticide Resistance: Mechanisms and Management Strategies
19. Lecture 19: Impact of Pesticides on Non-Target Species: Environmental and Health Concerns
20. Lecture 20: Recent Advances in Pest Control: Genetic Engineering, RNA Interference, and Nanotechnology

Unit 3: Introduction and Application of Biostatistics (10 Lectures)

21. Lecture 21: Introduction to Biostatistics: Importance and Applications in Biological Research
22. Lecture 22: Scientific Method: Designing Experiments, Hypotheses, and Data Collection
23. Lecture 23: Data Presentation: Types of Data, Tabulation, and Graphical Representation
24. Lecture 24: Frequency Distributions: Construction and Interpretation
25. Lecture 25: Measures of Central Tendency: Mean, Median, Mode – Calculation and Interpretation
26. Lecture 26: Measures of Dispersion: Range, Variance, Standard Deviation, and Standard Error
27. Lecture 27: Probability and Its Applications in Biology: Basic Concepts and Examples
28. Lecture 28: Sampling Methods: Types, Techniques, and Importance in Biostatistics
29. Lecture 29: Hypothesis Testing: Null and Alternative Hypotheses, Significance Levels, and p-Values
30. Lecture 30: Statistical Errors: Type I and Type II Errors – Concept and Examples

Unit 4: Advanced Biostatistical Methods (10 Lectures)

31. Lecture 31: Correlation: Types, Calculation, and Interpretation in Biological Studies
32. Lecture 32: Regression Analysis: Simple Linear Regression, Calculation, and Interpretation
33. Lecture 33: Analysis of Variance (ANOVA): One-Way and Two-Way ANOVA – Concepts and Applications

34. Lecture 34: Chi-Square Test: Calculation, Interpretation, and Applications in Genetics
35. Lecture 35: t-Tests: Paired and Unpaired t-Tests – Concepts, Calculation, and Interpretation
36. Lecture 36: Non-Parametric Tests: Mann-Whitney U Test, Wilcoxon Signed-Rank Test – Applications
37. Lecture 37: Multivariate Analysis: Principal Component Analysis (PCA) and Cluster Analysis
38. Lecture 38: Use of Statistical Software: Introduction to SPSS, R, and Excel for Biological Data Analysis
39. Lecture 39: Interpretation of Biostatistical Results: Case Studies and Practical Examples
40. Lecture 40: Recent Advances in Biostatistics: Big Data, Machine Learning, and Their Applications in Biology

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Lesson Plan for Chemistry - CH-302

Unit 1: Molecular Orbital Theory (7 Lectures)

1. Lecture 1: Introduction to VBT and LCAO Method
2. Lecture 2: MO Diagrams of C_2 and N_2
3. Lecture 3: MO Diagram of O_2, Bond Order Calculation
4. Lecture 4: MO Diagrams of Halogens, Color Correlation
5. Lecture 5: Non-Crossing Rule Explanation
6. Lecture 6: MO of Heteronuclear Molecules: CO
7. Lecture 7: MO of HX Molecules

Unit 2: Organometallic Chemistry (8 Lectures)

8. Lecture 8: Introduction and Classification of Organometallics
9. Lecture 9: π-Acidity of Ligands and Stretching Frequencies
10. Lecture 10: 18 Electron Rule Overview
11. Lecture 11: Alkyls of Li, Al, Hg - Preparation and Properties
12. Lecture 12: Bonding in Alkyls of Li, Al, Hg
13. Lecture 13: Metal-Ethylenic Complexes: Zeise's Salt

14. Lecture 14: Organometallic Catalysis: Oxidative Addition

15. Lecture 15: Reductive Elimination, Hydrogenation of Olefins

Unit 3: Bioinorganic Chemistry (8 Lectures)

16. Lecture 16: Essential and Trace Elements in Biology

17. Lecture 17: Metalloporphyrins: Structure and Function

18. Lecture 18: Haemoglobin: Structure and Biological Role

19. Lecture 19: Myoglobin: Structure and Oxygen Binding

20. Lecture 20: Alkali Metal Ions in Biological Processes

21. Lecture 21: Alkaline Earth Metal Ions, Focus on Ca^{2+}

22. Lecture 22: Nitrogen Fixation: Biological Mechanisms

23. Lecture 23: Nitrogenase: Structure and Function

Unit 4: Silicones and Phosphazenes (7 Lectures)

24. Lecture 24: Introduction to Silicones: Preparation Methods

25. Lecture 25: Properties and Uses of Silicones

26. Lecture 26: Phosphazenes: Preparation Techniques

27. Lecture 27: Phosphazenes: Structure and Properties

28. Lecture 28: Applications of Silicones in Industry

29. Lecture 29: Phosphazenes in Material Science

30. Lecture 30: Summary and Revision Session

Lesson Plan for Chemistry - CH-304

Unit 1: Heterocyclic Compounds-I (7 Lectures)

1. Lecture 1: Introduction to Heterocyclic Compounds

2. Lecture 2: Aromatic Characteristics of Pyrrole, Furan, Thiophene
3. Lecture 3: Aromatic Characteristics of Pyridine
4. Lecture 4: Synthesis of Pyrrole, Furan, Thiophene
5. Lecture 5: Synthesis of Pyridine; Electrophilic Substitution Mechanism
6. Lecture 6: Nucleophilic Substitution in Pyridine Derivatives
7. Lecture 7: Basicity: Pyridine, Piperidine, Pyrrole

Unit II: Heterocyclic Compounds-II & Organosulphur Compounds (8 Lectures)

8. Lecture 8: Condensed Heterocycles: Introduction
9. Lecture 9: Indole: Preparation, Fisher Indole Synthesis
10. Lecture 10: Quinoline: Preparation, Skraup Synthesis
11. Lecture 11: Isoquinoline: Preparation, Bischler-Napieralski Synthesis
12. Lecture 12: Electrophilic Substitution in Quinoline, Isoquinoline
13. Lecture 13: Organosulphur Compounds: Nomenclature, Structure
14. Lecture 14: Thiols, Thioethers: Formation, Reactions
15. Lecture 15: Sulphonic Acids, Sulphonamides: Reactions, Detergents

Unit III: Organic Synthesis via Enolates & Synthetic Polymers (8 Lectures)

16. Lecture 16: Enolates: Acidity of Hydrogens, Alkylation
17. Lecture 17: Synthesis of Ethyl Acetoacetate: Claisen Condensation
18. Lecture 18: Keto-Enol Tautomerism of Ethyl Acetoacetate
19. Lecture 19: Addition Polymerization: Free Radical Vinyl
20. Lecture 20: Ionic Vinyl Polymerization, Ziegler-Natta Polymerization
21. Lecture 21: Condensation Polymerization: Polyesters, Polyamides
22. Lecture 22: Phenol Formaldehyde Resins: Formation, Uses
23. Lecture 23: Natural and Synthetic Rubbers: Overview

Unit IV: Amino Acids, Peptides & Proteins (7 Lectures)

24. Lecture 24: Classification of Amino Acids: Properties, Isoelectric Point

25. Lecture 25: Preparation of α-Amino Acids

26. Lecture 26: Structure and Nomenclature of Peptides

27. Lecture 27: Classification of Proteins: Primary & Secondary Structure

28. Lecture 28: Peptide Structure Determination: End Group Analysis

29. Lecture 29: Peptide Synthesis: Classical, Solid-Phase Methods

30. Lecture 30: Secondary Structure of Proteins: Helices, Sheets

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Lesson Plan for Chemistry - CH-306

Unit I: Spectroscopy-III (8 Lectures)

1. Lecture 1: Introduction to Electronic Spectrum
2. Lecture 2: Potential Energy Curves: Bonding and Antibonding MOs
3. Lecture 3: Selection Rules in Electronic Transitions
4. Lecture 4: Franck-Condon Principle: Basics
5. Lecture 5: Sigma (σ) Molecular Orbitals and Transitions
6. Lecture 6: Pi (π) Molecular Orbitals and Transitions
7. Lecture 7: Non-bonding (n) Orbitals and Transitions
8. Lecture 8: Energy Levels in MOs: Overview

Unit II: Photochemistry (8 Lectures)

9. Lecture 9: Radiation-Matter Interaction: Introduction

10. Lecture 10: Thermal vs Photochemical Processes

11. Lecture 11: Grotthus-Draper Law and Stark-Einstein Law

12. Lecture 12: Jablonski Diagram: Excited State Processes

13. Lecture 13: Fluorescence and Phosphorescence

14. Lecture 14: Non-Radiative Processes: Internal Conversion

15. Lecture 15: Intersystem Crossing: Concepts

16. Lecture 16: Quantum Yield and Photosensitized Reactions

Unit III: Solutions (8 Lectures)

17. Lecture 17: Ideal and Non-Ideal Solutions

18. Lecture 18: Concentration Expressions: Activity and Coefficients

19. Lecture 19: Colligative Properties: Overview

20. Lecture 20: Raoult's Law and Vapor Pressure Lowering

21. Lecture 21: Osmosis: Law and Molecular Weight Determination

22. Lecture 22: Boiling Point Elevation and Freezing Point Depression

23. Lecture 23: Thermodynamic Derivations for Colligative Properties

24. Lecture 24: Abnormal Molar Mass: Degree of Dissociation

Unit IV: Phase Equilibrium (6 Lectures)

25. Lecture 25: Phase Equilibrium: Introduction and Key Terms

26. Lecture 26: Gibbs Phase Rule: Derivation and Application

27. Lecture 27: One-Component Systems: Water and Sulfur

28. Lecture 28: Two-Component Systems: Solid-Liquid Equilibria

29. Lecture 29: Simple Eutectics: Pb-Ag System

30. Lecture 30: Desilverisation of Lead: Process and Significance

Unit I: Fundamentals of Heredity and Linkage

Lecture 1: Introduction to Heredity

- Overview of heredity and its significance
- Brief life history of Gregor Mendel

Lecture 2: Terminologies in Genetics

- Definitions: Gene, allele, genotype, phenotype, homozygous, heterozygous
- Explanation of Mendelian terms and concepts

Lecture 3: Mendel's Laws of Inheritance

- Law of Segregation
- Law of Independent Assortment
- Examples and applications

Lecture 4: Modified Mendelian Ratios – Introduction

- Overview of modified Mendelian ratios
- Examples and significance

Lecture 5: Lethal Genes

- Definition and types of lethal genes
- Examples and implications for inheritance patterns

Lecture 6: Co-Dominance and Incomplete Dominance

- Explanation and examples of co-dominance
- Explanation and examples of incomplete dominance

Lecture 7: Gene Interaction – 9:7 Ratio

- Concept and examples of gene interaction
- Explanation of the 9:7 ratio

Lecture 8: Gene Interaction – 9:4:3 Ratio

- Concept and examples of gene interaction
- Explanation of the 9:4:3 ratio

Lecture 9: Gene Interaction – 13:3 Ratio

- Concept and examples of gene interaction
- Explanation of the 13:3 ratio

Lecture 10: Gene Interaction – 12:3:1 and 15:1 Ratios

- Explanation and examples of the 12:3:1 and 15:1 ratios
- Significance of these interactions

Lecture 11: Linkage – Concept and History

- Introduction to linkage and its discovery
- Concept of linkage and linkage maps

Lecture 12: Linkage – Complete and Incomplete Linkage

- Explanation of complete linkage
- Explanation of incomplete linkage
- Examples and significance

Unit II: Cell Organelles, Cell Cycle, and Cell Division

Lecture 1: Overview of Cell Organelles

- Introduction to major cell organelles and their functions

Lecture 2: Golgi Apparatus and Endoplasmic Reticulum

- Structure and function of the Golgi apparatus
- Structure and function of the Endoplasmic Reticulum (smooth and rough)

Lecture 3: Lysosomes, Peroxisomes, and Vacuoles

- Structure and function of lysosomes
- Structure and function of peroxisomes
- Structure and function of vacuoles

Lecture 4: Ultra-Structure and Function of Chloroplasts

- Structure and function of chloroplasts
- Role in photosynthesis

Lecture 5: Ultra-Structure and Function of Mitochondria

- Structure and function of mitochondria
- Role in cellular respiration

Lecture 6: Ultra-Structure and Function of Nucleus and Nucleolus

- Structure and function of the nucleus
- Structure and function of the nucleolus

Lecture 7: Introduction to Cell Cycle

- Overview of the cell cycle
- Phases: G1, S, G2, and M

Lecture 8: Molecular Basis of Cell Cycle Control

- Mechanisms of cell cycle regulation
- Role of checkpoints

Lecture 9: Cell Division – Mitosis

- Stages of mitosis
- Significance of mitosis in growth and repair

Lecture 10: Cell Division – Meiosis

- Stages of meiosis
- Significance of meiosis in sexual reproduction

Lecture 11: Comparison of Mitosis and Meiosis

- Differences and similarities between mitosis and meiosis
- Applications in genetics and evolution

Lecture 12: Review and Practical Exercises

- Summary of key concepts
- Laboratory exercises related to cell organelles and cell division
- Q&A session to address any remaining questions

Unit III: Cytoplasmic Inheritance, Chromosomal Inheritance, and Mutations

Lecture 1: Cytoplasmic Inheritance

- Overview of cytoplasmic inheritance
- Case study: Leaf variegation in Mirabilis jalapa

Lecture 2: Chromosome Theory of Inheritance

- Explanation of the chromosome theory
- Historical context and significance

Lecture 3: Sex-Determination

- Mechanisms of sex-determination in various organisms
- Examples and significance

Lecture 4: Sex-Linked Inheritance

- Overview of sex-linked traits
- Examples and inheritance patterns

Lecture 5: Crossing Over – Concept and Significance

- Explanation of crossing over
- Role in genetic variation

Lecture 6: Cytological Proof of Crossing Over

- Evidence and experiments demonstrating crossing over
- Techniques and results

Lecture 7: Mutations – Types and Effects

- Overview of mutation types (point mutations, insertions, deletions)
- Effects of different mutagens

Lecture 8: Chromosomal Aberrations – Numerical Changes

- Overview of numerical chromosomal changes (euploidy, polyploidy, aneuploidy)
- Examples and effects

Lecture 9: Chromosomal Aberrations – Structural Changes

- Overview of structural chromosomal changes (deletions, duplications, inversions, translocations)
- Examples and implications

Lecture 10: Case Studies in Chromosomal Aberrations

- Detailed examination of specific cases of chromosomal aberrations
- Impact on health and development

Lecture 11: Review of Cytoplasmic and Chromosomal Inheritance

- Summary of key concepts
- Discussion of interrelationships and practical applications

Lecture 12: Practical Exercises and Q&A

- Hands-on activities related to mutations and chromosomal aberrations
- Q&A session to address any remaining questions

Unit IV: Genetic Material and Gene Expression

Lecture 1: DNA as the Genetic Material

- Historical evidence supporting DNA as the genetic material
- Overview of DNA structure

Lecture 2: DNA Structure and Replication

- Detailed structure of DNA
- Mechanisms of DNA replication

Lecture 3: DNA-Protein Interactions

- Overview of interactions between DNA and proteins
- Role in gene regulation

Lecture 4: The Nucleosome Model

- Structure and function of nucleosomes
- Role in DNA packaging

Lecture 5: Genetic Code

- Characteristics and properties of the genetic code
- Codon usage and translation

Lecture 6: Satellite and Repetitive DNA

- Overview of satellite DNA and its functions
- Types of repetitive DNA and their roles

Lecture 7: Modern Concepts of Gene

- Definition and understanding of genes in modern genetics
- Gene function and regulation

Lecture 8: RNA Types and Functions

- Types of RNA (mRNA, tRNA, rRNA)
- Functions of different RNA molecules

Lecture 9: Ribosomes and Protein Synthesis

- Structure and function of ribosomes
- Role in translation and protein synthesis

Lecture 10: Transcription – Mechanism and Regulation

- Overview of transcription process
- Regulation of gene expression at the transcriptional level

Lecture 11: Translation – Mechanism and Regulation

- Overview of translation process
- Regulation of gene expression at the translational level

Lecture 12: Review and Practical Exercises

- Summary of key concepts
- Laboratory exercises related to DNA structure and gene expression
- Final Q&A session to address any remaining questions

Lesson Plan for Botany - BOT-304

Unit I: Introduction to Plant Breeding and Crop Improvement

Lecture 1: Introduction to Plant Breeding

- Overview of plant breeding
- Objectives and importance in agriculture

Lecture 2: Breeding Systems

- Types of breeding systems (self-pollination, cross-pollination, vegetative reproduction)
- Advantages and disadvantages of each system

Lecture 3: Modes of Reproduction in Crop Plants

- Overview of different reproductive modes (sexual and asexual)

- Examples of crop plants and their reproductive strategies

Lecture 4: Achievements in Plant Breeding

- Historical achievements in plant breeding (e.g., high-yielding varieties, disease resistance)
- Case studies of successful breeding programs

Lecture 5: Undesirable Consequences of Plant Breeding

- Potential negative effects of plant breeding (e.g., loss of genetic diversity, ecological impact)
- Examples and mitigation strategies

Lecture 6: Methods of Crop Improvement – Introduction

- Overview of crop improvement methods
- Importance and application in agriculture

Lecture 7: Centres of Origin and Domestication of Crop Plants

- Concept of centres of origin
- Examples of crop domestication and their geographic origins

Lecture 8: Plant Genetic Resources

- Definition and importance of plant genetic resources
- Conservation strategies and repositories

Lecture 9: Acclimatization

- Definition and process of acclimatization
- Examples of acclimatization in crop plants

Lecture 10: Review of Plant Breeding and Crop Improvement

- Summary of key concepts
- Discussion on the interrelationships between breeding systems and crop improvement methods

Lecture 11: Practical Applications and Case Studies

- Case studies of plant breeding programs and crop improvement methods
- Analysis of practical applications and outcomes

Lecture 12: Q&A and Interactive Session

- Addressing any remaining questions
- Interactive session with problem-solving activities related to plant breeding

Unit II: Selection Methods and Hybridization

Lecture 1: Introduction to Selection Methods

- Overview of selection methods in plant breeding
- Importance of selection in crop improvement

Lecture 2: Selection Methods for Self-Pollinated Plants

- Techniques and procedures for selecting self-pollinated crops
- Examples and case studies

Lecture 3: Selection Methods for Cross-Pollinated Plants

- Techniques and procedures for selecting cross-pollinated crops
- Examples and case studies

Lecture 4: Selection Methods for Vegetatively Propagated Plants

- Techniques and procedures for selecting vegetatively propagated crops
- Examples and case studies

Lecture 5: Introduction to Hybridization

- Overview of hybridization in plant breeding
- Importance and applications of hybridization

Lecture 6: Hybridization for Self-Pollinated Plants

- Procedures and techniques for hybridizing self-pollinated crops
- Advantages and limitations

Lecture 7: Hybridization for Cross-Pollinated Plants

- Procedures and techniques for hybridizing cross-pollinated crops
- Advantages and limitations

Lecture 8: Hybridization for Vegetatively Propagated Plants

- Procedures and techniques for hybridizing vegetatively propagated crops
- Advantages and limitations

Lecture 9: Advantages of Hybridization

- Benefits of hybridization in crop improvement
- Examples of successful hybrid varieties

Lecture 10: Limitations of Hybridization

- Challenges and limitations associated with hybridization
- Strategies to overcome these limitations

Lecture 11: Review of Selection Methods and Hybridization

- Summary of key concepts
- Discussion of interrelationships and practical applications

Lecture 12: Practical Exercises and Q&A

- Hands-on activities related to selection and hybridization methods
- Q&A session to address any remaining questions

Unit III: Quantitative Inheritance and Inbreeding Depression

Lecture 1: Introduction to Quantitative Inheritance

- Overview of quantitative inheritance
- Difference between quantitative and qualitative traits

Lecture 2: Mechanism of Quantitative Inheritance

- Genetic basis of quantitative traits
- Examples and models (e.g., additive gene effects)

Lecture 3: Examples of Quantitative Inheritance

- Case studies of quantitative traits in crops
- Analysis of inheritance patterns

Lecture 4: Monogenic vs. Polygenic Inheritance

- Comparison between monogenic and polygenic traits
- Examples and implications for breeding

Lecture 5: Inbreeding Depression

- Definition and concept of inbreeding depression
- Genetic basis and effects on crop performance

Lecture 6: History of Inbreeding Depression

- Historical context and research on inbreeding depression
- Case studies and examples

Lecture 7: Heterosis (Hybrid Vigor)

- Definition and concept of heterosis
- Genetic basis and benefits for crop improvement

Lecture 8: History of Heterosis

- Historical context and research on heterosis
- Case studies and examples

Lecture 9: Genetic Basis of Heterosis

- Mechanisms underlying heterosis
- Analysis of genetic interactions

Lecture 10: Practical Implications of Inbreeding Depression and Heterosis

- Application of concepts in breeding programs
- Strategies to manage inbreeding depression and utilize heterosis

Lecture 11: Review of Quantitative Inheritance and Inbreeding

- Summary of key concepts
- Discussion on practical applications and implications

Lecture 12: Practical Exercises and Q&A

- Hands-on activities related to quantitative inheritance and inbreeding depression
- Q&A session to address any remaining questions

Unit IV: Advanced Crop Improvement and Breeding Applications

Lecture 1: Introduction to Crop Improvement Applications

- Overview of advanced applications in crop improvement
- Importance of modern techniques

Lecture 2: Role of Mutations in Crop Improvement

- Mechanisms and applications of induced mutations
- Examples and case studies

Lecture 3: Polyploidy and Its Role in Crop Improvement

- Definition and types of polyploidy
- Applications and benefits in crop breeding

Lecture 4: Distant Hybridization

- Concept and techniques of distant hybridization
- Examples and outcomes in crop improvement

Lecture 5: Role of Biotechnology in Crop Improvement

- Overview of biotechnology applications in crop breeding
- Techniques and tools (e.g., genetic engineering, CRISPR)

Lecture 6: Case Studies of Biotechnology in Crop Improvement

- Successful examples of biotechnological interventions
- Analysis of outcomes and impact

Lecture 7: Integration of Traditional and Modern Techniques

- Combining traditional breeding methods with modern biotechnology
- Case studies and examples

Lecture 8: Ethical and Regulatory Considerations in Crop Improvement

- Overview of ethical issues and regulatory frameworks
- Impact on society and agriculture

Lecture 9: Future Trends in Crop Improvement

- Emerging technologies and trends in crop breeding
- Potential challenges and opportunities

Lecture 10: Review of Advanced Crop Improvement Techniques

- Summary of key concepts
- Discussion of practical applications and future directions

Lecture 11: Practical Exercises and Case Studies

- Hands-on activities related to advanced crop improvement techniques
- Case studies and group discussions

Lecture 12: Final Review and Q&A

- Comprehensive review of the entire syllabus
- Final Q&A session to address any remaining questions

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)

RAFFELS UNIVERSITY, NEEMRANA

B.Sc. Computer Science (3 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

2023-24

RAFFLES
UNIVERSITY

Raffles University Neemrana

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS) RAFFELS UNIVERSITY, NEEMRANA

B.Sc. Computer Science (3 Years Degree Program)

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Provide students with fundamental knowledge and ability to expertise in Computer Science.
PO 2	Provide insight to problem solving to succeed in Technical Profession through precise education and to prepare students to excel in postgraduate programs.
PO 3	To inculcate in students professional, effective communication skills, team work, multidisciplinary approach and an ability to relate issues to broader social context.
PO 4	Prepare students to be aware of excellence, leadership, written ethical codes and guidelines and lifelong learning needed for successful professional career by providing them with an excellent academic environment.
PO 5	Empower the students in academic, social, psychological and economic arenasby developing relevant competencies.
PO 6	Interpret and apply the implications of environment awareness initiatives incorporated in curriculum.
PO 7	Participation and contribution to community development activities throughNCC, NSS etc.
PO 8	Acquire sufficient knowledge base in the Domain Specific area leading to thepursuit of advanced level of study in the chosen Domain Specific area.
PO 9	Adaptability and capacity building to the everchanging needs of the industryand employment opportunities.
PO 10	Inculcate the human values through curricular, co-curricular and extracurricular activities.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The Department of Computer Science offers Three Year (comprising 6 semesters) Undergraduate Programin Computer Science with objective of empowering students to acquire all-inclusive understanding of Computer Knowledge both theoretical and practical as an academic discipline. Upon completion of B. Sc. Computer Science Degree Program successfully, the students shall acquire the following skills and competencies.

PSO 1	Ability to apply foundations of Mathematics, Principles of Physics/Statisticsand Theory of Computer Science in solving the real-world problems.
PSO 2	Identify, formulate, review research literature, and analyzes complex problems reaching substantiated conclusions using first principles of mathematics and Computer science.
PSO 3	Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PSO 4	Create, select, and apply appropriate techniques, resources, and modern IT tools including prediction and modelling to complex activities with an understanding of the limitations.
PSO 5	Understand the impact of the professional solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PSO 6	Function effectively as an individual, and as a member or leader in diverseteams, and in multidisciplinary settings.
PSO 7	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PSO-PO Mapping

	PO										
PSO		1	2	3	4	5	6	7	8	9	10
	1	√	√	√							
	2	√	√		√	√			√	√	
	3	√	√	√	√	√			√	√	
	4	√	√	√	√	√			√	√	√
	5			√	√	√	√	√	√		√
	6						√	√	√	√	√
	7			√	√		√	√	√	√	√

Course Objective and Course Outcomes

SCHOOL OF BASIC & APPLIED SCIENCES

(Syllabus & Scheme of Studies w.e.f. 2021-22) B.Sc. (Computer Science)

I Year (I semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credit s
				L	P	IA	End Ter m Exa m	Total		
1	Computer Science	COM- 101	Computer Fundamentals and Programming in C - I	2	0	20	30	50	3	2
2		COM- 103	Computer Architecture & Networking - I	2	0	20	30	50	3	2
3		COM- 105	Practical & Viva-voce (Based on Paper COM-101	2	0	20	30	50	3	2
5	Physics	PHY- 101	Mechanics	2	0	20	30	50	3	2
6		PHY- 103	Thermodynamics	2	0	20	30	50	3	2
7		PHY- 105	Wave and Oscillations	2	0	20	30	50	3	2
8		PHY- 107	Physics Lab-I	0	6	20	30	50	4	3
9	Mathematics	MA-101	Matrices and Statistics	2	0	20	30	50	3	2
10		MA-103	Calculus	2	0	20	30	50	3	2
11		MA-105	Three-Dimensional Geometry	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				20	12			550		23

Course outcome

Inorganic Chemistry (CH-101):

1. Systematic and coherent understanding of the fundamental concepts of atomic structure.
2. Students will be able to understand the basic principle of classifications of elements and their periodic properties
3. Students will have through knowledge of different kinds bonding, hybridization in diatomic molecules.
4. Students can gain thorough knowledge about the structures of ionic solids, coordination no and lattice energy.

Organic Chemistry (CH-103) Course Outcomes:

1. Have comprehensive knowledge of the basic organic chemistry like different electronic effects with suitable examples
2. Get information about the types of structural and stereoisomers, optical isomerism, and different nomenclature like D/L, R/S, cis/trans, E/Z etc. of various organic compounds.
3. Learn nomenclature of various types of alkanes and cycloalkanes, preparation and their chemical reactions.
4. Sound knowledge of alkenes, alkynes, dienes and their chemical reactions.

Physical Chemistry (CH-105) Course Outcomes:

1. To understand the Maxwell distribution law and various parameters associated with collisions ideal gas molecules
2. To learn about Role of temperature and pressure to establish the state of gases and describe the Concept of critical temperature, pressure and volume of real gases
3. To study the Physical properties of liquids like surface tension, viscosity and their measurements
4. To have knowledge about various types of symmetries present in different solids and and Bragg's law of X-ray diffraction

Mechanics -I (PHY-101:

1. CO 1: Student gains the knowledge on Fundamentals of Mechanics
2. CO 2: Student gets a thorough knowledge different types of forces that make lifesmoother.
3. CO 3: Student gets a thorough knowledge on fluid dynamics.
4. CO 4: Student gets a thorough knowledge on elastic properties of solids.

5. CO 5: Finds the evolution of theories for understanding the Universe and thedynamic nature of Universe.

Thermodynamics -I (PHY-103)

1. CO 1: Student gains the knowledge on Fundamentals of Thermodynamics
2. CO 2: Student gets a thorough knowledge different types of reversible andirreversible engines CO 3: Student gets a thorough knowledge on dynamics of Heat flow.
3. CO 4: Student gets a thorough knowledge on various degrees of freedom andmolecular movement. CO 5: Finds the evolution of Quantum Mechanics, a new branch of Physics

Electricity and Magnetism-I (PHY-105) Course Outcomes:

1. CO 1: understand concepts of electric and magnetic fields and electric potential; CO 2: understand the topic of capacitance;
2. C) 3: be able to treat DC and AC circuits;
3. CO 4: understand the Lorentz force law and apply it to solve problems;
4. CO 5: be able to treat the motion of charged objects in two and three dimensions;

Computer Fundamentals and Programming in C – I (COM-101)

1. CO 1: Understand the basics of computer.
2. CO 2: Understanding the concept of input and output devices of computer.
3. CO 3: Learn the functional units and classify types of computers, how they process information.
4. CO 4: Understanding the working of an operating system.
5. CO 5: Study to use internet safely, legally and responsibly.

Computer Architecture & Networking – I (COM-103)

1. CO 1: To know about the basics of circuit design using gates.
2. CO 2: Understanding the concept of combinational and sequential circuits.
3. CO 3: Learn the functional units of computers, how they process information.
4. CO 4: Understanding the working of different instruction cycles.
5. CO 5: Understanding the memory reference and input-output instructions

CO-Po mapping

CH-101	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-103	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-105	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-101	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-103	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-105	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

COM 101	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2	1	1						
CO 2	3	2	1							

CO 3	3	2								
CO 4	2	2	2	3	2					
CO 5				2	2					3

COM-103	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO1	3	2	1							
CO2	3	2	1							
CO3	3	2						2		
CO4	2	2		2				2		
CO5	2	2		2				2		

Lesson Plan for Chemistry - CH-101

UNIT-I: Atomic Structure (9 Lectures)

1. Lecture 1: Introduction to Atomic Structure: de-Broglie Matter Waves, Heisenberg's Uncertainty Principle
2. Lecture 2: Atomic Orbitals: Concepts and Types
3. Lecture 3: Quantum Numbers: Definitions and Significance
4. Lecture 4: Aufbau and Pauli Exclusion Principles
5. Lecture 5: Hund's Rule of Maximum Multiplicity: Electronic Configurations
6. Lecture 6: Radial and Angular Wave Functions: Concepts and Applications
7. Lecture 7: Probability Distribution Curves for s, p, and d Orbitals
8. Lecture 8: Shapes of Atomic Orbitals: s, p, d
9. Lecture 9: Summary and Review of Atomic Structure

UNIT-II: Periodic Table (9 Lectures)

10. Lecture 10: General Principles of the Periodic Table: Introduction and Overview
11. Lecture 11: Effective Nuclear Charge: Slater's Rules and Applications
12. Lecture 12: Atomic and Ionic Radii: Trends in the Periodic Table
13. Lecture 13: Ionization Energy: Definition, Determination, and Trends
14. Lecture 14: Electron Affinity: Definition, Determination, and Trends
15. Lecture 15: Electronegativity: Methods of Evaluation and Trends

16. Lecture 16: Comparative Analysis of s & p Block Elements in the Periodic Table
17. Lecture 17: Summary of Periodic Table Trends and Their Applications
18. Lecture 18: Review and Problem-Solving Session on Periodic Table Trends

UNIT-III: Covalent Bond (10 Lectures)

19. Lecture 19: Introduction to Covalent Bond: Valence Bond Theory (VBT)
20. Lecture 20: Limitations of Valence Bond Theory and Directional Characteristics of Covalent Bonds
21. Lecture 21: Hybridization: Types and Examples (BeF2, BF3, CH4)
22. Lecture 22: Shapes of Simple Inorganic Molecules and Ions: PF5, SF6, IF7
23. Lecture 23: Valence Shell Electron Pair Repulsion (VSEPR) Theory: Introduction and Applications
24. Lecture 24: VSEPR Theory Applied to NH3, H3O+, SF4
25. Lecture 25: VSEPR Theory Applied to ClF3, ICl−, H2O
26. Lecture 26: Molecular Orbital (MO) Theory: Heteronuclear Diatomic Molecules (CO, NO)
27. Lecture 27: Bond Strength and Bond Energy: Concepts and Calculations
28. Lecture 28: Percentage Ionic Character from Dipole Moment and Electronegativity Difference

UNIT-IV: Ionic Solids (9 Lectures)

29. Lecture 29: Introduction to Ionic Solids: Structures of NaCl, CsCl, ZnS, CaF2
30. Lecture 30: Radius Ratio Effect and Coordination Number in Ionic Structures
31. Lecture 31: Limitations of Radius Ratio Rule: Analysis and Examples
32. Lecture 32: Lattice Defects: Types and Their Effects on Properties
33. Lecture 33: Semiconductors: Introduction and Applications
34. Lecture 34: Lattice Energy: Concepts and Born-Haber Cycle (Mathematical Derivation Excluded)
35. Lecture 35: Solvation Energy and Its Relation with Solubility of Ionic Solids
36. Lecture 36: Polarizing Power and Polarisability of Ions: Fajan's Rule
37. Lecture 37: Summary and Review of Ionic Solids and Their Properties

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Lesson Plan for Chemistry - CH-103

UNIT-I: Structure and Bonding

Lecture 1: Localized and Delocalized Chemical Bond

Lecture 2: van der Waals' Interactions

Lecture 3: Resonance: Conditions, Effect, and Applications

Lecture 4: Hyperconjugation and Inductive Effect

Lecture 5: Electromeric Effect & Comparisons

Stereochemistry of Organic Compounds-I

6. Lecture 6: Isomerism: Concepts and Types

7. Lecture 7: Optical Isomerism: Elements of Symmetry, Molecular Chirality
8. Lecture 8: Enantiomers: Properties and Stereogenic Centers
9. Lecture 9: Chiral and Achiral Molecules with Two Stereogenic Centers
10. Lecture 10: Diastereomers: Threo, Erythro, and Meso Compounds
11. Lecture 11: Resolution of Enantiomers, Inversion, Retention, Racemization

UNIT-II: Stereochemistry of Organic Compounds-II

12. Lecture 12: Relative and Absolute Configuration: Sequence Rules
13. Lecture 13: R & S System of Nomenclature
14. Lecture 14: Geometric Isomerism: Configuration and E & Z System
15. Lecture 15: Conformational Analysis of Ethane and n-Butane
16. Lecture 16: Conformations of Cyclohexane: Axial and Equatorial Bonds
17. Lecture 17: Newman Projection, Sawhorse Formulae, Configuration vs. Conformation

UNIT-III: Mechanism of Organic Reactions

18. Lecture 18: Curved Arrow Notation: Drawing Electron Movements
19. Lecture 19: Homolytic and Heterolytic Bond Breaking
20. Lecture 20: Electrophiles and Nucleophiles: Types of Reagents
21. Lecture 21: Types of Organic Reactions: Energy Considerations
22. Lecture 22: Reactive Intermediates: Carbocations, Carbanions, Free Radicals
23. Lecture 23: Carbenes, Arynes, Nitrenes: Formation, Structure & Stability

UNIT-IV: Alkanes and Cycloalkanes

24. Lecture 24: IUPAC Nomenclature of Alkanes and Alkyl Groups
25. Lecture 25: Isomerism in Alkanes: Sources and Methods of Formation
26. Lecture 26: Wurtz, Kolbe, Corey-House Reactions, Decarboxylation of Acids
27. Lecture 27: Cycloalkanes: Nomenclature and Synthesis
28. Lecture 28: Photochemical Cycloaddition, Dehalogenation, Pyrolysis
29. Lecture 29: Baeyer's Strain Theory and Strainless Rings

Lesson Plan for Chemistry - CH-105

Unit 1: Gaseous States (11 Lectures)

1. Lecture 1: Introduction to Gaseous States: General Characteristics
2. Lecture 2: Maxwell's Distribution of Velocities: Overview and Calculations
3. Lecture 3: Calculation of Root Mean Square, Average, and Most Probable Velocities

4. Lecture 4: Collision Parameters: Collision Diameter, Number, Frequency, Mean Free Path
5. Lecture 5: Real Gases vs Ideal Gases: Deviations and Causes
6. Lecture 6: Vander Waal's Equation of State: Derivation and Applications
7. Lecture 7: Boyle's Temperature: Calculation and Significance
8. Lecture 8: Behavior of Real Gases: Explanation Using Vander Waal's Equation
9. Lecture 9: PV Isotherms of Real Gases: Continuity of States
10. Lecture 10: The Laws of Corresponding States: Concepts and Applications
11. Lecture 11: Review and Problem-Solving Session on Gaseous States

Unit 2: Critical Phenomenon (7 Lectures)

12. Lecture 12: Critical Phenomenon: Definitions and Concepts
13. Lecture 13: Determination of Critical Temperature, Pressure, and Volume
14. Lecture 14: PV Isotherms of Real Gases: Analysis and Interpretation
15. Lecture 15: Continuity of States: Explanation Using Isotherms
16. Lecture 16: Critical Constants and Vander Waal's Constants: Relationship
17. Lecture 17: Liquefaction of Gases: Methods and Applications
18. Lecture 18: Review and Discussion on Critical Phenomena

Unit 3: Liquid States (7 Lectures)

19. Lecture 19: Structure of Liquids: Overview and Importance
20. Lecture 20: Surface Tension: Concept and Determination
21. Lecture 21: Viscosity: Definition, Measurement, and Applications
22. Lecture 22: Vapour Pressure: Principles and Measurement Techniques
23. Lecture 23: Optical Rotations: Concept and Determination
24. Lecture 24: Properties of Liquids: Summary and Problem-Solving
25. Lecture 25: Review and Discussion on Liquid States

Unit 4: Solid States and Liquid Crystals (10 Lectures)

26. Lecture 26: Classification of Solids: Overview and Examples
27. Lecture 27: Laws of Crystallography: Constancy of Interfacial Angles, Rationality of Indices, Symmetry
28. Lecture 28: Symmetry Elements in Crystals: Explanation and Examples
29. Lecture 29: Unit Cell and Space Lattice: Definitions and Concepts
30. Lecture 30: Bravais Lattices and Crystal Systems: Classification and Properties
31. Lecture 31: X-Ray Diffraction by Crystals: Principles and Techniques
2. Lecture 32: Bragg's Equation: Derivation and Applications
33. Lecture 33: Determination of Crystal Structure: NaCl and KCl Case Studies
34. Lecture 34: Liquid Crystals: Types, Properties, and Applications

35. Lecture 35: Summary and Review of Solid States and Liquid Crystals

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Lesson Plan Mechanics Paper Code: PHY – 101

Week 1-3: UNIT I - Vector Calculus and Mechanics (10 Lectures)

1. **Lecture 1:** Introduction to Vector Calculus: Scalars and Vectors
2. **Lecture 2:** Gradient, Divergence, and Curl: Concepts and Applications
3. **Lecture 3:** Line, Surface, and Volume Integrals: Definitions and Calculations
4. **Lecture 4:** Frame of Reference: Inertial and Non-Inertial Frames
5. **Lecture 5:** Galilean Transformation: Concept and Mathematical Formulation
6. **Lecture 6:** Galilean Invariance: Principles and Applications
7. **Lecture 7:** Pseudo Forces in Non-Inertial Frames: Examples and Analysis
8. **Lecture 8:** Rotating Reference Frame: Centrifugal and Coriolis Forces
9. **Lecture 9:** Motion Under Central Force: Concept and Equations
10. **Lecture 10:** Kepler's Laws: Derivation and Physical Interpretation

Week 4-6: UNIT II - Fluid Dynamics and Elasticity (10 Lectures)

1. **Lecture 11:** Ideal Fluids: Properties and Assumptions
2. **Lecture 12:** Equation of Continuity: Derivation and Applications
3. **Lecture 13:** Streamline Flow: Concepts and Examples
4. **Lecture 14:** Rotational and Irrotational Flows: Differences and Analysis
5. **Lecture 15:** Euler's Equation of Fluid Motion: Derivation and Implications
6. **Lecture 16:** Bernoulli’s Theorem: Statement, Derivation, and Applications
7. **Lecture 17:** Viscous Fluids: Introduction and Properties
8. **Lecture 18:** Poiseuille's Equation: Derivation and Applications
9. **Lecture 19:** Viscosity by Rotating Cylinder Method: Theory and Experimentation
10. **Lecture 20:** Elasticity: Hook’s Law and Elastic Constants of Isotropic Solids

Week 7-9: UNIT III - Elasticity and Surface Tension (10 Lectures)

1. **Lecture 21:** Stress and Strain in Isotropic Homogeneous Medium: Definitions
2. **Lecture 22:** Elastic Moduli: Young's Modulus, Shear Modulus, and Bulk Modulus
3. **Lecture 23:** Relations Between Elastic Moduli: Mathematical Derivation
4. **Lecture 24:** Torsion of Cylinders: Theory and Applications
5. **Lecture 25:** Bending of Beams: Concepts and Equations
6. **Lecture 26:** Internal Energy of a Strained Body: Calculations and Implications
7. **Lecture 27:** Surface Tension: Definition and Measurement
8. **Lecture 28:** Surface Energy: Concept and Applications
9. **Lecture 29:** Capillarity and Applications in Daily Life
10. **Lecture 30:** Problem Solving and Applications in Elasticity and Surface Tension

Week 10-12: UNIT IV - Special Relativity (10 Lectures)

1. **Lecture 31:** Michelson-Morley Experiment: Setup, Results, and Inference
2. **Lecture 32:** Postulates of Special Relativity: Einstein's Principles
3. **Lecture 33:** Lorentz Transformations: Derivation and Implications
4. **Lecture 34:** Length Contraction: Concept and Examples
5. **Lecture 35:** Time Dilation: Theory and Practical Implications
6. **Lecture 36:** Simultaneity in Relativity Theory: Concepts and Paradoxes
7. **Lecture 37:** Addition of Velocities in Special Relativity
8. **Lecture 38:** Relativistic Dynamics: Concepts of Force and Momentum
9. **Lecture 39:** Variation of Mass with Velocity: Derivation and Applications
10. **Lecture 40:** Mass-Energy Relation: $E=mc^2$ and Its Implications

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Lesson plan Thermodynamics PHY – 103

Week 1-3: UNIT I - First Law of Thermodynamics (10 Lectures)

1. **Lecture 1:** Introduction to Thermodynamics and Internal Energy
2. **Lecture 2:** First Law of Thermodynamics: Concept and Mathematical Formulation
3. **Lecture 3:** Joule's Law: Understanding and Applications
4. **Lecture 4:** Applications of the First Law of Thermodynamics in Various Systems
5. **Lecture 5:** Carnot Cycle: Derivation and Understanding
6. **Lecture 6:** Carnot Engine: Efficiency and Real-world Applications
7. **Lecture 7:** Refrigerator and Heat Pumps: Carnot's Approach
8. **Lecture 8:** Reversible and Irreversible Processes: Definitions and Examples
9. **Lecture 9:** Carnot Theorem: Proof and Implications
10. **Lecture 10:** Thermodynamic Scale of Temperature: Understanding and Applications

Week 4-6: UNIT II - Entropy and Thermodynamic Potentials (10 Lectures)

1. **Lecture 11:** Introduction to Entropy: Concept and Definition
2. **Lecture 12:** Calculation of Entropy in Various Processes
3. **Lecture 13:** Entropy and Unavailable Energy: Understanding the Relationship
4. **Lecture 14:** Physical Significance of Entropy: Practical Examples
5. **Lecture 15:** Second Law of Thermodynamics: Different Formulations
6. **Lecture 16:** Thermodynamic Potentials: Definitions and Importance
7. **Lecture 17:** Maxwell's Equations in Thermodynamics: Derivations
8. **Lecture 18:** Applications of Maxwell's Equations: Practical Cases
9. **Lecture 19:** Phase Diagram and Triple Point of a Substance
10. **Lecture 20:** Joule-Thomson Effect: Understanding and Applications

Week 7-9: UNIT III - Kinetic Theory of Gases (10 Lectures)

1. **Lecture 21:** Maxwell-Boltzmann Distribution Law: Derivation and Understanding
2. **Lecture 22:** Evaluation of Root Mean Square (RMS) Velocity
3. **Lecture 23:** Average and Most Probable Speeds of Gas Molecules
4. **Lecture 24:** Mean Free Path: Definition and Calculation
5. **Lecture 25:** Transport Phenomenon: Viscosity, Thermal Conductivity, and Diffusion
6. **Lecture 26:** Degrees of Freedom: Definition and Applications
7. **Lecture 27:** Equipartition of Energy: Theoretical Basis
8. **Lecture 28:** Specific Heat of Gases: Application of Equipartition Theorem
9. **Lecture 29:** Real Gases and Deviations from Ideal Gas Behavior
10. **Lecture 30:** Summary and Problem Solving in Kinetic Theory

Week 10-12: UNIT IV - Black Body Radiation (10 Lectures)

1. **Lecture 31:** Emissive and Absorptive Powers: Definitions and Importance
2. **Lecture 32:** Black Body Radiation: Concept and Historical Background
3. **Lecture 33:** Kirchoff's Law of Radiation: Statement and Applications
4. **Lecture 34:** Intensity and Energy Density of Radiation: Definitions and Calculations
5. **Lecture 35:** Stefan-Boltzmann Law: Derivation and Applications
6. **Lecture 36:** Distribution of Energy in the Spectrum of Black Body Radiation
7. **Lecture 37:** Wein's Distribution Law: Derivation and Understanding
8. **Lecture 38:** Wein's Displacement Law: Implications and Applications
9. **Lecture 39:** Rayleigh-Jeans Law: Derivation and Limitations
10. **Lecture 40:** Planck's Law: Quantum Theory of Black Body Radiation

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Lesson plan Wave & Oscillations PHY – 105

Week 1-3: UNIT I - Simple Harmonic Oscillations (SHM) (10 Lectures)

1. **Lecture 1:** Introduction to Simple Harmonic Motion (SHM)
2. **Lecture 2:** Differential Equation of SHM: Derivation and General Solution
3. **Lecture 3:** Amplitude, Frequency, Time Period, and Phase: Definitions and Relationships
4. **Lecture 4:** Velocity and Acceleration in SHM: Equations and Graphical Analysis
5. **Lecture 5:** Kinetic Energy in SHM: Derivation and Time Dependence
6. **Lecture 6:** Potential Energy in SHM: Derivation and Time Dependence
7. **Lecture 7:** Total Energy in SHM: Conservation and Time Average Values
8. **Lecture 8:** Reference Circle and Rotating Vector Representation of SHM
9. **Lecture 9:** Examples and Applications of SHM in Real-World Systems
10. **Lecture 10:** Problem Solving Session: SHM

Week 4-6: UNIT II - Free Oscillations of Systems with One Degree of Freedom (10 Lectures)

1. **Lecture 11:** Introduction to Free Oscillations and Degrees of Freedom
2. **Lecture 12:** Mass-Spring System: Differential Equation and Solution
3. **Lecture 13:** Simple Pendulum: Derivation of Period and Energy Analysis
4. **Lecture 14:** Torsional Pendulum: Concept and Mathematical Formulation
5. **Lecture 15:** Oscillations in a U-Tube: Theory and Equations
6. **Lecture 16:** Compound Pendulum: Centers of Percussion and Oscillation
7. **Lecture 17:** Bar Pendulum: Theory and Applications
8. **Lecture 18:** Comparison of Different Oscillatory Systems
9. **Lecture 19:** Experimental Techniques for Measuring Oscillations
10. **Lecture 20:** Problem Solving Session: One Degree of Freedom Systems

Week 7-9: UNIT III - Systems with Two Degrees of Freedom (10 Lectures)

1. **Lecture 21:** Introduction to Coupled Oscillators: Concept and Examples
2. **Lecture 22:** Normal Coordinates: Definition and Application
3. **Lecture 23:** Normal Modes: Derivation and Understanding
4. **Lecture 24:** Energy Relations in Coupled Oscillators: Energy Transfer
5. **Lecture 25:** Examples of Two Coupled Oscillators: Analytical Solutions
6. **Lecture 26:** Normal Modes of N Coupled Oscillators: General Theory
7. **Lecture 27:** Application of Normal Modes to Physical Systems
8. **Lecture 28:** Experimental Methods for Studying Coupled Oscillators
9. **Lecture 29:** Advanced Topics in Coupled Oscillations: Nonlinearity and Chaos
10. **Lecture 30:** Problem Solving Session: Two Degrees of Freedom Systems

Week 10-12: UNIT IV - Waves (10 Lectures)

1. **Lecture 31:** Introduction to Waves: Plane and Spherical Waves
2. **Lecture 32:** Longitudinal and Transverse Waves: Definitions and Examples
3. **Lecture 33:** Plane Progressive (Travelling) Waves: Mathematical Representation
4. **Lecture 34:** Wave Equation: Derivation and General Solution
5. **Lecture 35:** Particle and Wave Velocities: Concepts and Calculations
6. **Lecture 36:** Differential Equation for Waves: Pressure of a Longitudinal Wave
7. **Lecture 37:** Energy Transport and Intensity of Waves: Derivations
8. **Lecture 38:** Water Waves: Ripple and Gravity Waves
9. **Lecture 39:** Experimental Observation of Waves: Techniques and Measurements
10. **Lecture 40:** Problem Solving Session: Waves

Lesson Plan Com-101

SN	Topic Name	Hours to Teach	Mode of Teaching

1	Unit I: Introduction		
1.1	Historical evolution of computers	1	PowerPoint Presentation
1.2	Classification of computers	1	PowerPoint Presentation
1.3	Model of a digital computer	1	Whiteboard, PowerPoint
1.4	Functioning of a digital computer	1	Whiteboard, PowerPoint
1.5	Usefulness of computers	1	PowerPoint Presentation
1.6	Human being Vs computer	1	PowerPoint Presentation
1.7	Computer as a tool	1	PowerPoint Presentation
1.8	Applications of computers (part 1)	1	PowerPoint Presentation
1.9	Applications of computers (part 2)	1	PowerPoint Presentation
1.10	Number Systems: Necessity of binary number system, Binary system	1	Whiteboard, Demonstration
1.11	Number Systems: Octal and hexadecimal systems	1	Whiteboard, Demonstration
1.12	Inter-conversion of numbers	1	Whiteboard, PowerPoint
1.13	Binary arithmetic	1	Whiteboard, Demonstration
1.14	Character codes	1	Whiteboard, PowerPoint
2	Unit II: Input/Output Devices		
2.1	Input Devices: Punched cards, card-readers, key-punching machines	1	PowerPoint Presentation
2.2	Input Devices: Keyboards, mouse, joysticks	1	PowerPoint Presentation
2.3	Input Devices: Trackballs, digitizer, voice-recognition, optical-recognition	1	Demonstration
2.4	Input Devices: Scanners, terminals, point-of-sale terminals, machine-vision systems	1	PowerPoint Presentation
2.5	Hard-copy devices: Print quality, Impact printers	1	PowerPoint Presentation
2.6	Hard-copy devices: Non-impact printers (Inkjet, Laser, Thermal, LED)	1	PowerPoint Presentation
2.7	Hard-copy devices: Plotters	1	PowerPoint Presentation
2.8	Soft-copy devices: Monitors, Video-standards (VGA, SVGA)	1	PowerPoint Presentation
2.9	Memory & Mass Storage Devices: Characteristics of memory systems	1	PowerPoint Presentation

2.10	Memory & Mass Storage Devices: Types of memory, RAM, ROM	1	PowerPoint Presentation
2.11	Memory & Mass Storage Devices: Magnetic disks (floppy, hard-disk)	1	PowerPoint Presentation
2.12	Memory & Mass Storage Devices: Optical disks, Magnetic tapes	1	PowerPoint Presentation
2.13	Concepts of Virtual and Cache memory	1	Whiteboard, Demonstration
3	Unit III: Software Concepts		
3.1	Introduction, Types of software - System & Application software	1	PowerPoint Presentation
3.2	Language Translators: Compiler, Interpreter, Assembler	1	Whiteboard, Demonstration
3.3	Operating System: Characteristics, Bootstrapping	1	PowerPoint Presentation
3.4	Operating System: Types of OS, Resource Manager	1	PowerPoint Presentation
3.5	BIOS, System utilities - Editor, Loader, Linker, File Manager	1	Whiteboard, Demonstration
3.6	Concept of GUI, GUI standards	1	PowerPoint Presentation

Computer Architecture & Networking – I (COM-103)

N	Topic Name	Hours to Teach	Mode of Teaching
1	Unit I: Basic Building Blocks and Circuit Design		
1.1	OR, AND, NOT, XOR Gates	1	Whiteboard, PowerPoint
1.2	De Morgan's Theorem	1	Whiteboard, PowerPoint
1.3	Universal Building Blocks	1	Whiteboard, PowerPoint
1.4	Laws and Theorem of Boolean Algebra	1	Whiteboard, PowerPoint
1.5	Simplifying Logic Circuits—Sum of Product and Product of Sum Form	1	Whiteboard, Demonstration
1.6	Algebraic Simplification	1	Whiteboard, Demonstration

1.7	Karnaugh Simplification	1	Whiteboard, Demonstration
1.8	Arithmetic Circuits	2	Whiteboard, PowerPoint
2	Unit II: Combinational and Sequential Circuits		
2.1	Combinational Circuits: Basics	1	PowerPoint Presentation
2.2	Sequential Circuits: Basics	1	PowerPoint Presentation
2.3	Flip-Flops	2	Whiteboard, PowerPoint
2.4	Counters	2	Whiteboard, Demonstration
2.5	Shift Registers	2	Whiteboard, Demonstration
2.6	Decoders and Encoders	2	PowerPoint Presentation
2.7	Multiplexer and De-multiplexer Circuits	2	Whiteboard, Demonstration
3	Unit III: Register Transfer and Micro-operations		
3.1	Register Transfer Language	1	PowerPoint Presentation
3.2	Bus and Memory Transfer	1	Whiteboard, PowerPoint
3.3	Arithmetic Logic Micro-operations	1	Whiteboard, Demonstration
3.4	Shift Micro-operations	1	Whiteboard, Demonstration
3.5	Basic Computer Organization and Design: Instruction and Instruction Codes	2	PowerPoint Presentation
3.6	Basic Computer Organization and Design: Computer Instructions	2	PowerPoint Presentation
3.7	Basic Computer Organization and Design: Timing and Control	1	Whiteboard, Demonstration
3.8	Basic Computer Organization and Design: Instruction Cycle	2	Whiteboard, Demonstration
3.9	Basic Computer Organization and Design: Memory Reference Instructions	1	PowerPoint Presentation
3.10	Basic Computer Organization and Design: Input-Output	1	PowerPoint Presentation

	and Interrupts		

SCHOOL OF BASIC AND APPLIED SCIENCES

(Scheme of Studies & Examinations w. e. f. 2022-25 onwards)

B. Sc. (Computer Science) I Year (II Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination Scheme			Duration of exam Hour	Credit s
				L	P	IA	End Ter m Exa m	Total		
1	Computer Science	COM- 102	Computer Fundamentals and Programming in C - II	2	0	20	30	50	3	2
2		COM- 104	Computer Architecture & Networking - II	2	0	20	30	50	3	2
3		COM- 106	Practical & Viva-voce (Based on Paper- COM-102	2	0	20	30	50	3	2
5	Physics	PHY- 102	Mathematical Physics	2	0	20	30	50	2	2
6		PHY- 104	Semiconductor Devices	2	0	20	30	50	2	2
7		PHY- 106	Laser and fiber optics	2	0	20	30	50	2	2
8		PHY- 108	Physics Lab- II		6	20	30	50	4	3
9	Mathematics	MA-102	Sequences and Series& Trigonometry	2	0	20	30	50	3	2
10		MA-104	Ordinary Differential Equations	2	0	20	30	50	3	2
11		MA-106	Vector Calculus and Geometry	2	0	20	30	50	3	2
12	Open Elective Paper			2	0	20	30	50	3	2
TOTAL				20	12			550		23

Organic Chemistry (CH-102)

1. Students can gain thorough knowledge about elements of carbon and nitrogen family and concept of catenation, carbides and fluorocarbons.
2. They will know about the elements of oxygen family and have knowledge about the chemical properties of oxides of sulphur.

2. Organic Chemistry (CH-104)

1. To have sound knowledge in alkenes and their properties.
2. Learn the basics of aromaticity and Huckel's rule. To know preparation and chemical reactions of different aromatic hydrcarbons..
3. Sound knowledge of dienes and their chemical reactions.
4. Get knowledge about the mechanism of SN1 and SN2 reactions and other various chemical reactions of alkyl and aryl halides.

3.Physical Chemistry (CH-106)

1. Systematic and coherent understanding of the fundamental concepts in Chemical Kinetics.
2. Students will be able to understand the causes behind the different types of chemical reactions and the temperature dependence of reaction rate.
3. Students will be able to understand the basic principle of the electrical conduction in liquid state and how is it measured.
4. Students will learn the principles of equipment and instruments used in the chemistry laboratory. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state and its' application in different cases.

Mechanics-II (PHY-102) Course Outcomes:

1. CO 1: Understand integration of vectors
2. CO 2: Student gets a thorough knowledge different types of forces that make lifesmoother. CO 3: Derive Stoke's , Greens and Gauss theorems.
3. CO 4: Student gets a thorough knowledge on elastic properties of solids.
4. CO 5: Finds the evolution of theories for understanding the Universe and thedynamic nature of Universe.

Thermodynamics-II (PHY-104) Course Outcomes:

1. CO 1: Student gains the knowledge on Fundamentals of Thermodynamics
2. CO 2: Student gets a thorough knowledge different types of reversible andirreversible engines
3. CO 3: Student gets a thorough knowledge on dynamics of Heat flow.
4. CO 4: Student gets a thorough knowledge on various degrees of freedom andmolecular movement.

5. CO 5: Finds the evolution of Quantum Mechanics, a new branch of Physics

Electricity and Magnetism-II (PHY-106) Course Outcomes:

1. CO 1: understand the sources of magnetic field;
2. CO 2: know the law of EM induction; understand EM induction and inductance;
3. CO 3: understand Maxwell's equations and wave equation;
4. CO 4: perform basic experiments in electricity, magnetism, and optics, and work with other team

Computer Fundamentals and Programming in C – II (COM-102)

1. CO 1: To know about the basics concept of Algorithms and flow chart of a problem in computer
2. CO 2: Understand I/O operations in your C program.
3. CO 3: Control the sequence of the program and give logical outputs
4. CO 4: Apply code reusability with functions and pointers
5. CO 5: Implement structure and strings in your C program

Computer Architecture & Networking – II (COM-104)

1. CO 1: Know about the basics of CPU and different addressing mode.
2. CO 2: Understand the basic of direct memory access (DMA)
3. CO3: Explain the basics of computer network and different type of network topology.
4. CO 4: Understand the differentiate between various type of computer network
5. CO 5: Understand the basic knowledge of reference model OSI, TCP/IP.

Co-Po mapping

CH-102	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-104	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-106	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-102	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1

	5	1	1	2	1	2	1	3	2	2	1

PHY-104	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-106	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

COM-102	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO1	3	2	1					2		
CO2	3	2								
CO3	3	2	2					2		
CO4	2	2		3				2	2	
CO5	2	2		3				2	2	

COM-104	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10

CO1	3	2		2				3	2	
CO2	3	2						2	2	
CO3	3	3	2	2				3	3	
CO4	3	3	2	2				3	3	
CO5	3	3		2				3	3	

Lesson Plan for Chemistry - CH-102

Unit 1: Hydrogen Bonding, Vander Waals Forces, and Metallic Bond

1. Lecture 1: Introduction to Hydrogen Bonding: Definition and Types
2. Lecture 2: Effects of Hydrogen Bonding on Physical Properties
3. Lecture 3: Applications of Hydrogen Bonding in Chemistry
4. Lecture 4: Overview of Vander Waals Forces: Types and Significance
5. Lecture 5: Introduction to Metallic Bond: Basic Concepts
6. Lecture 6: Band Theory of Metallic Bond
7. Lecture 7: Types and Applications of Semiconductors

Unit 2: s-Block Elements and Noble Gases

8. Lecture 8: Comparative Study of s-Block Elements
9. Lecture 9: Diagonal Relationships in s-Block Elements
10. Lecture 10: Hydrides of s-Block Elements: Properties and Functions
11. Lecture 11: Solvation and Complexation Tendencies in s-Block Elements
12. Lecture 12: Chemical Properties and Low Reactivity of Noble Gases
13. Lecture 13: Chemistry of Xenon: Fluorides, Oxides, and Oxyfluorides

Unit 3: p-Block Elements

14. Lecture 14: Comparative Study of p-Block Elements
15. Lecture 15: Boron Family: Diborane - Properties and Structure
16. Lecture 16: Borazine: Chemical Properties and Structure
17. Lecture 17: Trihalides of Boron: Acid Character and Structure
18. Lecture 18: Carbon Family: Catenation and p–d Bonding

19. Lecture 19: Carbides and Fluorocarbons
20. Lecture 20: Silicates and Silicones: Structural Aspects and Uses

Unit 4: Nitrogen, Oxygen, and Halogen Families

21. Lecture 21: Nitrogen Family: Structures of Oxides and Oxyacids
22. Lecture 22: Phosphorus: White, Yellow, and Red Allotropes
23. Lecture 23: Oxygen Family: Oxyacids of Sulfur - Structures and Acid Strength
24. Lecture 24: Hydrogen Peroxide: Structure, Properties, and Uses
25. Lecture 25: Halogen Family: Basic Properties and Types of Interhalogens

26. Lecture 26: Hydro and Oxyacids of Chlorine: Structure and Acid Strength

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Lesson Plan for Chemistry - CH-104

UNIT-I: Alkenes (11 Lectures)

1. Lecture 1: Nomenclature of Alkenes
2. Lecture 2: Mechanisms of Dehydration of Alcohols
3. Lecture 3: Dehydrohalogenation of Alkyl Halides
4. Lecture 4: The Saytzeff Rule
5. Lecture 5: Hofmann Elimination
6. Lecture 6: Physical Properties and Relative Stabilities of Alkenes
7. Lecture 7: Hydrogenation: Mechanism and Reactions
8. Lecture 8: Electrophilic and Free Radical Additions
9. Lecture 9: Markownikoff's Rule and Hydroboration-Oxidation
10. Lecture 10: Oxymercuration-Reduction and Ozonolysis
11. Lecture 11: Hydration, Hydroxylation, and Oxidation with KMnO4

UNIT-II: Arenes and Aromaticity (10 Lectures)

12. Lecture 12: Nomenclature of Benzene Derivatives
13. Lecture 13: Aromatic Nucleus and Side Chain
14. Lecture 14: Huckel Rule and Aromaticity
15. Lecture 15: Aromatic, Antiaromatic, and Non-Aromatic Compounds
16. Lecture 16: Aromatic Electrophilic Substitution: General Mechanism
17. Lecture 17: Nitration and Halogenation of Arenes
18. Lecture 18: Sulphonation and Friedel-Crafts Reaction
19. Lecture 19: Energy Profile Diagrams in Aromatic Substitution
20. Lecture 20: Activating and Deactivating Substituents
21. Lecture 21: Orientation in Aromatic Electrophilic Substitution

UNIT-III: Dienes and Alkynes (9 Lectures)

22. Lecture 22: Nomenclature and Classification of Dienes
23. Lecture 23: Structure of Butadiene and 1,2 and 1,4 Additions
24. Lecture 24: Electrophilic and Free Radical Mechanism in Dienes
25. Lecture 25: Diels-Alder Reaction: Mechanism and Examples
26. Lecture 26: Nomenclature, Structure, and Bonding in Alkynes
27. Lecture 27: Methods of Formation of Alkynes
28. Lecture 28: Chemical Reactions of Alkynes
29. Lecture 29: Acidity of Alkynes
30. Lecture 30: Electrophilic and Nucleophilic Addition Reactions

UNIT-IV: Alkyl and Aryl Halides (9 Lectures)

31. Lecture 31: Nomenclature and Classes of Alkyl Halides
32. Lecture 32: Methods of Formation of Alkyl Halides
33. Lecture 33: Chemical Reactions of Alkyl Halides

34. Lecture 34: Mechanisms and Stereochemistry of SN2 Reactions
35. Lecture 35: Mechanisms and Stereochemistry of SN1 Reactions
36. Lecture 36: Energy Profile Diagrams for SN2 and SN1 Reactions
37. Lecture 37: Formation and Reactions of Aryl Halides
38. Lecture 38: Addition-Elimination Mechanism in Nucleophilic Aromatic Substitution
39. Lecture 39: Elimination-Addition Mechanism in Nucleophilic Aromatic Substitution
40. Lecture 40: Reactivity of Alkyl, Allyl, Vinyl, and Aryl Halides

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Lesson Plan for Chemistry - CH-106

Unit 1: Kinetics-I (7 Lectures)

1. Lecture 1: Introduction to Reaction Kinetics: Rate, Rate Equation
2. Lecture 2: Factors Influencing Reaction Rates: Concentration, Temperature
3. Lecture 3: Pressure, Solvent, Light, and Catalyst Effects
4. Lecture 4: Reaction Order: Definitions and Concepts
5. Lecture 5: Integrated Rate Expressions: Zero, First Order
6. Lecture 6: Second and Third Order Reactions: Half-life Period
7. Lecture 7: Methods for Determining Reaction Order

Unit 2: Kinetics-II (6 Lectures)

8. Lecture 8: Temperature's Effect on Reaction Rate: Arrhenius Equation
9. Lecture 9: Simple Collision Theory: Unimolecular Collisions
10. Lecture 10: Bimolecular Collisions: Theoretical Concepts
11. Lecture 11: Transition State Theory: Overview
12. Lecture 12: Transition State Theory: Bimolecular Reactions
13. Lecture 13: Comparative Analysis of Theories

Unit 3: Electrochemistry-I (8 Lectures)

14. Lecture 14: Electrolytic Conduction: Factors and Concepts
15. Lecture 15: Conductance Types: Specific, Molar, Equivalent
16. Lecture 16: Variation of Conductance with Concentration
17. Lecture 17: Arrhenius Theory of Ionization
18. Lecture 18: Ostwald's Dilution Law and Applications
19. Lecture 19: Debye-Huckel-Onsager's Equation: Introduction
20. Lecture 20: Transport Number: Definition and Determination
21. Lecture 21: Numerical Problems on Conductance and Transport Numbers

Unit 4: Electrochemistry-II (9 Lectures)

22. Lecture 22: Kohlrausch's Law: Definition and Applications
23. Lecture 23: Molar Ionic Conductance: Effects of Viscosity, Temperature
24. Lecture 24: Calculation of Conductance: Weak Electrolytes
25. Lecture 25: Conductometry: Applications in Chemistry

26. Lecture 26: Degree of Dissociation: Determination Methods
27. Lecture 27: Solubility Product of Sparingly Soluble Salts
28. Lecture 28: Conductometric Titrations: Overview and Examples
29. Lecture 29: pH and pKa: Definitions, Buffer Solutions
30. Lecture 30: Buffer Mechanisms and Henderson-Hasselbalch Equation

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Lesson plan for COM-102

SN	Topic Name	Hours to Teach	Mode of Teaching
1	Unit I: Basic Concepts and Elements of C		
1.1	Basic Concepts of Programming, Problem Solving, Algorithm Designing and Flowcharting	2	Whiteboard, PowerPoint
1.2	Concept of Structured Programming	2	Whiteboard, PowerPoint
1.3	Elements of C: C Character Set	2	Whiteboard, PowerPoint
1.4	Elements of C: Identifiers and Keywords	1	Whiteboard, PowerPoint
1.5	Elements of C: Data Types - Declaration and Definition	2	Whiteboard, Demonstration
2	Unit II: Operators, Data Input/Output, and Control Statements		
2.1	Operators: Arithmetic, Relational, Logical, Bitwise, Unary, Assignment, Conditional Operators	4	Whiteboard, PowerPoint
2.2	Operators: Hierarchy & Associativity	2	Whiteboard, PowerPoint
2.3	Data Input/Output: Basics	1	Whiteboard, Demonstration
2.4	Control Statements: Sequencing, Selection (if and switch)	3	Whiteboard, Demonstration
2.5	Control Statements: Alternation, Repetition (for, while, do-while)	4	Whiteboard, Demonstration
2.6	Control Statements: break, continue, goto	2	Whiteboard, PowerPoint
3	Unit III: Functions, Data Structures, Pointers, and Program Development		
3.1	Functions: Definition, Prototype, Passing Parameters, Recursion	2	Whiteboard, PowerPoint

3.2	Data Structures: Arrays, Struct, Union	2	Whiteboard, Demonstration
3.3	Data Structures: String, Data Files	1	Whiteboard, Demonstration
3.4	Pointers: Declaration, Operations on Pointers	2	Whiteboard, Demonstration
3.5	Pointers: Array of Pointers, Pointers to Arrays	1	Whiteboard, PowerPoint
3.6	Program Development in C: Techniques and Practices	3	Whiteboard, Demonstration

Lesson plan for COM-104

SN	Topic Name	Hours to Teach	Mode of Teaching
1	Unit I: Central Processing Unit and Input-Output Organization		
1.1	Central Processing Unit: General Register Organization	2	Whiteboard, PowerPoint
1.2	Central Processing Unit: Stack Organization	2	Whiteboard, PowerPoint
1.3	Central Processing Unit: Instruction Formats	1	Whiteboard, PowerPoint
1.4	Central Processing Unit: Addressing Modes	2	Whiteboard, PowerPoint
1.5	Central Processing Unit: Data and Transfer Manipulation	1	Whiteboard, PowerPoint
1.6	Central Processing Unit: Program Control	2	Whiteboard, PowerPoint
1.7	Central Processing Unit: Reduced Instruction Set Computer	2	Whiteboard, PowerPoint
1.8	Input-Output Organization: Peripheral Devices	1	Whiteboard, PowerPoint
1.9	Input-Output Organization: Input-Output Interface	1	Whiteboard, PowerPoint
1.10	Input-Output Organization: Asynchronous Data Transfer, Modes of Transfer	2	Whiteboard, PowerPoint
1.11	Input-Output Organization: Priority Interrupt, Direct Memory Access (DMA), IOP	2	Whiteboard, Demonstration
2	Unit II: Computer Networking		

2.1	Computer Networking: Introduction to Computer Network	1	Whiteboard, PowerPoint
2.2	Computer Networking: Why Computer Network?	1	Whiteboard, PowerPoint
2.3	Computer Networking: Types of Computer Network	1	Whiteboard, PowerPoint
2.4	Computer Networking: Network Topology	1	Whiteboard, PowerPoint
2.5	Computer Networking: Internet and Its Hardware & Software Requirements	1	Whiteboard, PowerPoint
2.6	Computer Networking: Applications of Internet (E-mail, FTP, Telnet, etc.)	1	Whiteboard, PowerPoint
2.7	Computer Networking: Overview of Intranet and Its Applications	1	Whiteboard, PowerPoint
2.8	Computer Networking: Hardware Requirements for LAN	1	Whiteboard, Demonstration
2.9	Computer Networking: Transmission Channel for LAN, Network Interface Unit	1	Whiteboard, Demonstration
2.10	Computer Networking: Servers & Workstations, LAN Software	1	Whiteboard, PowerPoint
2.11	Computer Networking: Introduction to Ethernet, Token Ring, Hub, Switches, Bridges, Routers	2	Whiteboard, Demonstration
3	Unit III: Private Networks and Network Protocols		
3.1	Private Networks: ISDN, PSTN, PSDN, Value Added Network	1	Whiteboard, PowerPoint
3.2	Private Networks: OSI Model	1	Whiteboard, PowerPoint
3.3	Private Networks: TCP/IP Model	1	Whiteboard, PowerPoint
3.4	Private Networks: Network Protocols	1	Whiteboard, PowerPoint
3.5	Private Networks: Applications of Computer Network	1	Whiteboard, PowerPoint

SCHOOL OF BASIC AND APPLIED SCIENCES

(Scheme of Studies & Examinations w. e. f. 2022-25 onwards)

B. Sc. (Computer Science) II Year (III Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credit s
				L	P	IA	End Ter m Exa m	Total		
1	Computer Science	COM- 201	Data and File Structures - I	2	0	20	30	50	3	2
2		COM- 203	Object-oriented Design and C++ - I	2	0	20	30	50	3	2
3		COM- 205	Practical & Viva-voce (Based on Paper COM-201 & 203)	2	0	20	30	50	3	2
5	Physics	PHY-201	Electrostatics	2	0	20	30	50	3	2
6		PHY-203	Magnetism	2	0	20	30	50	3	2
7		PHY-205	Elective Paper	2	0	20	30	50	3	2
8		PHY-207	Physics Lab-III	0	6	20	30	50	4	3
9	Mathematics	MA-201	Advance Calculus	2	0	20	30	50	3	2
10		MA-203	Partial Differential Equations	2	0	20	30	50	3	2
11		MA-205	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	2	20	30	50	3	2
				20	14			550		23

Inorganic Chemistry (CH-201) Course Outcomes:

1. CO 1: Have good knowledge about d-block elements particularly of transition elements.
2. CO 2: To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties of some compounds of transition elements.
3. CO 3: To know about the basic concepts of coordination chemistry like EAN, Werner theory of coordination, nomenclature and isomerism in coordination complexes.
4. CO 4: Students can gain knowledge about the properties and reactions in non-aqueous solvents like liquid NH3 and liquid SO2, and also the concept of Acids and Bases.

Organic Chemistry (CH-203) Course Outcomes:

1. CO 1: Have comprehensive knowledge of the synthesis and properties of alcohols and epoxides CO 2: Know about synthesis and properties of phenols and their chemical reactions.
2. CO 3: Have knowledge of Beer-Lambert law, molar absorptivity, different electronic transitions, analysis UV spectra and application of UV spectroscopy in structure elucidation.
3. CO 4: Knowledge about various methods for the preparation of carboxylic acid, carboxylic derivatives (ester, amide, acid chlorides, anhydrides) and their chemical reactions.

Physical Chemistry (CH-205) Course Outcomes:

1. CO 1: To know about different process, functions and 1st law of thermodynamics
2. CO 2: To have knowledge about w, q, dU & dH and Kirchoffs equation
3. CO 3: To understand the basic terms related to chemical equilibrium and derive the law thermodynamically, deduce relation between various equilibrium constants and determining partition coefficient of a solvent dissolved in two immiscible solvents
4. CO 4: To have good knowledge about distribution law and its applications

Optics-I (PHY-201) Course Outcomes:

1. CO 1: Student gains the knowledge on Electromagnetic nature of light. CO 2: Student gets a thorough knowledge optical properties of light.
2. CO 3: Applications of different techniques to correct the aberrations.
3. CO 4: Studies different eye pieces and various methods to produce collimatedparallel beams of light.
4. CO 5: Finds the applications of diffraction and its classification in day – to – day life.

Modern Physics – 1(PHY-203)

1. CO 1: To understand the difference between Atomic and Molecular spectroscopies.
2. CO 2: Understand the intuitive ideas of the Quantum physics and Nuclear physics.
3. CO 3: Derive Schrodinger time dependent and time independent wave equations
4. CO 4: To understand dual nature of matter
5. CO 5: Gain knowledge on classification of various crystal systems

Electronics-I (PHY-205) Course Outcomes:

1. Understand the diode and transistor characteristics.
2. Verify the rectifier circuits using diodes and implement them using hardware.
3. Design the biasing circuits like self biasing.
4. Design various amplifiers like CE, CC, common source amplifiers and implement them using hardware and also observe their frequency responses
5. Analyze the concepts of SCR and observe its characteristics.

Data and File Structures – I (COM-201)

1. CO 1: Understand the concept of Dynamic memory management, data types, algorithms.
2. CO 2: Understand basic data structures such as arrays, linked lists, stacks and queues.
3. CO 3: Describe the hash function and concepts of collision and its resolution methods
4. CO 4: Solve problem involving graphs, trees and heaps
5. CO 5: Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

Object-oriented Design and C++ - I (COM-203)

1. CO 1: Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data and objects.
2. CO 2: Understand dynamic memory management techniques using pointers, constructors, destructors, etc
3. CO 3: Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.
4. CO 4: Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.
5. CO 5: Demonstrate the use of various OOPs concepts with the help of programs

Co-Po mapping

CH-201	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-203	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-205	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-201	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-203	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-205	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO1	3	2	2	2	2					
CO2	3	3	2	2	2					

CO3	2	2	3	2	2					
CO4	2	2	3	3	3					
CO5	3	3	2	3	3					

COM-203	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2						3		
CO 2	3	3						3		
CO 3	2	2						3		
CO 4	2			3				2		
CO 5	3	2			3			3		

Lesson plan

Lesson Plan for Chemistry - CH-201

UNIT–I: Chemistry of Elements of I Transition Series (6 Lectures)

1. Lecture 1: Introduction to Transition Elements
2. Lecture 2: Position in Periodic Table
3. Lecture 3: General Characteristics & Properties
4. Lecture 4: Structures & Properties of TiO_2
5. Lecture 5: Structures & Properties of $VOCl_2$
6. Lecture 6: Structures & Properties of $FeCl_3$, $CuCl_2$, $Ni(CO)_4$

UNIT–II: Elements of IInd & IIIrd Transition Series (7 Lectures)

7. Lecture 7: Characteristics of IInd & IIIrd Transition Elements
8. Lecture 8: Comparison of 3d, 4d & 5d Elements
9. Lecture 9: Ionic Radii Comparison
10. Lecture 10: Oxidation State Comparison
11. Lecture 11: Magnetic Properties
12. Lecture 12: Spectral Properties

13. Lecture 13: Stereochemistry of Transition Elements

UNIT–III: Coordination Compounds (9 Lectures)

14. Lecture 14: Werner's Coordination Theory
15. Lecture 15: Effective Atomic Number Concept
16. Lecture 16: Introduction to Chelates
17. Lecture 17: Nomenclature of Coordination Compounds
18. Lecture 18: Isomerism in Coordination Compounds I
19. Lecture 19: Isomerism in Coordination Compounds II
20. Lecture 20: Valence Bond Theory I
21. Lecture 21: Valence Bond Theory II
22. Lecture 22: Application of Valence Bond Theory

UNIT–IV: Non-Aqueous Solvents (4 Lectures)

23. Lecture 23: Physical Properties of Solvents
24. Lecture 24: Types & Characteristics of Solvents
25. Lecture 25: Reactions in Liquid NH_3
26. Lecture 26: Reactions in Liquid SO_2

UNIT–V: Acids and Bases, HSAB Concept (4 Lectures)

27. Lecture 27: Arrhenius & Bronsted-Lowry Concepts
28. Lecture 28: Lux-Flood, Solvent System, Lewis Concepts
29. Lecture 29: Relative Strength of Acids & Bases
30. Lecture 30: HSAB Concept, Symbiosis, Electronegativity

Lesson Plan for Chemistry - CH-203

Unit 1: Alcohols and Epoxides (7 Lectures)

1. Lecture 1: Monohydric Alcohols: Nomenclature and Formation
2. Lecture 2: Reduction of Aldehydes and Ketones to Alcohols
3. Lecture 3: Hydrogen Bonding and Acidic Nature of Alcohols

4. Lecture 4: Reactions of Alcohols: Overview
5. Lecture 5: Dihydric Alcohols: Nomenclature and Formation
6. Lecture 6: Oxidative Cleavage of Glycols (Pb(OAc)4 and HIO4)
7. Lecture 7: Pinacol-Pinacolone Rearrangement

Unit 2: Phenols (7 Lectures)

8. Lecture 8: Nomenclature, Structure, and Bonding of Phenols
9. Lecture 9: Preparation and Properties of Phenols
10. Lecture 10: Acidic Character of Phenols vs. Alcohols
11. Lecture 11: Resonance Stabilization of Phenoxide Ion
12. Lecture 12: Electrophilic Aromatic Substitution in Phenols
13. Lecture 13: Mechanisms: Fries and Claisen Rearrangements
14. Lecture 14: Reimer-Tiemann, Kolbe's, Schotten-Baumann Reactions

Unit 3: UV Absorption Spectroscopy (8 Lectures)

15. Lecture 15: Absorption Laws: Beer-Lambert Law and Molar Absorptivity
16. Lecture 16: UV Spectra: Presentation and Analysis
17. Lecture 17: Types of Electronic Transitions
18. Lecture 18: Effect of Conjugation on Absorption
19. Lecture 19: Chromophores and Auxochromes: Concepts
20. Lecture 20: Spectral Shifts: Bathochromic, Hypsochromic, Hyperchromic
21. Lecture 21: UV Spectra of Conjugated Enes and Enones
22. Lecture 22: Woodward-Fieser Rules: Calculation of λmax

Unit 4: Carboxylic Acids & Derivatives (8 Lectures)

23. Lecture 23: Nomenclature, Structure, and Bonding of Carboxylic Acids
24. Lecture 24: Acidity and Substituent Effects on Carboxylic Acids
25. Lecture 25: Preparation and Reactions of Carboxylic Acids
26. Lecture 26: Hell-Volhard Zelinsky Reaction
27. Lecture 27: Reduction and Decarboxylation of Carboxylic Acids
28. Lecture 28: Acid Derivatives: Nomenclature and Preparation
29. Lecture 29: Stability and Interconversion of Acyl Derivatives
30. Lecture 30: Esterification and Hydrolysis Mechanisms (Acidic/Basic)

Unit 1: Thermodynamics-I (8 Lectures)

1. **Lecture 1:** Introduction to Thermodynamics: Basic Terms
2. Lecture 2: Types of Systems: Intensive vs. Extensive Properties
3. Lecture 3: State and Path Functions: Differentials
4. Lecture 4: Thermodynamic Processes: Concepts of Heat and Work
5. Lecture 5: Zeroth Law: Temperature and Thermal Equilibrium
6. Lecture 6: First Law of Thermodynamics: Internal Energy
7. Lecture 7: Enthalpy: Heat Capacities and Their Relationship
8. Lecture 8: Applications: First Law and Thermodynamic Processes

Unit 2: Thermodynamics-II (8 Lectures)

9. **Lecture 9**: Joule's Law: Ideal and Real Gases
10. Lecture 10: Joule-Thomson Effect: Coefficient and Inversion Temp.
11. Lecture 11: Work and Heat Calculations for Ideal Gases
12. Lecture 12: Isothermal and Adiabatic Expansion: Reversible Processes
13. Lecture 13: Temperature Dependence of Enthalpy: Kirchoff's Equation
14. Lecture 14: Bond Energies: Calculation and Applications
15. Lecture 15: Applications: Expansion Processes and Bond Energy
16. Lecture 16: Review of Thermodynamics: Key Concepts

Unit 3: Chemical Equilibrium (7 Lectures)

17. Lecture 17: Equilibrium Constant and Free Energy: Definitions
18. Lecture 18: Chemical Potential: Thermodynamic Derivation
19. Lecture 19: Law of Chemical Equilibrium: Derivation and Concepts
20. Lecture 20: Temperature Dependence: Van't Hoff Isochore
21. Lecture 21: Van't Hoff Isotherm: Applications
22. Lecture 22: Le-Chatelier's Principle: Clausius-Clapeyron Equation
23. Lecture 23: Applications: Equilibrium in Reactions

Unit 4: Distribution Law (7 Lectures)

24. Lecture 24: Nernst Distribution Law: Derivation
25. Lecture 25: Modifications: Dissociation, Association, Chemical Comb.
26. Lecture 26: Application: Hydrolysis of Aniline Hydrochloride
27. Lecture 27: Application: Potassium Triiodide Complex
28. Lecture 28: Process of Extraction: Distribution Law
29. Lecture 29: Review of Distribution Law: Key Concepts
30. Lecture 30: Summary and Review: Thermodynamics and Equilibrium

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Lesson plan Electrostatics PHY – 201

Week 1-3: UNIT I - Electrostatics and Gauss's Theorem (10 Lectures)

1. **Lecture 1:** Introduction to Coulomb's Law of Electrostatics: Basic Concepts
2. **Lecture 2:** Electric Intensity and Potential: Definitions and Relations
3. **Lecture 3:** Gauss's Theorem: Statement and Derivation
4. **Lecture 4:** Applications of Gauss's Theorem: Symmetric Charge Distributions
5. **Lecture 5:** Poisson's and Laplace's Equations: Derivation and Physical Significance
6. **Lecture 6:** Deduction from Gauss's Theorem: Potential and Field Calculations
7. **Lecture 7:** Uniqueness Theorem: Statement and Applications
8. **Lecture 8:** Superposition Theorem: Statement and Examples
9. **Lecture 9:** Application of Laplace's Equation to Spherical Charge Distribution
10. **Lecture 10:** Problem Solving Session: Electrostatics and Gauss's Theorem

Week 4-6: UNIT II - Multipolar Expansion and Dipole Interactions (10 Lectures)

1. **Lecture 11:** Introduction to Multipolar Expansion of Scalar Potential: Monopole Term
2. **Lecture 12:** Dipole Term in Multipolar Expansion: Definition and Examples
3. **Lecture 13:** Quadrupole Term in Multipolar Expansion: Concepts and Applications
4. **Lecture 14:** Potential and Field Due to a Dipole: Calculations and Examples
5. **Lecture 15:** Work Done in Deflecting a Dipole: Theory and Calculations
6. **Lecture 16:** Dipole-Dipole Interaction: Electric Dipoles
7. **Lecture 17:** Dipole-Dipole Interaction: Magnetic Dipoles
8. **Lecture 18:** Force on a Dipole in a Non-Homogeneous Field: Derivation and Applications
9. **Lecture 19:** Application Examples: Dipole Interactions in Various Fields
10. **Lecture 20:** Problem Solving Session: Multipolar Expansion and Dipole Interactions

Week 7-9: UNIT III - Polarization and Dielectric Media (10 Lectures)

1. **Lecture 21:** Introduction to Polarization: Concepts and Mechanisms
2. **Lecture 22:** Electric Displacement Vector (D): Definition and Applications
3. **Lecture 23:** Gauss's Theorem in Dielectric Media: Application and Boundary Conditions

4. **Lecture 24:** Boundary Conditions for Electric Fields: Theory and Examples
5. **Lecture 25:** Electrostatic Field Energy: Concepts and Calculations
6. **Lecture 26:** Computation of Capacitance: Parallel Plate Capacitors
7. **Lecture 27:** Spherical Capacitors Containing Dielectrics: Uniform and Non-Uniform Cases
8. **Lecture 28:** Cylindrical Capacitors Containing Dielectrics: Uniform and Non-Uniform Cases
9. **Lecture 29:** Practical Applications: Capacitors in Circuit Design
10. **Lecture 30:** Problem Solving Session: Polarization, Displacement, and Capacitance

Week 10-12: UNIT IV - Boundary Value Problems and Field Solutions (10 Lectures)

1. **Lecture 31:** Introduction to Boundary Value Problems in Electrostatics
2. **Lecture 32:** Field Problems: Point Charge Near a Grounded Conducting Infinite Plane
3. **Lecture 33:** Method of Images: Application to Grounded Conducting Plane
4. **Lecture 34:** Boundary Value Problems in a Uniform External Field: Concepts and Methods
5. **Lecture 35:** Conducting Spherical Shell in a Uniform External Field: Solution
6. **Lecture 36:** Dielectric Sphere in a Uniform External Field: Solution
7. **Lecture 37:** Practical Examples: Boundary Value Problems in Electrostatics
8. **Lecture 38:** Numerical Techniques: Solving Boundary Value Problems
9. **Lecture 39:** Problem Solving Session: Field Problems and Boundary Value Solutions
10. **Lecture 40:** Review and Summary of Electrostatics and Boundary Value Problems

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Lesson plan Magnetism PHY – 203

Week 1-3: UNIT I - Magnetic Induction and Vector Potential (10 Lectures)

1. **Lecture 1:** Introduction to Lorentz Force: Concepts and Derivations
2. **Lecture 2:** Concept of Magnetic Induction: Definition and Applications
3. **Lecture 3:** Force on a Linear Current Element: Derivation and Examples
4. **Lecture 4:** Biot-Savart's Law: Statement and Derivation
5. **Lecture 5:** Magnetic Vector Potential: Definition and Concept
6. **Lecture 6:** Calculation of Magnetic Vector Potential: Straight Wire
7. **Lecture 7:** Magnetic Field Due to a Straight Wire: Calculation and Examples
8. **Lecture 8:** Magnetic Field Due to a Small Current Loop: Theory and Computation
9. **Lecture 9:** Vector Potential and Magnetic Induction in Simple Cases
10. **Lecture 10:** Problem Solving Session: Magnetic Induction and Vector Potential

Week 4-6: UNIT II - Magnetic Dipoles and Ampere's Law (10 Lectures)

1. **Lecture 11:** Introduction to Magnetic Dipoles: Concept and Properties
2. **Lecture 12:** Magnetic Field Due to a Dipole: Theory and Calculations
3. **Lecture 13:** Magnetic Shell: Definition and Applications
4. **Lecture 14:** Ampere's Theorem: Statement and Proof
5. **Lecture 15:** Ampere's Circuital Law: Illustration with a Straight Wire
6. **Lecture 16:** Force Between Long Parallel Current-Carrying Conductors: Derivation and Examples
7. **Lecture 17:** Magnetic Monopole: Concept and Theoretical Basis
8. **Lecture 18:** Comparison Between Static Electric and Magnetic Fields: Key Differences
9. **Lecture 19:** Magnetic Dipole Moment: Definition and Calculations
10. **Lecture 20:** Problem Solving Session: Magnetic Dipoles and Ampere's Law

Week 7-9: UNIT III - Current Distributions and Magnetization (10 Lectures)

1. **Lecture 21:** Free Current and Bound Current: Definitions and Differences
2. **Lecture 22:** Surface and Volume Density of Current Distribution: Concepts and Examples
3. **Lecture 23:** Magnetization: Definition and Physical Significance
4. **Lecture 24:** Non-Uniform Magnetization of Matter: Theory and Computations
5. **Lecture 25:** Ampere's Law in Terms of Free Current Density: Derivation and Applications
6. **Lecture 26:** Introduction to Magnetic Field Intensity (H): Definition and Uses
7. **Lecture 27:** Relation Between B and H Fields: Theory and Examples
8. **Lecture 28:** Magnetic Susceptibility and Permeability: Concepts and Calculations
9. **Lecture 29:** Practical Applications: Magnetization in Materials
10. **Lecture 30:** Problem Solving Session: Current Distributions and Magnetization

Week 10-12: UNIT IV - Boundary Conditions and Magnetic Materials (10 Lectures)

1. **Lecture 31:** Line Integral of H in Terms of Free Current: Derivation and Applications
2. **Lecture 32:** Boundary Conditions for Magnetic Field (B) and Magnetic Field Intensity (H): Theory and Examples
3. **Lecture 33:** Permanently Magnetized Body: Concepts and Examples
4. **Lecture 34:** Magnetic Scalar Potential: Definition and Applications
5. **Lecture 35:** Application of Laplace's Equation to Magnetic Sphere in Uniform Magnetic Field: Derivation and Results
6. **Lecture 36:** Hysteresis in Ferromagnetic Materials: Theory and Observations
7. **Lecture 37:** Energy Loss in Ferromagnetic Materials: Causes and Effects
8. **Lecture 38:** Magnetic Circuit: Concept and Analysis
9. **Lecture 39:** Energy Stored in Magnetic Field: Calculation and Examples
10. **Lecture 40:** Review and Summary: Magnetism Concepts and Problem Solving

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Lesson plan Optics – I PHY – 205 A

Week 1-3: UNIT I - Geometrical Optics and Optical Systems (10 Lectures)

1. **Lecture 1:** Light as Electromagnetic Waves: Overview and Principles
2. **Lecture 2:** Ray Optics: Basics and Geometrical Optics
3. **Lecture 3:** Fermat's Principle: Statement and Applications
4. **Lecture 4:** Reflection and Refraction at Curved Surfaces: Derivations and Examples
5. **Lecture 5:** Dispersion of Light: Basic Concepts and Formulas
6. **Lecture 6:** Dispersive Power of Optical Systems: Definitions and Calculations
7. **Lecture 7:** Dispersive Power of a Prism: Derivation and Applications
8. **Lecture 8:** Optical Systems: Field of View, Entrance and Exit Pupil
9. **Lecture 9:** Practical Examples: Reflection, Refraction, and Dispersion
10. **Lecture 10:** Problem Solving Session: Geometrical Optics and Optical Systems

Week 4-6: UNIT II - Aberrations and Optical Instruments (10 Lectures)

1. **Lecture 11:** Chromatic Aberration: Causes and Methods of Reduction
2. **Lecture 12:** Achromatic Lens Combination: Theory and Calculation
3. **Lecture 13:** Field of View in Optical Instruments: Definitions and Examples

4. **Lecture 14:** Entrance and Exit Pupil: Concepts and Applications
5. **Lecture 15:** Microscopes: Types, Components, and Working Principles
6. **Lecture 16:** Ramsden Eyepiece: Design and Functionality
7. **Lecture 17:** Huygens Eyepiece: Design and Functionality
8. **Lecture 18:** Huygens Principle: Statement and Applications
9. **Lecture 19:** Deduction of Laws of Reflection and Refraction from Huygens Principle
10. **Lecture 20:** Problem Solving Session: Aberrations and Optical Instruments

Week 7-9: UNIT III - Interference and Interferometers (10 Lectures)

1. **Lecture 21:** Fresnel's Bi-Prism: Principle and Applications
2. **Lecture 22:** Interference in Thin Films: Theory and Examples
3. **Lecture 23:** Fringes of Equal Inclination: Formation and Analysis
4. **Lecture 24:** Fringes of Equal Thickness: Formation and Analysis
5. **Lecture 25:** Newton's Rings: Formation, Calculation, and Applications
6. **Lecture 26:** Michelson's Interferometer: Principle and Uses
7. **Lecture 27:** Application of Michelson's Interferometer in Fine Structure Studies
8. **Lecture 28:** Multiple Beam Interference: Reflected and Transmitted Patterns
9. **Lecture 29:** Fabry-Perot Interferometer: Principle, Working, and Applications
10. **Lecture 30:** Problem Solving Session: Interference and Interferometers

Week 10-12: UNIT IV - Diffraction and Resolution (10 Lectures)

1. **Lecture 31:** Fresnel and Fraunhofer Diffraction: Classification and Concepts
2. **Lecture 32:** Fresnel's Half-Period Zones: Explanation and Applications
3. **Lecture 33:** Rectilinear Propagation of Light: Explanation and Examples
4. **Lecture 34:** Zone Plate: Concept and Applications
5. **Lecture 35:** Fraunhofer Diffraction Due to a Single Slit: Theory and Patterns
6. **Lecture 36:** Fraunhofer Diffraction Due to a Double Slit: Theory and Patterns
7. **Lecture 37:** Fraunhofer Diffraction Due to a Circular Aperture: Qualitative Analysis
8. **Lecture 38:** Plane Diffraction Grating (Transmission): Theory and Calculation
9. **Lecture 39:** Rayleigh Criterion of Resolution: Definition and Applications
10. **Lecture 40:** Resolving Power of Optical Systems: Prism, Telescope, Microscope, and Grating

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Lesson plan COM-201

SN	Topic Name	Hours to Teach	Mode of Teaching
1	Unit I: Data Structures and Linear Structures		
1.1	Data Structure and Its Essence	1	Whiteboard, PowerPoint
1.2	Data Structure Types	1	Whiteboard, PowerPoint
1.3	Linear and List Structures: Arrays	1	Whiteboard, PowerPoint
1.4	Linear and List Structures: Stacks	1	Whiteboard, PowerPoint

1.5	Linear and List Structures: Queues	1	Whiteboard, PowerPoint
1.6	Linear and List Structures: Lists (Sequential and Linked)	2	Whiteboard, Demonstration
1.7	Linear and List Structures: Simple Lists, Circular Lists, Doubly Linked Lists	2	Whiteboard, Demonstration
2	Unit II: Advanced List Structures and Arrays		
2.1	Inverted Lists and Threaded Lists	2	Whiteboard, PowerPoint
2.2	Operations on List Structures and Applications	2	Whiteboard, Demonstration
2.3	Arrays: Multidimensional Arrays	1	Whiteboard, PowerPoint
2.4	Arrays: Sequential Allocation, Address Calculations, Sparse Arrays	2	Whiteboard, Demonstration
3	Unit III: Tree Structures and Algorithms		
3.1	Tree Structures: Introduction to Trees, Binary Trees	1	Whiteboard, PowerPoint
3.2	Tree Structures: Binary Search Trees	1	Whiteboard, PowerPoint
3.3	Implementing Binary Trees	2	Whiteboard, Demonstration
3.4	Tree Traversal Algorithms (Pre-order, In-order, Post-order)	2	Whiteboard, Demonstration
3.5	Threaded Trees and Trees in Search Algorithms	1	Whiteboard, PowerPoint
3.6	AVL Trees and Polish Notation	2	Whiteboard, Demonstration
3.7	Expression Trees	1	Whiteboard, PowerPoint

Lesson plan COM-203

SN	Topic Name	Hours to Teach	Mode of Teaching
1	Unit I: Object-Oriented Concepts		
1.1	Introduction to Object-Oriented Concepts: Data Abstraction, Encapsulation	1	Whiteboard, PowerPoint
1.2	Classes and Objects	1	Whiteboard, PowerPoint

1.3	Modularity and Hierarchy	1	Whiteboard, PowerPoint
1.4	Typing, Concurrency, and Persistence	2	Whiteboard, PowerPoint
2	Unit II: Object-Oriented Methodology		
2.1	Advantages and Disadvantages of OO Methodologies	1	Whiteboard, PowerPoint
2.2	Modeling and Domain Analysis	2	Whiteboard, PowerPoint
2.3	OMT Methodology: Object Model	2	Whiteboard, PowerPoint
2.4	OMT Methodology: Links and Associations	1	Whiteboard, Demonstration
2.5	OMT Methodology: Multiplicity, Link Attributes, Role Names, Ordering	1	Whiteboard, PowerPoint
2.6	OMT Methodology: Qualification, Aggregation, Generalization, and Inheritance	2	Whiteboard, Demonstration
2.7	OMT Methodology: Abstract Class, Meta Data,	2	Whiteboard,
3	Unit III: Dynamic, Functional, and System Models		
3.1	Dynamic Model: Events, States, Scenarios, Event Traces, State Diagram	2	Whiteboard, PowerPoint
3.2	Functional Model: Data Flow Diagrams	2	Whiteboard, PowerPoint
3.3	Analysis and System Design	2	Whiteboard, Demonstration
3.4	Object Design: Techniques and Practices	3	Whiteboard, Demonstration
4	Review, Practical Work, and Integration		
4.1	Review of Key Concepts and Q&A	2	Whiteboard, PowerPoint
4.2	Practical Work: Modeling and Designing Object-Oriented	6	Demonstration, Lab
4.3	Practical Work: Case Studies and Integration	5	Demonstration, Lab Work

SCHOOL OF BASIC AND APPLIED SCIENCES

(Scheme of Studies & Examinations w .e. f. 2022-25 onwards)

B. Sc. (Computer Science) II Year (IV Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credit s
				L	P	IA	End Ter m Exa m	Total		
1	Computer Science	COM- 202	Data and File Structures - II	2	0	20	30	50	3	2
2		COM- 204	Object-oriented Design and C++ - II	2	0	20	30	50	3	2
3		COM- 206	Practical & Viva-voce (Based on Paper COM- 202 and COM- 204)	2	0	20	30	50	3	2
5	Physics	PHY- 202	Statistical Mechanics	2	0	20	30	50	2	2
6		PHY- 204	Quantum Mechanics-I	2	0	20	30	50	2	2
7		PHY- 206	Elective Paper	2	0	20	30	50	2	2
8		PHY- 208	Physics Lab- IV		6	20	30	50	4	3
9	Mathematics	MA-202	Linear programming	2	0	20	30	50	3	2
10		MA-204	Special Functions and Integral Transforms	2	0	20	30	50	3	2
11		MA-206	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				20	12			550		23

Course Outcomes

Inorganic Chemistry (CH-202) Course Outcomes:

1. Have good knowledge about d-block elements particularly of transition elements.
2. To study the bonding of 3d elements. To recapitulate the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbital's in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters. Students will be able to calculate the spectroscopic terms for various metal ions.
3. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties some compounds of transition elements.
4. To know about position of f block elements in periodic table and their general characteristics. To study the occurrence and separation of lanthanides and lanthanide compounds. Have knowledge of actinides their existence and general properties.
5. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

Organic Chemistry (CH-204) Course Objective:

1. Able To describe absorptions of various functional groups and applications of IR spectroscopy. To know the application of IR spectroscopy in structure elucidation.
2. To synthesize and know reactions of amines.
3. To discuss synthetic application of diazonium salts and other nitro compounds.
4. Get knowledge about the preparation of aliphatic, aromatic aldehydes and ketones and various important name reactions of aldehydes and ketones.

Physical Chemistry (CH-206)

1. Systematic and coherent understanding of the fundamental concepts in Physical chemistry.
2. Students will be able to understand the fundamentals of thermodynamics and electrochemistry.
3. Students will be able to understand the solve problems using the properties and relationships of thermodynamic equations. Students will have understanding of thermodynamic fundamentals for application in applied thermodynamics.
4. Students will gain the knowledge of instrumentation in electrochemistry. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state.

Statistical Mechanics (PHY-202)

1. CO 1: Student gains the knowledge on fundamentals of Statistical Mechanics

2. CO 2: Student gets a thorough knowledge on different systems and ensembles.
3. CO 3: The role of partition function in scientific problem solving.
4. CO 4: Applies the statistics accordingly to different classes of particles.
5. CO 5: Applies the statistics for various quantum possible applications.

Quantum Mechanics-I (PHY-204):

1. CO 1: Student gains the knowledge on fundamentals of Quantum Mechanics
2. CO 2: Student gets a thorough knowledge on dual nature of matter and itsverification.
3. CO 3: The dynamics of fundamental particles are studied using Schrodinger timedependent and time independent wave equations.
4. CO 4: Eigen states and eigen values gives the knowledge of allowed and forbiddenenergy regions.
5. CO 5: Applies the Quantum conditions for various quantum applications.

Optics-II (PHY-206)

1. CO 1: Student gains the knowledge on basic principles of light and its applications.
2. CO 2: Student gets a thorough knowledge on types of polarization and its production andapplications. CO 3: Student gains the demonstrated knowledge on diffraction phenomenon of light.
3. CO 4: Gains a comprehensive knowledge on construction of a hologram
4. CO 5: Gains a demonstrated knowledge on 3 level laser system and atomic interferencelasing without inversion.

Data and File Structures – II (COM-202)

1. CO 1: Understand the concept of Dynamic memory management, data types, algorithms.
2. CO 2: Understand basic data structures such as arrays, linked lists, stacks and queues.
3. CO 3: Describe the hash function and concepts of collision and its resolution methods
4. CO 4: Solve problem involving graphs, trees and heaps
5. CO 5: Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

Object-oriented Design and C++ - II (COM-204)

1. CO 1: Describe the procedural and object-oriented paradigm with concepts of streams, classes, functions, data and objects.
2. CO 2: Understand dynamic memory management techniques using pointers, constructors, destructors, etc
3. CO 3: Describe the concept of function overloading, operator overloading, virtual functions and polymorphism.
4. CO 4: Classify inheritance with the understanding of early and late binding, usage of exception

handling, generic programming.

5. CO 5: Demonstrate the use of various OOPs concepts with the help of programs.

Co-PO mapping

CH-202	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-204	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-	PO

206											
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-202	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-204	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-206	PO									
		1	2	3	4	5	6	7	8	9	10

CO	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

COM 202	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2						3		
CO 2	3	2						3		
CO 3	3							2		
CO 4	3	2						3		
CO 5	3	3						3		

COM-204	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2						3		
CO 2	3	3						3		
CO 3	2	2						3		
CO 4	2			3				2		
CO 5	3	2						3		

Lesson plan

Lesson Plan for Chemistry - CH-202

UNIT-I: Chemistry of f-block elements (10 Lectures)

1. Lecture 1: Introduction to f-block elements: Overview and significance.
2. Lecture 2: Lanthanides: Electronic structure and oxidation states.
3. Lecture 3: Lanthanide Contraction: Causes and consequences.
4. Lecture 4: Ionic radii and complex formation in lanthanides.

5. Lecture 5: Occurrence and isolation of lanthanides.
6. Lecture 6: Important compounds of lanthanides.
7. Lecture 7: Actinides: General features and electronic structure.
8. Lecture 8: Comparison of Lanthanides and Actinides.
9. Lecture 9: Separation techniques for Np, Pu, and Am from U.
10. Lecture 10: Actinides vs. Transition Elements: Properties.

UNIT-II: Theory of Qualitative and Quantitative Inorganic Analysis-I (10 Lectures)

11. Lecture 11: Introduction to inorganic analysis: Acidic radicals.
12. Lecture 12: Identification of common acidic radicals.
13. Lecture 13: Chemistry of analysis: Typical combinations of acid radicals.
14. Lecture 14: Interference in acidic radicals: Causes.
15. Lecture 15: Removal of interference: Methods and techniques.
16. Lecture 16: Chemistry of basic radicals: An overview.
17. Lecture 17: Precipitation: Theory and types.
18. Lecture 18: Co-precipitation: Mechanisms and examples.
19. Lecture 19: Post-precipitation: Factors and effects.
20. Lecture 20: Purification of precipitates: Methods.

UNIT-III: Theory of Qualitative and Quantitative Inorganic Analysis-II (10 Lectures)

21. Lecture 21: Group analysis of basic radicals: Principles.
22. Lecture 22: Separation of cations: Group-wise analysis.
23. Lecture 23: Precipitation reactions: Key concepts.
24. Lecture 24: Co-precipitation in analysis: Practical aspects.
25. Lecture 25: Handling post-precipitation in experiments.
26. Lecture 26: Identifying interfering radicals: Case studies.
27. Lecture 27: Advanced techniques in purification.
28. Lecture 28: Application of qualitative analysis in industry.
29. Lecture 29: Quantitative analysis: Introduction and importance.
30. Lecture 30: Final review and application in inorganic chemistry.

Unit 1: Infrared (IR) Absorption Spectroscopy (7 Lectures)

1. Lecture 1: Introduction to IR Spectroscopy: Molecular Vibrations
2. Lecture 2: Hooke's Law: Selection Rules and IR Band Positions
3. Lecture 3: Intensity and Measurement of IR Spectra
4. Lecture 4: Fingerprint Region and Characteristic Absorptions
5. Lecture 5: Interpretation of IR Spectra: Simple Organic Compounds
6. Lecture 6: Functional Groups in IR Spectroscopy
7. Lecture 7: Applications of IR in Structure Elucidation

Unit 2: Amines (8 Lectures)

8. Lecture 8: Structure and Nomenclature of Amines
9. Lecture 9: Physical Properties of Amines
10. Lecture 10: Separation Techniques for Amines
11. Lecture 11: Structural Features Affecting Amines' Basicity
12. Lecture 12: Preparation of Alkyl Amines: Methods and Reactions
13. Lecture 13: Preparation of Aryl Amines: Techniques and Examples
14. Lecture 14: Electrophilic Aromatic Substitution in Aryl Amines
15. Lecture 15: Reactions of Amines with Nitrous Acid

Unit 3: Diazonium Salts and Nitro Compounds (8 Lectures)

16. Lecture 16: Diazotization Mechanism and Structure of Benzene Diazonium Chloride
17. Lecture 17: Replacement of Diazo Group by Various Groups
18. Lecture 18: Reduction of Diazonium Salts and Coupling Reactions
19. Lecture 19: Preparation and Reactions of Nitro Alkanes
20. Lecture 20: Preparation and Reactions of Nitro Arenes
21. Lecture 21: Electrophilic Substitution in Nitro Arenes
22. Lecture 22: Reduction of Nitro Compounds: Mechanisms and Media
23. Lecture 23: Synthetic Applications of Diazonium Salts and Nitro Compounds

Unit 4: Aldehydes and Ketones (7 Lectures)

24. Lecture 24: Nomenclature and Structure of Carbonyl Group
25. Lecture 25: Synthesis of Aldehydes: Methods and Applications
26. Lecture 26: Synthesis of Ketones: Techniques and Importance

27. Lecture 27: Reactivity Comparison of Aldehydes and Ketones
28. Lecture 28: Nucleophilic Additions: Mechanisms and Examples
29. Lecture 29: Oxidation and Reduction Reactions in Aldehydes and Ketones
30. Lecture 30: Key Reactions: Wittig, Mannich, Perkin, and Cannizaro

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Lesson Plan for Chemistry - CH-206

Unit 1: Thermodynamics-III (7 Lectures)

1. Lecture 1: Second Law of Thermodynamics: Introduction and Need
2. Lecture 2: Statements of the Second Law
3. Lecture 3: Carnot's Cycle: Efficiency and Theorem
4. Lecture 4: Thermodynamic Scale of Temperature
5. Lecture 5: Concept of Entropy: Definition and State Function
6. Lecture 6: Entropy Changes in Physical Processes
7. Lecture 7: Entropy as Criteria of Spontaneity and Equilibrium

Unit 2: Thermodynamics-IV (7 Lectures)

8. Lecture 8: Third Law of Thermodynamics: Nernst Heat Theorem

9. Lecture 9: Residual Entropy and Absolute Entropy
10. Lecture 10: Gibbs and Helmholtz Functions: Definitions
11. Lecture 11: Criteria for Equilibrium and Spontaneity: A and G
12. Lecture 12: Variation of G and A with Pressure and Volume
13. Lecture 13: Variation of G and A with Temperature
14. Lecture 14: Applications and Advantages of G and A

Unit 3: Electrochemistry-III (8 Lectures)

15. Lecture 15: Electrolytic and Galvanic Cells: Basics

16. Lecture 16: Reversible and Irreversible Cells
17. Lecture 17: EMF of Cells: Measurement and Significance
18. Lecture 18: Standard Cell and Thermodynamic Quantities
19. Lecture 19: Nernst Equation and Electrode Reactions
20. Lecture 20: Standard Hydrogen Electrode and Reference Electrodes
21. Lecture 21: Electrochemical Series: Definition and Applications

22. Lecture 22: Metal-Metal Ion and Redox Electrodes

Unit 4: Electrochemistry-IV (8 Lectures)

23. Lecture 23: Concentration Cells with Transference

24. Lecture 24: Concentration Cells without Transference

25. Lecture 25: Liquid Junction Potential

26. Lecture 26: Application of EMF Measurements: Valency of Ions

27. Lecture 27: Solubility Product and Activity Coefficient

28. Lecture 28: Potentiometric Titrations: Acid-Base

29. Lecture 29: Potentiometric Titrations: Redox

30. Lecture 30: Determination of pH: Hydrogen and Glass Electrodes

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Lesson plan Statistical Mechanics PHY – 202

Week 1-3: UNIT I - Classical and Quantum Description of Statistical Systems (10 Lectures)

1. **Lecture 1:** Introduction to Statistical Mechanics: Microstates and Macrostates
2. **Lecture 2:** Classical Description: Phase Space and Its Importance
3. **Lecture 3:** Quantum Description: Wave Functions and Quantum States
4. **Lecture 4:** Concept of Ensemble: Definition and Types
5. **Lecture 5:** Hypothesis of Equal A Priori Probability: Concept and Implications
6. **Lecture 6:** Microstates and Macrostates in Detail: Classical and Quantum Views
7. **Lecture 7:** Isolated Systems in Equilibrium: Basic Concepts and Examples
8. **Lecture 8:** Phase Space vs. Wave Functions: Comparative Analysis
9. **Lecture 9:** Statistical Ensembles: Concept and Definitions
10. **Lecture 10:** Problem Solving Session: Microstates, Macrostates, and Ensembles

Week 4-6: UNIT II - Ensembles and Partition Functions (10 Lectures)

1. **Lecture 11:** Micro-canonical Ensemble: Definition and Properties
2. **Lecture 12:** Canonical Ensemble: Definition and Applications
3. **Lecture 13:** Grand Canonical Ensemble: Concepts and Uses
4. **Lecture 14:** Partition Function: Concept and Calculation for Various Ensembles
5. **Lecture 15:** System in Thermal Equilibrium with Heat Bath: Analysis and Examples
6. **Lecture 16:** Law of Equipartition of Energy: Derivation and Applications
7. **Lecture 17:** Limits of Validity of Equipartition Theorem: Theory and Examples
8. **Lecture 18:** Application of Equipartition Theorem: Classical Systems
9. **Lecture 19:** Practical Examples: Partition Functions and Ensemble Analysis
10. **Lecture 20:** Problem Solving Session: Ensembles and Partition Functions

Week 7-9: UNIT III - Quantum Statistics and Distribution Laws (10 Lectures)

1. **Lecture 21:** Introduction to Quantum Statistics: Basic Principles
2. **Lecture 22:** Gibbs' Paradox: Statement and Resolution
3. **Lecture 23:** Identical Particles and Symmetry Requirements: Quantum Perspective

4. **Lecture 24:** Derivation of Fermi-Dirac Statistics: Micro-canonical Ensemble Approach
5. **Lecture 25:** Derivation of Bose-Einstein Statistics: Micro-canonical Ensemble Approach
6. **Lecture 26:** Classical Limit of Quantum Statistics: Overview and Applications
7. **Lecture 27:** Comparison of Fermi-Dirac and Bose-Einstein Statistics: Key Differences
8. **Lecture 28:** Quantum Statistics in Low and High Temperature Limits
9. **Lecture 29:** Applications of Quantum Statistics: Examples and Case Studies
10. **Lecture 30:** Problem Solving Session: Quantum Statistics and Distribution Laws

Week 10-12: UNIT IV - Bose-Einstein Distribution and Applications (10 Lectures)

1. **Lecture 31:** Bose-Einstein Distribution Law: Derivation and Explanation
2. **Lecture 32:** Application of Bose-Einstein Statistics to Derive Planck's Law
3. **Lecture 33:** Rayleigh-Jeans Law as a Limiting Case of Planck's Law: Derivation and Discussion
4. **Lecture 34:** Wien's Law as a Limiting Case of Planck's Law: Derivation and Discussion
5. **Lecture 35:** Phonons and Lattice Vibrations: Concept and Theory
6. **Lecture 36:** Specific Heat of Solids: Einstein's Theory and Debye's Theory
7. **Lecture 37:** Comparison of Einstein and Debye Theories: Key Points
8. **Lecture 38:** Bose-Einstein Condensation: Theory and Applications
9. **Lecture 39:** Practical Examples: Application of Statistical Mechanics in Modern Physics
10. **Lecture 40:** Review and Summary: Statistical Mechanics and Quantum Statistics

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Lesson plan Quantum Mechanics PHY – 204

Week 1-3: UNIT I - Foundations of Quantum Mechanics (10 Lectures)

1. **Lecture 1:** Introduction to Quantum Mechanics: Historical Background and Key Concepts
2. **Lecture 2:** de Broglie Hypothesis: Wave-Particle Duality
3. **Lecture 3:** Compton Effect: Explanation and Significance
4. **Lecture 4:** Davisson-Germer Experiment: Theory and Results
5. **Lecture 5:** Heisenberg Uncertainty Principle: Statement, Implications, and Examples
6. **Lecture 6:** Wave Function: Concept and Physical Meaning
7. **Lecture 7:** Group Velocity and Phase Velocity: Definitions and Relationships
8. **Lecture 8:** Classical Velocity vs. Group Velocity: Analysis and Comparison
9. **Lecture 9:** Principle of Superposition: Application to Quantum Mechanics
10. **Lecture 10:** Problem Solving Session: de Broglie Hypothesis, Uncertainty Principle, and Wave Functions

Week 4-6: UNIT II - Quantum Mechanics Postulates and Operators (10 Lectures)

1. **Lecture 11:** Basic Postulates of Quantum Mechanics: Overview and Discussion
2. **Lecture 12:** Dynamical Variables as Linear Hermitian Operators: Definitions and Examples
3. **Lecture 13:** Eigenvalue Equation for Operators: Theory and Applications
4. **Lecture 14:** Momentum Operator: Definition and Physical Interpretation
5. **Lecture 15:** Energy Operator: Schrödinger Equation and its Role
6. **Lecture 16:** Angular Momentum Operators: Definitions and Properties
7. **Lecture 17:** Measurement of Quantum Variables: Results and Interpretation
8. **Lecture 18:** Expectation Values: Calculation and Significance
9. **Lecture 19:** Operator Algebra: Commutation Relations and Implications

10. **Lecture 20:** Problem Solving Session: Quantum Mechanics Postulates and Operators

Week 7-9: UNIT III - Quantum Mechanics Formalism (10 Lectures)

1. **Lecture 21:** Commutation Relations Between Operators: Theory and Examples
2. **Lecture 22:** Compatible Observables: Definition and Simultaneous Measurement
3. **Lecture 23:** Ehrenfest Theorem: Statement and Applications
4. **Lecture 24:** Time-Dependent Schrödinger Equation: Derivation and Applications
5. **Lecture 25:** Time-Independent Schrödinger Equation: Theory and Examples
6. **Lecture 26:** Eigenstates and Eigenvalues: Concepts and Calculations
7. **Lecture 27:** Normalization of Wave Functions: Procedure and Importance
8. **Lecture 28:** Ortho-Normality of Wave Functions: Definitions and Applications
9. **Lecture 29:** Physical Interpretation of Wave Functions: Probability Densities
10. **Lecture 30:** Problem Solving Session: Schrödinger Equation, Eigenstates, and Normalization

Week 10-12: UNIT IV - Quantum Potential Wells and Barrier Penetration (10 Lectures)

1. **Lecture 31:** One-Dimensional Potential Well: Concept and Analysis
2. **Lecture 32:** Boundary Conditions for Potential Wells: Derivations and Examples
3. **Lecture 33:** Penetration of Rectangular Potential Barrier: Theory and Calculations
4. **Lecture 34:** Reflection Coefficient: Derivation and Physical Meaning
5. **Lecture 35:** Transmission Coefficient: Derivation and Physical Meaning
6. **Lecture 36:** Alpha Decay: Quantum Mechanical Explanation and Examples
7. **Lecture 37:** Application of Quantum Mechanics to Tunneling Phenomena
8. **Lecture 38:** Quantum Mechanics in Higher Dimensions: Overview
9. **Lecture 39:** Review of Quantum Mechanics Concepts: Summary and Integration
10. **Lecture 40:** Comprehensive Problem Solving Session: Potential Wells, Barrier Penetration, and Quantum Phenomena

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Lesson plan Elective paper (Optics – II) PHY – 206 A

Week 1-3: UNIT I - Polarization and Optical Activity (10 Lectures)

1. **Lecture 1:** Introduction to Polarization: Concept and Importance
2. **Lecture 2:** States of Polarization: Linear, Circular, and Elliptical
3. **Lecture 3:** Double Refraction: Explanation Using Electromagnetic Theory
4. **Lecture 4:** Huygens' Construction for Uniaxial Crystals: Theory and Examples
5. **Lecture 5:** Polaroids: Types, Working Principles, and Applications
6. **Lecture 6:** Circularly and Elliptically Polarized Light: Characteristics and Analysis
7. **Lecture 7:** Fresnel's Explanation of Optical Activity: Theory and Implications
8. **Lecture 8:** Bi-Quartz and Half Shade Polarimeter: Design and Usage
9. **Lecture 9:** Applications of Polarization in Optics: Practical Examples
10. **Lecture 10:** Problem Solving Session: Polarization, Optical Activity, and Instruments

Week 4-6: UNIT II - Diffraction and Gratings (10 Lectures)

1. **Lecture 11:** Introduction to Diffraction: Basic Concepts and Definitions
2. **Lecture 12:** Fresnel's Diffraction: Principles and Examples

3. **Lecture 13:** Zone Plate: Concept, Construction, and Applications
4. **Lecture 14:** Diffraction Due to a Straight Edge: Theory and Calculations
5. **Lecture 15:** Fraunhofer Diffraction Due to a Single Slit: Analysis and Patterns
6. **Lecture 16:** Fraunhofer Diffraction Due to Double Slits: Interference and Diffraction
7. **Lecture 17:** Plane Transmission Grating: Theory, Design, and Applications
8. **Lecture 18:** Resolving Power of a Grating: Calculation and Examples
9. **Lecture 19:** Practical Applications of Diffraction and Gratings in Optical Systems
10. **Lecture 20:** Problem Solving Session: Diffraction, Gratings, and Practical Applications

*Week 7-9: UNIT III - **Holography** (10 Lectures)*

1. **Lecture 21:** Introduction to Holography: Principles and Concepts
2. **Lecture 22:** Production of Holograms: Process and Techniques
3. **Lecture 23:** Analysis of Holograms: Methods and Applications
4. **Lecture 24:** Observing Small Object Deformations Using Holography
5. **Lecture 25:** Holographic Optical Instruments: Types and Uses
6. **Lecture 26:** Pattern Recognition Using Holography: Techniques and Applications
7. **Lecture 27:** Volume Holograms: Theory and Practical Applications
8. **Lecture 28:** Modifications in Holography: Recent Advances and Innovations
9. **Lecture 29:** Case Studies: Holography in Modern Optical Systems
10. **Lecture 30:** Problem Solving Session: Holography and Optical Instrumentation

*Week 10-12: UNIT IV - **Laser Theory and Atomic Interaction** (10 Lectures)*

1. **Lecture 31:** Introduction to Laser Theory: Basic Principles and Concepts
2. **Lecture 32:** Electric Dipole Interaction: Theory and Applications
3. **Lecture 33:** Simple Laser Theory: Components and Operation
4. **Lecture 34:** Three-Level Laser Systems: Theory and Examples
5. **Lecture 35:** Atomic Interference: Concepts and Applications in Lasers
6. **Lecture 36:** Lasing Without Inversion: Principles and Practical Examples
7. **Lecture 37:** Correlated Emission Lasers: Theory and Applications
8. **Lecture 38:** Motion of a Two-Level Atom in a Quantized Light Field: Analysis and Results
9. **Lecture 39:** Recent Advances in Laser Technology: Innovations and Applications
10. **Lecture 40:** Problem Solving Session: Laser Theory, Atomic Interaction, and Modern Applications

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Lesson plan COM-202

SN	Topic Name	Hours to Teach	Mode of Teaching
1	Unit I: Graph Data Structures and B-Trees		
1.1	Graph Data Structures and Their Applications	2	Whiteboard,

			PowerPoint
1.2	Graph Traversals: Depth-First Search (DFS), Breadth-First Search (BFS)	2	Whiteboard, Demonstration
1.3	Shortest Paths: Dijkstra's Algorithm, Bellman-Ford Algorithm	2	Whiteboard, Demonstration
1.4	Spanning Trees: Prim's Algorithm, Kruskal's Algorithm	2	Whiteboard, Demonstration
1.5	Family of B-Trees: B-tree, B*-Trees, B+ Trees	3	Whiteboard, PowerPoint
2	Unit II: Sorting and Searching Techniques		
2.1	Internal and External Sorting	1	Whiteboard, PowerPoint
2.2	Various Sorting Algorithms: Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort	3	Whiteboard, Demonstration
2.3	Time and Space Complexity of Sorting Algorithms	2	Whiteboard, PowerPoint
2.4	Searching Techniques: Linear Search, Binary Search	2	Whiteboard, Demonstration
2.5	Merging Algorithms and Applications of Sorting and Searching	2	Whiteboard, Demonstration
3	Unit III: File Systems and Storage Devices		
3.1	Physical Storage Devices and Their Characteristics	2	Whiteboard, PowerPoint
3.2	Constituents of a File: Fields, Records, Fixed and Variable Length Records	2	Whiteboard, PowerPoint
3.3	Primary and Secondary Keys	1	Whiteboard, PowerPoint
3.4	File Operations and Basic File System Operations	2	Whiteboard, Demonstration
3.5	File Organizations: Serial Sequential, Indexed Sequential, Direct, Inverted, Multilist	3	Whiteboard, Demonstration
3.6	Hashing Functions and Collision Handling Methods	2	Whiteboard, Demonstration

Lesson plan COM-204

SN	Topic Name	Hours to Teach	Mode of Teaching
1	Unit I: Fundamentals of C++		
1.1	Fundamentals of C++: Overview and Basics	1	Whiteboard, PowerPoint
1.2	Data Types: Basic and Derived	1	Whiteboard, PowerPoint
1.3	Structs vs Classes	1	Whiteboard, PowerPoint
1.4	Static Data & Member Functions	1	Whiteboard, PowerPoint
1.5	Constant Parameters & Member Functions	1	Whiteboard, PowerPoint
1.6	Friend Functions & Friend Classes	1	Whiteboard, PowerPoint
1.7	Control Statements: if, switch, loops	2	Whiteboard, Demonstration
1.8	Arrays and Pointers	2	Whiteboard, Demonstration
2	Unit II: Advanced C++ Concepts		
2.1	Role of Constructors & Destructors	2	Whiteboard, PowerPoint
2.2	Dynamic Objects and Memory Management	2	Whiteboard, Demonstration
2.3	Operator Overloading	2	Whiteboard, Demonstration
2.4	Function Overloading	2	Whiteboard, Demonstration
2.5	Inheritance: Base and Derived Classes	2	Whiteboard, Demonstration
2.6	Virtual Functions and Abstract Classes	2	Whiteboard, Demonstration
2.7	Template Functions & Template Classes	2	Whiteboard, Demonstration
3	Unit III: Exception Handling, Files, and Streams		
3.1	Exception Handling: try, catch, throw	2	Whiteboard, PowerPoint
3.2	Files and Streams: Basics and File Handling	2	Whiteboard, PowerPoint
3.3	Stream Classes and I/O Operations	2	Whiteboard, Demonstration
3.4	Data Structures Using C++	2	Whiteboard, Demonstration
3.5	ASCII & Binary Files: Reading and Writing	2	Whiteboard, Demonstration
3.6	Sequential & Random Access to a File	2	Whiteboard, Demonstration
3.7	Program Development in C++: Best Practices	2	Whiteboard, Demonstration

SCHOOL OF BASIC AND APPLIED SCIENCES

(Scheme of Studies & Examinations w. e. f. 2022-25 onwards)

B. Sc. (Computer Science) III Year (V Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credit s
				L	P	IA	End Ter m Exa m	Total		
1	Computer Science	COM- 301	Database Managemen t System, Oracle and Visual Basic - I	2	0	20	30	50	3	2
2		COM- 303	Software Engineering - I	2	0	20	30	50	3	2
3		COM- 305	Practical & Viva-voce (Based on Paper COM- 301)	2	0	20	30	50	3	2
5	Physics	PHY- 301	Solid State Physics	2	0	20	30	50	3	2
6		PHY- 303	Advance Electronic	2	0	20	30	50	3	2
7		PHY- 305	Elective Paper	2	0	20	30	50	3	2
8		PHY- 307	Physics Lab- V	0	6	20	30	50	4	3
9	Mathematics	MA-301	Real Analysis	2	0	20	30	50	3	2
10		MA-303	Modern algebra	2	0	20	30	50	3	2
11		MA-305	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				20	12			550		23

Course Outcomes

1. Inorganic Chemistry (CH-301) Course Outcomes:

1. To summarize the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbitals in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters.
2. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.
3. To study the magnetic properties of transition metal complexes and various types of magnetic materials and their magnetic susceptibility.
4. Have knowledge about orgal level diagrams for d1 and d9 electronic states and the electronic spectrum of [Ti(H2O)6]+3complex ion.

2. Organic Chemistry (CH-303) Course Outcomes:

1. Get knowledge about the principle of nuclear magnetic resonance.
2. To elucidate the structure of various molecules by using PMR spectra.
3. To have knowledge about classification, structures and important reactions of carbohydrates
4. Sound knowledge of organometallic compounds.

3.Physical Chemistry (CH-305) Course Outcomes:

1. To know about dual characteristic of matter and extend this fact to obtain postulates of quantum mechanics and quantum-mechanical operators, apply Schrödinger equation to determine the physical observables for particle in a box.
2. To have knowledge about dipole moment, magnetic permeability and susceptibility
3. To have sound knowledge about the consequences of interaction of radiation with matter resulting into various types of spectra.
4. To be able to solve various numerical problems related to spectroscopy.
5. Student gains the knowledge on various nuclear models and properties ofnuclei
6. Student gets a thorough knowledge on alpha, beta, gamma decay
7. The Geiger Nuttel law, Range of alpha particles and their disintegrationlaws are thoroughly understood.

8. Types of nuclear accelerators and their basic principles of operation arethoroughly studied.
9. Student gains knowledge on how to control a nuclear chain reaction and how to attain the nuclear stability.

PHY-301 Solid State Physics Course Outcomes:

1. Student gains the knowledge on fundamentals of Crystal structure
2. Student gets a thorough knowledge on different techniques for studying crystal structures
3. Applications of reciprocal lattice for crystal structure studies.
4. Studies the different types of magnetic materials
5. Studies the real time applications of superconducting materials and the corresponding science.

PHY-303 Advance Electronic Course Outcomes:

1. Student gains the knowledge on functioning of FET and MOSFET for practical applications
2. Student gets a thorough knowledge functioning of OP AMPs
3. Student applies OP Amps for various mathematical operations like addition, subtraction, integration, differentiation, etc.
4. Studies the Amplitude and frequency modulations and its detection techniques.
5. Finds the applications of digital electronics in day – to – day life and could design them.

Database Management System, Oracle and Visual Basic -I(COM-301)

1. CO1: Model Entity-Relationship diagrams for enterprise level databases
2. CO 2: Formulate Queries using SQL and Relational Formal Query Languages
3. CO 3: Apply different normal forms to design the Database
4. CO 4: Summarize concurrency control protocols and recovery algorithms
5. CO 5: Identify suitable Indices and Hashing mechanisms for effective storage and retrieval of Data

Software Engineering-I (COM-303)

1. CO 1: Students will be able to decompose the given project in various phases of a lifecycle.
2. CO 2: Students will be able to choose appropriate process model depending on the user requirements.
3. CO 3: Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.
4. CO 4: Students will be able to know various processes used in all the phases of the product.
5. CO 5: Students can apply the knowledge, techniques, and skills in the development of a software product

CO-PO mapping

CH-301	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-303	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-305	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

PHY-301	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

PHY-303	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-305	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CO \ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2						3		
CO 2	3	3						3		
CO 3	3	2						3		
CO 4	2	2						2		
CO 5	3	3						3		

Unit 1: Metal-Ligand Bonding in Transition Metal Complexes (7 Lectures)

1. Lecture 1: Introduction to Metal-Ligand Bonding: Overview
2. Lecture 2: Valence Bond Theory: Limitations and Challenges
3. Lecture 3: Introduction to Crystal-Field Theory: Basics
4. Lecture 4: Spectrochemical Series: Definition and Importance
5. Lecture 5: Crystal Field Splitting in Octahedral Complexes
6. Lecture 6: Tetrahedral Complexes: Crystal Field Splitting
7. Lecture 7: Square Planar Complexes: Crystal Field Splitting

Unit 2: Thermodynamic and Kinetic Aspects of Metal Complexes (8 Lectures)

8. Lecture 8: Jahn-Teller Effect: Overview and Significance
9. Lecture 9: Thermodynamic Stability of Metal Complexes: Basics
10. Lecture 10: Factors Influencing Stability: Key Concepts
11. Lecture 11: Substitution Reactions in Metal Complexes: Overview
12. Lecture 12: Pt(II) Complexes: Substitution Reactions
13. Lecture 13: Kinetic vs Thermodynamic Control in Reactions
14. Lecture 14: Ligand Substitution Mechanisms: Introduction
15. Lecture 15: Factors Affecting Reaction Rates in Complexes

Unit 3: Magnetic Properties of Transition Metal Complexes (7 Lectures)

16. Lecture 16: Types of Magnetic Behavior in Complexes
17. Lecture 17: Spin-Only Formula: Application and Examples
18. Lecture 18: Orbital Contribution to Magnetic Moments
19. Lecture 19: L-S Coupling: Concept and Importance
20. Lecture 20: Spectroscopic Ground States: Determination
21. Lecture 21: Magnetic Moment Data: Application in 3d Metals
22. Lecture 22: Interpretation of Magnetic Properties

Unit 4: Electron Spectra of Transition Metal Complexes (8 Lectures)

23. Lecture 23: Introduction to Electronic Transitions in Complexes
24. Lecture 24: Selection Rules for d-d Transitions: Explanation
25. Lecture 25: Appearance of Colour in Transition Metal Complexes
26. Lecture 26: Orgel Diagram: Energy Levels for d1 States

27. Lecture 27: Orgel Diagram: Energy Levels for d9 States
28. Lecture 28: Case Study: [Ti(H2O)6]+3 Spectrum Analysis
29. Lecture 29: Interpretation of Electronic Spectra: Basic Approach
30. Lecture 30: Summary and Review of Transition Metal Complexes

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Lesson Plan for Chemistry - CH-303

Unit 1: NMR Spectroscopy-I (7 Lectures)

1. Lecture 1: Principle of Nuclear Magnetic Resonance
2. Lecture 2: Introduction to Proton NMR
3. Lecture 3: Number of Signals, Peak Areas, and Integration
4. Lecture 4: Equivalent vs. Nonequivalent Protons
5. Lecture 5: Chemical Shift, Shielding, and Deshielding
6. Lecture 6: Proton Counting and Signal Splitting
7. Lecture 7: Coupling Constants

Unit 2: NMR Spectroscopy-II (8 Lectures)

8. Lecture 8: Factors Affecting Chemical Shift
9. Lecture 9: Ethyl Bromide NMR Spectrum
10. Lecture 10: NMR Spectra of n-Propyl and Isopropyl Bromide
11. Lecture 11: NMR of 1,1-Dibromoethane and 1,1,2-Tribromoethane
12. Lecture 12: NMR of Ethanol and Acetaldehyde
13. Lecture 13: NMR of Ethyl Acetate and Toluene
14. Lecture 14: NMR of Benzaldehyde and Acetophenone
15. Lecture 15: Introduction to Carbon NMR and Chemical Shift Values

Unit 3: Carbohydrates-I (8 Lectures)

16. Lecture 16: Classification and Nomenclature of Carbohydrates
17. Lecture 17: Monosaccharides and Osazone Formation
18. Lecture 18: Inter-conversion of Glucose and Fructose
19. Lecture 19: Chain Lengthening and Shortening of Aldoses
20. Lecture 20: Configuration of Monosaccharides and Diastereomers
21. Lecture 21: Conversion of Glucose into Mannose
22. Lecture 22: Formation of Glycosides, Ethers, and Esters

23. Lecture 23: Determination of Ring Size for Glucose and Fructose

Unit 4: Carbohydrates-II & Organometallic Compounds (7 Lectures)

24. Lecture 24: Structures of Ribose and Deoxyribose

25. Lecture 25: Introduction to Disaccharides: Maltose, Sucrose, Lactose

26. Lecture 26: Introduction to Polysaccharides: Starch, Cellulose

27. Lecture 27: Organomagnesium Compounds: Grignard Reagents

28. Lecture 28: Formation and Reactions of Grignard Reagents

29. Lecture 29: Organolithium and Organozinc Compounds: Formation

30. Lecture 30: Chemical Reactions of Organolithium and Organozinc Compounds

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Lesson Plan for Chemistry - CH-305

Unit I: Quantum Mechanics-I (7 Lectures)

1. Lecture 1: Introduction to Quantum Mechanics: Black-body Radiation, Planck's Law
2. Lecture 2: Photoelectric Effect: Concepts and Applications
3. Lecture 3: Heat Capacity of Solids and Compton Effect
4. Lecture 4: Wave Function: Significance and Interpretation
5. Lecture 5: Quantum Mechanical Operators: Commutation Relations
6. Lecture 6: Heisenberg Uncertainty Principle: Position and Momentum
7. Lecture 7: Particle in a 1D Box: Wave Function and Energy

Unit II: Physical Properties and Molecular Structure (7 Lectures)

8. Lecture 8: Optical Activity and Polarization: Clausius-Mossotti Equation

9. Lecture 9: Dipole Moment: Measurement and Structural Implications

10. Lecture 10: Magnetic Permeability and Susceptibility: Concepts and Determination

11. Lecture 11: Paramagnetism and Diamagnetism: Properties and Examples

12. Lecture 12: Ferromagnetism: Principles and Applications

13. Lecture 13: Application of Magnetic Susceptibility in Molecular Structure

14. Lecture 14: Orientation of Dipoles in Electric Fields

Unit III: Spectroscopy-I (8 Lectures)

15. Lecture 15: Introduction to Spectroscopy: Electromagnetic Spectrum and Regions

16. Lecture 16: Born-Oppenheimer Approximation: Statement and Importance

17. Lecture 17: Rotational Spectra of Diatomic Molecules: Rigid Rotator Model 18. Lecture

18: Selection Rules and Spectral Intensity Distribution

19. Lecture 19: Determination of Bond Length and Isotope Effect

20. Lecture 20: Non-Rigid Rotor: Qualitative Description
21. Lecture 21: Maxwell-Boltzmann Distribution: Population Distribution
22. Lecture 22: Degrees of Freedom: Translational, Rotational, Vibrational

Unit IV: Spectroscopy-II (8 Lectures)

23. Lecture 23: Infrared Spectra: Simple Harmonic Oscillator Model
24. Lecture 24: Selection Rules and Pure Vibrational Spectra
25. Lecture 25: Force Constant and Bond Energies: Determination
26. Lecture 26: Effects of Anharmonic Motion and Isotopic Substitution
27. Lecture 27: Raman Spectra: Polarizability and Quantum Theory
28. Lecture 28: Pure Rotational Raman Spectra: Selection Rules
29. Lecture 29: Pure Vibrational Raman Spectra: Diatomic Molecules
30. Lecture 30: Vibrational Frequencies of Functional Groups: Overview and Applications

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Lesson plan Solid State Physics PHY – 301

Week 1-3: UNIT I - Crystalline and Glassy Forms (10 Lectures)

1. **Lecture 1:** Introduction to Crystalline and Glassy Forms: Overview and Significance
2. **Lecture 2:** Liquid Crystals: Properties, Types, and Applications
3. **Lecture 3:** Crystal Structure and Periodicity: Basic Concepts
4. **Lecture 4:** Lattice and Basis: Definitions and Examples
5. **Lecture 5:** Crystal Translational Vectors and Axes: Understanding Symmetry
6. **Lecture 6:** Unit Cell and Primitive Cell: Definitions and Calculations
7. **Lecture 7:** Wigner-Seitz Primitive Cell: Construction and Importance
8. **Lecture 8:** Symmetry Operations for Two-Dimensional Crystals: Group Theory Basics
9. **Lecture 9:** Bravais Lattices in Two and Three Dimensions: Classification and Examples
10. **Lecture 10:** Crystal Planes, Miller Indices, and Interplanar Spacing

Week 4-6: UNIT II - X-ray Diffraction and Reciprocal Lattice (10 Lectures)

1. **Lecture 11:** Introduction to X-ray Diffraction: Basic Principles
2. **Lecture 12:** Bragg's Law: Derivation and Applications
3. **Lecture 13:** Experimental Methods in X-ray Diffraction: Techniques and Instruments
4. **Lecture 14:** K-space and Reciprocal Lattice: Concepts and Physical Significance
5. **Lecture 15:** Reciprocal Lattice Vectors: Derivation and Examples
6. **Lecture 16:** Reciprocal Lattice to a Simple Cubic Lattice: Calculations
7. **Lecture 17:** BCC and FCC Structures: Reciprocal Lattice Analysis
8. **Lecture 18:** HCP Structure: Reciprocal Lattice and Applications
9. **Lecture 19:** Case Studies: X-ray Diffraction in Material Science
10. **Lecture 20:** Problem Solving Session: X-ray Diffraction and Reciprocal Lattices

Week 7-9: UNIT III - Magnetic Materials (10 Lectures)

1. **Lecture 21:** Introduction to Magnetic Materials: Types and Properties
2. **Lecture 22:** Hall Effect: Theory, Experimental Setup, and Applications
3. **Lecture 23:** Diamagnetism: Concept and Materials
4. **Lecture 24:** Paramagnetism: Theory and Materials
5. **Lecture 25:** Ferromagnetism: Properties and Applications
6. **Lecture 26:** Electron Spin and Magnetic Moment: Quantum Mechanical Explanation
7. **Lecture 27:** Magnetic Susceptibility: Measurement and Applications
8. **Lecture 28:** Magnetism in Materials: Practical Applications and Case Studies
9. **Lecture 29:** Problem Solving Session: Magnetic Properties and Susceptibility
10. **Lecture 30:** Review Session: Key Concepts in Magnetism

Week 10-12: UNIT IV - Superconductivity (10 Lectures)

1. **Lecture 31:** Historical Introduction to Superconductivity: Discovery and Early Research
2. **Lecture 32:** Survey of Superconductivity: Key Concepts and Materials
3. **Lecture 33:** Superconducting Systems: Low Tc and High Tc Superconductors
4. **Lecture 34:** Isotopic Effect: Theory and Experimental Evidence
5. **Lecture 35:** Critical Magnetic Field and Meissner Effect: Explanation and Applications
6. **Lecture 36:** London Theory and Pippard's Equation: Theoretical Foundations
7. **Lecture 37:** Classification of Superconductors: Type I and Type II
8. **Lecture 38:** BCS Theory of Superconductivity: Key Concepts and Applications
9. **Lecture 39:** Practical Applications of Superconductivity: Power and Technology
10. **Lecture 40:** Problem Solving Session: Superconductivity, BCS Theory, and Applications

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Lesson plan Advance Electronics PHY – 303

Week 1-3: UNIT I - Field Effect Transistors (FETs) (10 Lectures)

1. **Lecture 1:** Introduction to Field Effect Transistors (FETs): Overview and Types
2. **Lecture 2:** JFET Structure and Basic Operation: Construction and Working Principles
3. **Lecture 3:** JFET Static, Drain, and Transfer Characteristics: Analysis and Graphical Representation
4. **Lecture 4:** Pinch-Off and Saturation Region in JFETs: Concept and Applications
5. **Lecture 5:** Common Source FET Amplifier: Circuit Design and Operation
6. **Lecture 6:** Small Signal Low Frequency Equivalent Circuit: Voltage Gain in FET Amplifiers
7. **Lecture 7:** Introduction to MOSFETs: EMOSFET and DMOSFET Structures and Operations
8. **Lecture 8:** MOSFET Drain and Transfer Characteristics: Analysis and Graphical Representation
9. **Lecture 9:** CMOS Technology: Introduction, Principles, and Applications
10. **Lecture 10:** Problem Solving Session: FET Characteristics and Applications

Week 4-6: UNIT II - Operational Amplifiers (Op-Amps) (10 Lectures)

1. **Lecture 11:** Introduction to Operational Amplifiers (Op-Amps): Ideal Characteristics
2. **Lecture 12:** Concept of Virtual Ground in Op-Amps: Understanding and Applications
3. **Lecture 13:** Important Terms in Op-Amps: Offset Voltage, CMRR, and Slew Rate
4. **Lecture 14:** Applications of Op-Amps: Designing Inverting and Non-Inverting Amplifiers
5. **Lecture 15:** Differential Amplifier Using Op-Amps: Design and Analysis

6. **Lecture 16:** Schmitt Trigger Circuit Using Op-Amps: Working and Applications
7. **Lecture 17:** Integrator and Differentiator Circuits Using Op-Amps: Design and Applications
8. **Lecture 18:** Practical Considerations in Op-Amp Circuits: Real-World Examples
9. **Lecture 19:** Case Studies: Op-Amp Applications in Signal Processing
10. **Lecture 20:** Problem Solving Session: Op-Amp Circuits and Applications

Week 7-9: UNIT III - Communication Principles (10 Lectures)

1. **Lecture 21:** Introduction to Communication Principles: Basics and Importance
2. **Lecture 22:** Modulation Techniques: Elementary Theory of Amplitude Modulation (AM)
3. **Lecture 23:** Amplitude Modulation (AM): Modulation Index and Signal Representation
4. **Lecture 24:** Detection of AM Waves: Techniques and Applications
5. **Lecture 25:** Frequency Modulation (FM): Elementary Theory and Modulation Index
6. **Lecture 26:** Frequency Modulation (FM): Signal Representation and Applications
7. **Lecture 27:** Detection of FM Waves: Techniques and Circuit Design
8. **Lecture 28:** Comparison of AM and FM: Advantages, Disadvantages, and Applications
9. **Lecture 29:** Problem Solving Session: Modulation and Detection Techniques
10. **Lecture 30:** Case Studies: Real-World Applications of AM and FM

Week 10-12: UNIT IV - Digital Electronics (10 Lectures)

1. **Lecture 31:** Introduction to Digital Electronics: Basic Concepts and Logic Gates
2. **Lecture 32:** AND, OR, NOT Gates: Truth Tables, Circuits Using Diodes and Transistors
3. **Lecture 33:** NAND and NOR Gates as Universal Gates: Design and Applications
4. **Lecture 34:** Combination of Gates for Different Boolean Functions: Practical Examples
5. **Lecture 35:** De Morgan's Theorem: Explanation and Applications
6. **Lecture 36:** Half Adder and Full Adder Circuits: Design and Analysis
7. **Lecture 37:** Digital Comparator, Decoder, and Encoder: Principles and Circuits
8. **Lecture 38:** Multiplexer and Demultiplexer: Design, Applications, and Circuit Examples
9. **Lecture 39:** Digital to Analog and Analog to Digital Conversion: Techniques and Applications
10. **Lecture 40:** Problem Solving Session: Digital Electronics Circuits and Applications

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Lesson plan Quantum Mechanics PHY – 305

Unit I: History and Foundations of Quantum Mechanics (10 Lectures)

1. **Lecture 1**: Introduction to Quantum Mechanics - Historical Context and Importance.
2. **Lecture 2**: Planck's Quantum Hypothesis and Black Body Radiation.
3. **Lecture 3**: Nature of Light - Wave-Particle Duality and de Broglie Hypothesis.
4. **Lecture 4**: Heisenberg's Uncertainty Principle - Concept and Applications.
5. **Lecture 5**: Compton Effect - Explanation and Experimental Evidence.
6. **Lecture 6**: Phase Velocity vs. Group Velocity - Mathematical Relations.
7. **Lecture 7**: Relation between Phase Velocity and Group Velocity in Quantum Mechanics.
8. **Lecture 8**: Experimental Verifications of Quantum Concepts - Early Experiments.
9. **Lecture 9**: Mathematical Foundations of Wave-Particle Duality.
10. **Lecture 10**: Summary and Problem-Solving Session on Unit I.

Unit II: Linear Operators and Quantum Mechanics (10 Lectures)

1. **Lecture 11**: Introduction to Linear Operators in Quantum Mechanics.
2. **Lecture 12**: Momentum Operator and its Applications.
3. **Lecture 13**: Energy Operator and Hamiltonian in Quantum Systems.
4. **Lecture 14**: Eigenvalue Problem - Introduction and Significance.
5. **Lecture 15**: Hermitian and Unitary Operators - Properties and Applications.
6. **Lecture 16**: Expectation Values and their Physical Significance.
7. **Lecture 17**: Commutator Brackets and their Role in Quantum Mechanics.
8. **Lecture 18**: Uncertainty Relations and their Derivation.
9. **Lecture 19**: Application of Uncertainty Principle in Quantum Systems.
10. **Lecture 20**: Summary and Problem-Solving Session on Unit II.

Unit III: Schrödinger's Wave Equation (10 Lectures)

1. **Lecture 21**: Introduction to Schrödinger's Wave Equation.
2. **Lecture 22**: Derivation of 1-D Time-Dependent Schrödinger Equation.
3. **Lecture 23**: 2-D and 3-D Time-Dependent Schrödinger Equation - General Form.
4. **Lecture 24**: Time-Independent Schrödinger Equation - Concepts and Derivation.
5. **Lecture 25**: Eigenvalues and Eigenfunctions - Physical Meaning.
6. **Lecture 26**: Wave Functions - Significance, Orthogonality, and Normalization.
7. **Lecture 27**: Probability Current Density - Concept and Calculation.
8. **Lecture 28**: Applications of Schrödinger's Equation - Introduction.
9. **Lecture 29**: Case Studies: Simple Quantum Systems.
10. **Lecture 30**: Summary and Problem-Solving Session on Unit III.

Unit IV: Applications of Schrödinger's Wave Equation (10 Lectures)

1. **Lecture 31**: Free Particle in 1-D, 2-D, 3-D Box - Solutions and Interpretation.
2. **Lecture 32**: Energy Quantization and Momentum in a Box.
3. **Lecture 33**: One-Dimensional Step Potential ($E > V_0$) - Reflection and Transmission.
4. **Lecture 34**: One-Dimensional Step Potential ($E < V_0$) - Penetration Depth.
5. **Lecture 35**: One-Dimensional Potential Barrier ($E > V_0$) - Transmission Coefficient.
6. **Lecture 36**: One-Dimensional Potential Barrier ($E < V_0$) - Tunneling and Applications.
7. **Lecture 37**: Brief Overview of Harmonic Oscillator in Quantum Mechanics.
8. **Lecture 38**: Energy Levels and Eigenfunctions of the Harmonic Oscillator.
9. **Lecture 39**: Real-World Applications of Quantum Tunneling and Harmonic Oscillators.
10. **Lecture 40**: Comprehensive Review and Problem-Solving Session on Unit IV

Lesson plan COM-301

SN	Topic Name	Hours to Teach	Mode of Teaching
1	Unit I: Basic Concepts and Data Modeling		
1.1	File Systems vs. DBMS: Differences, Advantages, and	1	Whiteboard,

	Disadvantages		PowerPoint
1.2	Objectives of a Database and Database Systems Concepts and Architecture	2	Whiteboard, PowerPoint
1.3	Data Modeling for a Database: Records and Files, Abstraction, and Data Integration	2	Whiteboard, PowerPoint
1.4	Database Management Systems: Relational, Network, and Hierarchical Models	3	Whiteboard, PowerPoint
2	Unit II: Relational Data Manipulations and Database Design		
2.1	Relational Data Manipulations: Relational Algebra and Relational Calculus	2	Whiteboard, Demonstration
2.2	SQL: Basic Queries, Joins, Subqueries, Aggregations	3	Whiteboard, Demonstration
2.3	Relational Database Design: Functional Dependencies, Finding Keys	2	Whiteboard, PowerPoint
2.4	Normalization: 1st to 3rd NFs, BCNF, Lossless Join and Dependency-Preserving Decomposition	3	Whiteboard, Demonstration
2.5	Computing Closures of Set Functional Dependencies and Finding Keys	2	Whiteboard, Demonstration
3	Unit III: Practical Design, Query Processing, and Security		
3.1	Practical Database Design: Role of Information Systems, Design Process	2	Whiteboard, PowerPoint
3.2	Physical Database Design in Relational Databases	2	Whiteboard, Demonstration
3.3	Query Processing: General Strategies, Query Optimization, Query Processor	3	Whiteboard, Demonstration
3.4	Concepts of Security, Concurrency, and Recovery in Databases	2	Whiteboard, PowerPoint
3.5	Database Security Issues and Recovery Techniques	2	Whiteboard, PowerPoint

SN	Topic Name	Hours to Teach	Mode of Teaching
1	Unit I: Software Engineering Basics and Project Management		
1.1	Software Characteristics and the Software Crisis	1	Whiteboard, PowerPoint
1.2	Software Engineering Paradigms: Overview of Various Paradigms	1	Whiteboard, PowerPoint
1.3	Goals and Principles of Software Engineering	1	Whiteboard, PowerPoint
1.4	Software Project Management: Planning a Software Project	2	Whiteboard, PowerPoint
1.5	Software Cost Estimation and Project Scheduling	2	Whiteboard, Demonstration
1.6	Personnel Planning and Team Structure	2	Whiteboard, PowerPoint
2	Unit II: Software Configuration and Requirement Analysis		
2.1	Software Configuration Management: Overview and Tools	2	Whiteboard, Demonstration
2.2	Software Quality and Quality Assurance: Principles and Practices	2	Whiteboard, PowerPoint
2.3	Project Monitoring and Risk Management	2	Whiteboard, Demonstration
2.4	Software Requirement Analysis: Structured Analysis and Object-Oriented Analysis	2	Whiteboard, PowerPoint
2.5	Data Modeling, Software Requirement Specification, and Validation	2	Whiteboard, Demonstration
3	Unit III: Design and Implementation		
3.1	Software Design Fundamentals: Introduction to Design Principles	2	Whiteboard, PowerPoint
3.2	Software Design Principles: Detailed Examination	2	Whiteboard, Demonstration
3.3	Design Methodology: Structured Design vs. Object-Oriented	2	Whiteboard,

	Design		Demonstration
3.4	Design Strategies: Approaches and Techniques	2	Whiteboard, PowerPoint
3.5	Design Verification, Monitoring, and Control	2	Whiteboard, Demonstration
3.6	Coding, Programming Styles, and Implementation	2	Whiteboard, Demonstration

SCHOOL OF BASIC AND APPLIED SCIENCES

(Scheme of Studies & Examinations w. e. f. 2022-25 onwards)

B. Sc. (Computer Science) III Year (VI Semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination Scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Computer Science	COM- 302	Database Management System, Oracle and Visual Basic - II	2	0	20	30	50	3	2
2		COM- 304	Software Engineering - II	2	0	20	30	50	3	2
3		COM- 306	Practical & Viva-voce (Based on Paper COM- 302)	2	0	20	30	50	3	2
5	Physics	PHY- 302	Atomic, Molecular physics	2	0	20	30	50	3	2
6		PHY- 304	Nuclear Physics	2	0	20	30	50	3	2
7		PHY- 306	Elective Paper	2	0	20	30	50	3	2
8		PHY- 308	Physics Lab-VI	0	6	20	30	50	4	3
9	Mathematics	MA- 302	Complex Analysis	2	0	20	30	50	3	2
10		MA- 304	Linear Algebra	2	0	20	30	50	3	2
11		MA- 306	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				20	12			550		23

Inorganic Chemistry (CH-302) Course Outcomes:

1. To get the detailed understanding of Bonding in homonuclear and heteronuclear molecules using the molecular orbital theory.
2. To study the nomenclature, classification, preparation and bonding in organometallic compounds and of metal carbonyls also.
3. To know about basic concepts of bioinorganic chemistry with reference to metal ions present in biological systems. To understand the biochemistry of oxygen carriers especially hemoglobin and myoglobin.
4. To know about various inorganic clusters compounds with special reference to silicones and phosphazenes.

Organic Chemistry (CH-304) Course Outcomes:

1. To gain knowledge about aromatic behaviour and basicity of simple heterocyclic compounds (pyridine, piperidine and pyrrole).
2. To know about 5 and 6 membered heterocyclic rings , basicity of and the preparation and reactions of indole, quinoline and isoquinoline.
3. To get knowledge about the acidity of α-hydrogens of diethyl malonate, ethyl acetoacetate and the synthesis and Keto-enol tautomerism of ethyl acetoacetate.
4. To learn about the essential amino acids, peptides and proteins. To get the knowledge about their structure and properties.

Physical Chemistry (CH-306) Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts in Physical chemistry.
2. Students will be able to understand the basic principle of electronic spectroscopy and the energy related to every colour imparted by chemicals. They will also gain the clear physical interpretation of chemical bonding and molecular structure.
3. The course curriculum is expected to develop an inquisitive feature among the students through suitable questions and experimental investigation.
4. Students will be having clear knowledge of how light is important to chemical reactions and how the amount of molecules in a solution affects the nature of a solution which is beneficial for the applied field.

5. Students will gain the knowledge of different phases of materials and their co-existence

Nuclear Physics (PHY-304) Course Outcomes:

1. Student gains the knowledge on various nuclear models and properties of nuclei
2. Student gets a thorough knowledge on alpha, beta, gamma decay
3. The Geiger Nuttel law, Range of alpha particles and their disintegration laws are thoroughly understood.
4. Types of nuclear accelerators and their basic principles of operation are thoroughly studied.
5. Student gains knowledge on how to control a nuclear chain reaction and how to attain the nuclear stability.

Atomic Physics (PHY-306) Course Outcomes:

1. Student gains the knowledge on basic principles of optical Fibre communication.
2. Student gets a thorough knowledge on basics of Laser functioning and different types of lasers and their applications.
3. Student gains the demonstrated knowledge on storing and retrieving information from Holograms and the principles behind it.
4. Gains a comprehensive knowledge on various blocks of optical Fibre communication systems including source, couplers, receivers, sensors.
5. Gains a demonstrated knowledge on digital communication system.

Database Management System, Oracle and Visual Basic-II (COM-302)

1. CO1: Model Entity-Relationship diagrams for enterprise level databases
2. CO 2: Formulate Queries using SQL and Relational Formal Query Languages
3. CO 3: Apply different normal forms to design the Database
4. CO 4: Summarize concurrency control protocols and recovery algorithms
5. CO 5: Identify suitable Indices and Hashing mechanisms for effective storage and retrieval of Data

Software Engineering-II (COM-304

1. CO 1: Students will be able to decompose a given project into various phases of the software lifecycle.
2. CO 2: Students will be able to select and apply appropriate process models based on user requirements and project specifics.
3. CO 3: Students will be able to perform various lifecycle activities effectively, including Analysis, Design, Implementation, Testing, and Maintenance.

4. CO 4: Students will be able to use various software metrics and reliability measures to assess and enhance software quality.
5. CO 5: Students will be able to utilize CASE tools to support software engineering processes and improve project efficiency.

Co-PO mapping

CH-302	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-304	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-306	PO										
		1	2	3	4	5	6	7	8	9	10

CO	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-302	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-304	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-306	PO									
		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1

CO	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

COM-302	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2						3		
CO 2	3	3						3		
CO 3	3	3						3		
CO 4	2	3						2		
CO 5	3	3						3		

COM-304	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	2						1	2	
CO 2		2							3	
CO 3	3	3	2	2				3	2	
CO 4		2	2	2	2					
CO 5					3				2	

Lesson plan

Lesson Plan for Chemistry - CH-302

Unit 1: Molecular Orbital Theory (7 Lectures)

1. Lecture 1: Introduction to VBT and LCAO Method
2. Lecture 2: MO Diagrams of C_2 and N_2
3. Lecture 3: MO Diagram of O_2, Bond Order Calculation
4. Lecture 4: MO Diagrams of Halogens, Color Correlation
5. Lecture 5: Non-Crossing Rule Explanation

6. Lecture 6: MO of Heteronuclear Molecules: CO
7. Lecture 7: MO of HX Molecules

Unit 2: Organometallic Chemistry (8 Lectures)

8. Lecture 8: Introduction and Classification of Organometallics
9. Lecture 9: π-Acidity of Ligands and Stretching Frequencies
10. Lecture 10: 18 Electron Rule Overview
11. Lecture 11: Alkyls of Li, Al, Hg - Preparation and Properties
12. Lecture 12: Bonding in Alkyls of Li, Al, Hg
13. Lecture 13: Metal-Ethylenic Complexes: Zeise's Salt
14. Lecture 14: Organometallic Catalysis: Oxidative Addition
15. Lecture 15: Reductive Elimination, Hydrogenation of Olefins

Unit 3: Bioinorganic Chemistry (8 Lectures)

16. Lecture 16: Essential and Trace Elements in Biology
17. Lecture 17: Metalloporphyrins: Structure and Function
18. Lecture 18: Haemoglobin: Structure and Biological Role
19. Lecture 19: Myoglobin: Structure and Oxygen Binding
20. Lecture 20: Alkali Metal Ions in Biological Processes
21. Lecture 21: Alkaline Earth Metal Ions, Focus on Ca^{2+}
22. Lecture 22: Nitrogen Fixation: Biological Mechanisms
23. Lecture 23: Nitrogenase: Structure and Function

Unit 4: Silicones and Phosphazenes (7 Lectures)

24. Lecture 24: Introduction to Silicones: Preparation Methods
25. Lecture 25: Properties and Uses of Silicones
26. Lecture 26: Phosphazenes: Preparation Techniques
27. Lecture 27: Phosphazenes: Structure and Properties
28. Lecture 28: Applications of Silicones in Industry
29. Lecture 29: Phosphazenes in Material Science
30. Lecture 30: Summary and Revision Session

Lesson Plan for Chemistry - CH-304

Unit 1: Heterocyclic Compounds-I (7 Lectures)

1. Lecture 1: Introduction to Heterocyclic Compounds
2. Lecture 2: Aromatic Characteristics of Pyrrole, Furan, Thiophene

3. Lecture 3: Aromatic Characteristics of Pyridine
4. Lecture 4: Synthesis of Pyrrole, Furan, Thiophene
5. Lecture 5: Synthesis of Pyridine; Electrophilic Substitution Mechanism
6. Lecture 6: Nucleophilic Substitution in Pyridine Derivatives
7. Lecture 7: Basicity: Pyridine, Piperidine, Pyrrole

Unit II: Heterocyclic Compounds-II & Organosulphur Compounds (8 Lectures)

8. Lecture 8: Condensed Heterocycles: Introduction
9. Lecture 9: Indole: Preparation, Fisher Indole Synthesis
10. Lecture 10: Quinoline: Preparation, Skraup Synthesis
11. Lecture 11: Isoquinoline: Preparation, Bischler-Napieralski Synthesis
12. Lecture 12: Electrophilic Substitution in Quinoline, Isoquinoline
13. Lecture 13: Organosulphur Compounds: Nomenclature, Structure
14. Lecture 14: Thiols, Thioethers: Formation, Reactions
15. Lecture 15: Sulphonic Acids, Sulphonamides: Reactions, Detergents

Unit III: Organic Synthesis via Enolates & Synthetic Polymers (8 Lectures)

16. Lecture 16: Enolates: Acidity of Hydrogens, Alkylation
17. Lecture 17: Synthesis of Ethyl Acetoacetate: Claisen Condensation
18. Lecture 18: Keto-Enol Tautomerism of Ethyl Acetoacetate
19. Lecture 19: Addition Polymerization: Free Radical Vinyl
20. Lecture 20: Ionic Vinyl Polymerization, Ziegler-Natta Polymerization
21. Lecture 21: Condensation Polymerization: Polyesters, Polyamides
22. Lecture 22: Phenol Formaldehyde Resins: Formation, Uses
23. Lecture 23: Natural and Synthetic Rubbers: Overview

Unit IV: Amino Acids, Peptides & Proteins (7 Lectures)

24. Lecture 24: Classification of Amino Acids: Properties, Isoelectric Point
25. Lecture 25: Preparation of α-Amino Acids
26. Lecture 26: Structure and Nomenclature of Peptides
27. Lecture 27: Classification of Proteins: Primary & Secondary Structure
28. Lecture 28: Peptide Structure Determination: End Group Analysis

29. Lecture 29: Peptide Synthesis: Classical, Solid-Phase Methods

30. Lecture 30: Secondary Structure of Proteins: Helices, Sheets

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Lesson Plan for Chemistry - CH-306

Unit I: Spectroscopy-III (8 Lectures)

1. Lecture 1: Introduction to Electronic Spectrum
2. Lecture 2: Potential Energy Curves: Bonding and Antibonding MOs
3. Lecture 3: Selection Rules in Electronic Transitions
4. Lecture 4: Franck-Condon Principle: Basics
5. Lecture 5: Sigma (σ) Molecular Orbitals and Transitions
6. Lecture 6: Pi (π) Molecular Orbitals and Transitions
7. Lecture 7: Non-bonding (n) Orbitals and Transitions
8. Lecture 8: Energy Levels in MOs: Overview

Unit II: Photochemistry (8 Lectures)

9. Lecture 9: Radiation-Matter Interaction: Introduction
10. Lecture 10: Thermal vs Photochemical Processes
11. Lecture 11: Grotthus-Draper Law and Stark-Einstein Law
12. Lecture 12: Jablonski Diagram: Excited State Processes
13. Lecture 13: Fluorescence and Phosphorescence
14. Lecture 14: Non-Radiative Processes: Internal Conversion
15. Lecture 15: Intersystem Crossing: Concepts
16. Lecture 16: Quantum Yield and Photosensitized Reactions

Unit III: Solutions (8 Lectures)

17. Lecture 17: Ideal and Non-Ideal Solutions
18. Lecture 18: Concentration Expressions: Activity and Coefficients
19. Lecture 19: Colligative Properties: Overview
20. Lecture 20: Raoult's Law and Vapor Pressure Lowering
21. Lecture 21: Osmosis: Law and Molecular Weight Determination
22. Lecture 22: Boiling Point Elevation and Freezing Point Depression
23. Lecture 23: Thermodynamic Derivations for Colligative Properties
24. Lecture 24: Abnormal Molar Mass: Degree of Dissociation

Unit IV: Phase Equilibrium (6 Lectures)

25. Lecture 25: Phase Equilibrium: Introduction and Key Terms

26. Lecture 26: Gibbs Phase Rule: Derivation and Application

27. Lecture 27: One-Component Systems: Water and Sulfur

28. Lecture 28: Two-Component Systems: Solid-Liquid Equilibria

29. Lecture 29: Simple Eutectics: Pb-Ag System

30. Lecture 30: Desilverisation of Lead: Process and Significance

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Lesson plan Atomic, Molecular and Laser Physics PHY – 302

UNIT I: Thermodynamics (10 Lectures)

1. **Lecture 1:** Introduction to the First Law of Thermodynamics; Internal Energy and Joule's Law.
2. **Lecture 2:** Applications of the First Law; Carnot Cycle and Engine.
3. **Lecture 3:** Reversible and Irreversible Processes; Carnot Theorem.
4. **Lecture 4:** Thermodynamic Scale of Temperature.
5. **Lecture 5:** Introduction to Entropy; Calculation of Entropy in Various Processes.
6. **Lecture 6:** Entropy and Unavailable Energy; Physical Significance of Entropy.
7. **Lecture 7:** Second Law of Thermodynamics; Introduction to Thermodynamic Potentials.
8. **Lecture 8:** Maxwell's Equations; Application of Maxwell's Equations.
9. **Lecture 9:** Phase Diagram and Triple Point of a Substance; Joule-Thomson Effect.
10. **Lecture 10:** Review and Problem-Solving Session on Thermodynamics.

UNIT II: Classical and Fluid Mechanics (10 Lectures)

1. **Lecture 11:** Background of Vector Calculus; Gradient, Divergence, and Curl.
2. **Lecture 12:** Line, Surface, and Volume Integrals; Frame of Reference.
3. **Lecture 13:** Galilean Transformation and Invariance; Inertial and Non-Inertial Frames.
4. **Lecture 14:** Pseudo Forces; Rotating Reference Frame, Centrifugal, and Coriolis Forces.
5. **Lecture 15:** Motion under Central Force; Kepler's Laws.
6. **Lecture 16:** Conservative and Non-Conservative Forces.
7. **Lecture 17:** Ideal Fluids; Equation of Continuity and Streamline Flow.
8. **Lecture 18:** Euler's Equation and Bernoulli's Theorem; Viscous Fluids.
9. **Lecture 19:** Elasticity: Hooke's Law, Elastic Constants of Isotropic Solids.
10. **Lecture 20:** Review and Problem-Solving Session on Classical and Fluid Mechanics.

UNIT III: Quantum Mechanics and Atomic Structure (10 Lectures)

1. **Lecture 21:** Review of History of Quantum Mechanics; Planck's Quantum Hypothesis.
2. **Lecture 22:** Nature of Light; de Broglie Waves and Wave-Particle Duality.
3. **Lecture 23:** Heisenberg's Uncertainty Principle; Compton Effect.
4. **Lecture 24:** Linear Operators; Momentum and Energy Operators.
5. **Lecture 25:** Schrödinger Equation: Derivation of Time-Dependent and Time-Independent Forms.
6. **Lecture 26:** Eigenvalues, Eigenfunctions, and their Significance.
7. **Lecture 27:** Application of Schrödinger Wave Equation: Particle in a Box.
8. **Lecture 28:** One-Dimensional Step Potential; Reflection and Transmission Coefficients.

9. **Lecture 29:** Brief Overview of Harmonic Oscillator in Quantum Mechanics.
10. **Lecture 30:** Review and Problem-Solving Session on Quantum Mechanics.

UNIT IV: Atomic Structure and Spectroscopy (10 Lectures)

1. **Lecture 31:** Early Models of Atomic Structure; Hydrogen Atom Spectrum.
2. **Lecture 32:** Bohr Model; Franck-Hertz Experiment; Discovery of Hydrogen Isotopes.
3. **Lecture 33:** Correspondence Principle; Spectra of Hydrogen-like Atoms.
4. **Lecture 34:** Magnetic Moment due to Orbital Motion; Normal Zeeman Effect.
5. **Lecture 35:** Quantum Mechanics Applied to Hydrogen Atom; Stern-Gerlach Experiment.
6. **Lecture 36:** Spin-Orbit Coupling; Fine Structure of Hydrogen Atom Spectrum.
7. **Lecture 37:** Many-Electron Atoms: Hund's Rule and Periodic Table; Alkali Spectra.
8. **Lecture 38:** Rotational and Vibrational Spectroscopy; Diatomic Molecules.
9. **Lecture 39:** Raman Effect and Introduction to LASERs; He-Ne LASER.
10. **Lecture 40:** Final Review and Problem-Solving Session on Atomic Structure and Spectroscopy.

Lesson plan Nuclear Physics PHY – 304

UNIT I: Nuclear Composition, Properties, and Stability (10 Lectures)

1. **Lecture 1:** Introduction to Nuclear Physics: Historical Perspective, Fundamental Concepts
2. **Lecture 2:** Nuclear Composition: Protons, Neutrons, and Isotopes
3. **Lecture 3:** Nuclear Properties: Charge, Spin, and Magnetic Moment
4. **Lecture 4:** Nuclear Mass: Mass Spectrometry and Mass Deficit
5. **Lecture 5:** Nuclear Binding Energy: Concepts and Calculations
6. **Lecture 6:** Nuclear Size Determination: Scattering Experiments, Radii
7. **Lecture 7:** Semi-Empirical Mass Formula: Application and Limitations
8. **Lecture 8:** Nuclear Stability: Binding Energy and the Valley of Stability
9. **Lecture 9:** Introduction to Nuclear Models: Liquid Drop and Shell Models
10. **Lecture 10:** Review of UNIT I and Problem-Solving Session

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UNIT II: Radioactive Decay and Interaction of Radiation with Matter (10 Lectures)

1. **Lecture 11:** Alpha Decay: Mechanism, Energy Release, and Theoretical Models
2. **Lecture 12:** Beta Decay: Fermi Theory, Energy Spectrum, and Neutrino Hypothesis
3. **Lecture 13:** Gamma Decay: Electromagnetic Transitions, Multipolarity, Internal Conversion
4. **Lecture 14:** Interaction of Radiation with Matter: Overview and Key Concepts
5. **Lecture 15:** Energy Loss of Charged Particles: Bethe-Bloch Formula, Stopping Power
6. **Lecture 16:** Absorption of Gamma Rays: Photoelectric Effect, Compton Scattering, Pair Production
7. **Lecture 17:** Attenuation of Radiation: Attenuation Coefficients and Applications
8. **Lecture 18:** Radiation Dose: Concepts, Units, and Biological Effects
9. **Lecture 19:** Radiation Protection and Shielding: Materials and Techniques
10. **Lecture 20:** Review of UNIT II and Problem-Solving Session

UNIT III: Nuclear Accelerators and Detectors (10 Lectures)

1. **Lecture 21:** Introduction to Nuclear Accelerators: Basic Principles
2. **Lecture 22:** Linear Accelerator: Design, Working Principle, and Applications
3. **Lecture 23:** Cyclotron: Principles, Construction, and Uses
4. **Lecture 24:** Betatron: Principles, Design, and Applications
5. **Lecture 25:** Synchrotron: Principles, Operation, and Applications
6. **Lecture 26:** Radiation Detectors: General Principles and Classification
7. **Lecture 27:** Gas-Filled Detectors: Ionization Chamber, Proportional Counter, Geiger-Müller Counter
8. **Lecture 28:** Scintillation Detectors: Materials, Mechanism, and Applications
9. **Lecture 29:** Semiconductor Detectors: Design, Function, and Use in Nuclear Physics
10. **Lecture 30:** Review of UNIT III and Problem-Solving Session

UNIT IV: Nuclear Reactions, Reactors, and Applications (10 Lectures)

1. **Lecture 31:** Introduction to Nuclear Reactions: Types and Characteristics
2. **Lecture 32:** Conservation Laws in Nuclear Reactions: Energy, Momentum, and Quantum Numbers
3. **Lecture 33:** Q-Value of Nuclear Reactions: Definition, Calculation, and Significance
4. **Lecture 34:** Reaction Threshold: Concept and Examples
5. **Lecture 35:** Nuclear Reactors: Basic Principles, Components, and Types
6. **Lecture 36:** Fission Reactors: Mechanism, Control, and Energy Production
7. **Lecture 37:** Fusion Reactors: Mechanism, Challenges, and Future Prospects
8. **Lecture 38:** Nuclear Energy: Advantages, Risks, and Environmental Impact
9. **Lecture 39:** Applications of Nuclear Physics: Medicine, Industry, and Research
10. **Lecture 40:** Review of UNIT IV and Comprehensive Course Review

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Lesson plan Electromagnetic Theory PHY – 304

Unit I: Foundations of Electromagnetic Theory (10 Lectures)

1. **Lecture 1**: Introduction to Electromagnetic Theory, Overview of Maxwell’s equations, Historical context and significance
2. **Lecture 2**: Maxwell's Equations, Differential form of Gauss's laws
3. **Lecture 3**: Maxwell's Equations, Differential form of Faraday's law and Ampère's law
4. **Lecture 4**: Displacement Current and Ampère's Law, Concept of displacement current, Modification of Ampère's law
5. **Lecture 5**: Vector and Scalar Potentials, Definitions and significance, Relations to electromagnetic fields
6. **Lecture 6**: Gauge Transformations, Lorentz gauge, Coulomb gauge, Applications and simplifications
7. **Lecture 7**: Boundary Conditions at Interfaces, Continuity of fields at dielectric boundaries
8. **Lecture 8**: Wave Equations, Derivation from Maxwell’s equations, Solutions in free space
9. **Lecture 9**: Plane Waves in Dielectric Media, Characteristics and propagation
10. **Lecture 10**: Poynting Theorem and Energy Density, Poynting vector and energy flow, Electromagnetic field momentum and angular momentum density

Unit II: Reflection, Refraction, and Waves in Conducting Media (10 Lectures)

1. **Lecture 11**: Reflection and Refraction at Interfaces, Snell's law and Fresnel equations
2. **Lecture 12**: Fresnel Formulae and Brewster's Angle, Derivation and applications, Total internal reflection
3. **Lecture 13**: Waves in Conducting Media, Reflection at metallic surfaces
4. **Lecture 14**: Waves in Conducting Media, Skin depth and frequency dependence
5. **Lecture 15**: Maxwell's Equations in Microscopic Media, Plasmas and the plasma frequency
6. **Lecture 16**: Propagation of Waves in the Ionosphere, Refractive index and ionized gases
7. **Lecture 17**: Energy Loss and Attenuation in Conductors, Detailed analysis and applications
8. **Lecture 18**: Practical Examples of Reflection and Refraction, Real-world applications and problem-solving
9. **Lecture 19**: Mid-Term Review, Review of Units I and II
10. **Lecture 20**: Mid-Term Exam, Assessment of understanding and problem-solving skills

Unit III: Polarization and Anisotropic Media (10 Lectures)

1. **Lecture 21**: Polarization of Electromagnetic Waves, Linear polarization
2. **Lecture 22**: Circular and Elliptical Polarization, Descriptions and mathematical treatments
3. **Lecture 23**: Propagation in Anisotropic Media, Dielectric tensor and wave behavior
4. **Lecture 24**: Fresnel's Formula in Anisotropic Media, Application to uniaxial crystals
5. **Lecture 25**: Double Refraction, Phenomenon and practical examples
6. **Lecture 26**: Nicol Prism and Polarizing Devices, Operation and uses
7. **Lecture 27**: Production of Circularly and Elliptically Polarized Light, Techniques and equipment
8. **Lecture 28**: Babinet Compensator and Analysis, Description and applications
9. **Lecture 29**: Problem-Solving Session, Exercises and examples on polarization
10. **Lecture 30**: Review and Applications of Polarization, Real-world applications and case studies

Unit IV: Waveguides and Optical Fibers (10 Lectures)

1. **Lecture 31**: Introduction to Waveguides, Basics and types
2. **Lecture 32**: Coaxial Transmission Lines, Analysis and applications
3. **Lecture 33**: Modes in Rectangular Waveguides, TE and TM modes
4. **Lecture 34**: Energy Flow and Attenuation in Waveguides, Detailed analysis and calculations
5. **Lecture 35**: Rectangular Resonant Cavities, Principles and applications
6. **Lecture 36**: Planar Optical Waveguides, Basics and characteristics
7. **Lecture 37**: Planar Dielectric Waveguides, Conditions of continuity and phase shift
8. **Lecture 38**: Eigenvalue Equations for Waveguides, Derivations and solutions
9. **Lecture 39**: Phase and Group Velocity of Guided Waves, Analysis and practical considerations
10. **Lecture 40**: Final Review and Exam, Comprehensive review of all units, Final assessment

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Lesson plan Com-302

SN	Topic Name	Hours to Teach	Mode of Teaching
1	Unit I: Oracle Basics and SQL*Forms		

1.1	Introduction to Oracle: Modules of Oracle and Invoking SQL*PLUS	1	Whiteboard, PowerPoint
1.2	Data Types, Data Constraints, Operators	2	Whiteboard, Demonstration
1.3	Data Manipulation: Create, Modify, Insert, Delete, Update	3	Whiteboard, Demonstration
1.4	Searching, Matching, and Oracle Functions	2	Whiteboard, Demonstration
1.5	SQL*Forms: Form Construction and User-Defined Forms	2	Demonstration, Lab Work
1.6	SQL*Forms: Multiple-Record Form, Master-Detail Form	2	Demonstration, Lab Work
1.7	PL/SQL Blocks in SQL*Forms: Syntax, Data Types, Functions, Error Handling	3	Whiteboard, Demonstration
1.8	SQL*ReportWriter: Selective Dump Report, Master-Detail Report, Control-Break Report	2	Demonstration, Lab Work
2	Unit II: SQL*Menu, Stored Procedures/Functions, and Database Triggers		
2.1	SQLMenu: Various Menu Styles, Pull-Down & Bar-Menu, Authorization of SQLMenu	2	Whiteboard, Demonstration
2.2	Creating Oracle Menu, Granting Role Access, Generating & Executing Applications	2	Demonstration, Lab Work
2.3	Stored Procedures: Creation, Execution, and Storage	3	Whiteboard, Demonstration
2.4	Stored Functions: Creation, Execution, Storage	2	Whiteboard, Demonstration
2.5	Database Triggers: Types, Use, BEFORE vs AFTER Trigger Combinations	2	Whiteboard, Demonstration
2.6	Creating and Dropping Triggers	2	Demonstration, Lab Work
3	Unit III: Introduction to Visual Basic		
3.1	Introduction to Visual Basic: Analyzing Controls and Properties	2	Whiteboard, Demonstration

3.2	Coding, Loops, Dialog Boxes, and Additional Controls	2	Whiteboard, Demonstration
3.3	Option Buttons, Frames, Check Boxes, Scroll Bars, Timer Control	2	Demonstration, Lab Work
3.4	Procedures and Functions, Debugging Windows	2	Whiteboard, Demonstration
3.5	Database Programming and Crystal Reports	2	Demonstration, Lab Work
3.6	Simple Active X Controls	2	Demonstration, Lab Work

Lesson plan Com-304:

SN	Topic Name	Hours to Teach	Mode of Teaching
1	Unit I: Software Metrics and Reliability		
1.1	Introduction to Software Metrics: Need and Benefits	1	Whiteboard, PowerPoint
1.2	Size Metrics: Types and Calculations	2	Whiteboard, Demonstration
1.3	Control Complexity Metrics: Concepts and Application	2	Whiteboard, Demonstration
1.4	Composite Metrics and Object-Oriented Metrics	2	Whiteboard, PowerPoint
1.5	Software Quality Metrics: Definition and Importance	2	Whiteboard, Demonstration
1.6	Software Reliability Metrics and Specification	2	Whiteboard, PowerPoint
1.7	Fault Avoidance and Tolerance, Exception Handling, Defensive Programming	3	Whiteboard, Demonstration
2	Unit II: Software Testing		

2.1	Fundamentals of Software Testing: Overview and Objectives	2	Whiteboard, PowerPoint
2.2	White Box Testing Techniques: Concepts and Examples	2	Whiteboard, Demonstration
2.3	Black Box Testing Techniques: Concepts and Examples	2	Whiteboard, Demonstration
2.4	Software Testing Strategies: Unit Testing and Integration Testing	3	Whiteboard, Demonstration
2.5	Validation Testing and System Testing	2	Whiteboard, PowerPoint
2.6	Debugging Techniques: Methods and Tools	2	Whiteboard, Demonstration
3	Unit III: Software Maintenance and CASE Tools		
3.1	Aims of Software Maintenance: Objectives and Importance	2	Whiteboard, PowerPoint
3.2	Types of Software Maintenance: Corrective, Adaptive, Perfective, Preventive	2	Whiteboard, Demonstration
3.3	Maintenance Characteristics and Maintainability	2	Whiteboard, Demonstration
3.4	Maintenance Tasks and Side Effects	2	Whiteboard, PowerPoint
3.5	Introduction to CASE Tools: Overview and Types	2	Whiteboard, Demonstration
3.6	CASE Tools in Software Engineering: Applications and Benefits	2	Whiteboard, Demonstration
Subtotal	12		

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)

RAFFELS UNIVERSITY, NEEMRANA

B.Sc. (PCM) (3 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana

RAFFLES
UNIVERSITY

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Vision: To evolve as an Institution of Excellence, where scholars develop informed and inquiring minds and broaden the frontiers of pure and applied knowledge.

Mission: In graining the capacity to us usher in change by discovering nurturing and expanding individual skills talents and interests while standing forth as leader and path breaker in their future carrier.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. PEO 1 To providing subjective and practical knowledge as well as developing practical solutions and connections between theory.
2. PEO 2 Hearten individual growth among the students and enhance their confidence by providing them an opportunity to become a part of science-industry.
3. PEO 3 To make Science subjects interesting through technically, scientifically and experimentally.
4. PEO 4 To develop problem-solving skills through practical applications and research

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Provide students with fundamental knowledge and ability to expertise in Computer Science.
PO 2	Provide insight to problem solving to succeed in Technical Profession through precise education and to prepare students to excel in postgraduate programs.
PO 3	To inculcate in students professional, effective communication skills, team work, multidisciplinary approach and an ability to relate issues to broader social context.
PO 4	Prepare students to be aware of excellence, leadership, written ethical codes and guidelines and lifelong learning needed for successful professional career by providing them with an excellent academic environment.
PO 5	Empower the students in academic, social, psychological and economic arenas by developing relevant competencies.
PO 6	Interpret and apply the implications of environment awareness initiatives incorporated in curriculum.
PO 7	Participation and contribution to community development activities through NCC, NSS etc.
PO 8	Acquire sufficient knowledge base in the Domain Specific area leading to the pursuit of advanced level of study in the chosen Domain Specific area.
PO 9	Adaptability and capacity building to the everchanging needs of the industryand employment opportunities.
PO 10	Inculcate the human values through curricular, co-curricular and extra curricular activities.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The School of Science, offers Three Year (comprising 6 semesters) Undergraduate Programin Mathematical Science with objective of empowering students to acquire all-inclusive understanding of Computer Knowledge both theoretical and practical as an academic discipline. Upon completion of B. Sc. Mathematical Science Degree Program sucesfuyl, the students shall acquire the following skills and competencies.

PSO 1	Develop the ability to apply the knowledge acquired in the classroom and laboratories to specificproblems in theoretical and experimental Physics.
PSO 2	Gain the knowledge of Chemistry through theory and practical s.
PSO 3	Develop research-oriented skills.
PSO 4	Demonstrate basic manipulative skills in algebra, geometry, trigonometry and beginning calculus.
PSO 5	Investigate and apply mathematical problems and solutions in variety of context related to science,technology, business and industry. Illustrate solutions using numeric or graphical methods.
PSO 6	Develop programming skills and practical to further mathematical understanding and solvemathematical problem.
PSO 7	Perform job in various fields' like science, engineering, education, banking, business and public service, etc. Or be an entrepreneur with precision, analytical mind, innovative thinking, clarity of thought , expression, and systematic approach.

PSO-PO Mapping

	PO										
PSO		1	2	3	4	5	6	7	8	9	10
	1	√	√	√							
	2	√	√		√	√			√	√	
	3	√	√	√	√	√			√	√	
	4	√	√	√	√	√			√	√	√
	5			√	√	√	√	√	√		√
	6						√	√	√	√	√
	7			√	√		√	√	√	√	√

Course Objective and Course Outcomes SCHOOL OF BASIC & APPLIED SCIENCES

(Syllabus & Scheme of Studies B.Sc. (PCM)

I Year (I semester)

RAFFLES
UNIVERSITY

Scheme of Studies B.Sc. (PCM) I Year (I semester)

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term	Total		
1	Chemistry	CH-101	Inorganic Chemistry	2	0	40	60	100	3	2
2		CH-103	Organic Chemistry	2	0	40	60	100	3	2
3		CH-105	Physical Chemistry	2	0	40	60	100	3	2
4		CH-107	Chemistry Lab-I	0	6	20	30	50	4	3
5	Physics	PHY-101	Mechanics – I	2	0	40	60	100	3	2
6		PHY-103	Thermodynamic s – I	2	0	40	60	100	3	2
7		PHY-105	Electricity and Magnetism – I	2	0	40	60	100	3	2
8		PHY-107	Physics Laboratory	0	6	20	30	50	4	3
9	Mathematics	MA-101	Matrices and Statistics	2	0	40	60	100	3	2
10		MA-103	Calculus	2	0	40	60	100	3	2
11		MA-105	Three-Dimensional Geometry	2	0	40	60	100	3	2
12	Open Elective Paper	-	-	2	0	40	60	100	3	2
TOTAL				20	12			1100		26

Course Outcomes

Inorganic Chemistry (CH-101):

1. Systematic and coherent understanding of the fundamental concepts of atomic structure.
2. Students will be able to understand the basic principle of classifications of elements and their periodic properties
3. Students will have through knowledge of different kinds bonding, hybridization in diatomic molecules.
4. Students can gain thorough knowledge about the structures of ionic solids, coordination no and lattice energy.

Organic Chemistry (CH-103) Course Outcomes:

1. Have comprehensive knowledge of the basic organic chemistry like different electronic effects with suitable examples
2. Get information about the types of structural and stereoisomers, optical isomerism, and different nomenclature like D/L, R/S, cis/trans, E/Z etc. of various organic compounds.
3. Learn nomenclature of various types of alkanes and cycloalkanes, preparation and their chemical reactions.
4. Sound knowledge of alkenes, alkynes, dienes and their chemical reactions.

Physical Chemistry (CH-105) Course Outcomes:

1. To understand the Maxwell distribution law and various parameters associated with collisions ideal gas molecules
2. To learn about Role of temperature and pressure to establish the state of gases and describe the Concept of critical temperature, pressure and volume of real gases
3. To study the Physical properties of liquids like surface tension, viscosity and their measurements
4. To have knowledge about various types of symmetries present in different solids and and Bragg's law of X-ray diffraction

Mechanics -I (PHY-101:

1. CO 1: Student gains the knowledge on Fundamentals of Mechanics
2. CO 2: Student gets a thorough knowledge different types of forces that make lifesmoother.
3. CO 3: Student gets a thorough knowledge on fluid dynamics.
4. CO 4: Student gets a thorough knowledge on elastic properties of solids.
5. CO 5: Finds the evolution of theories for understanding the Universe and thedynamic nature of

Universe.

Thermodynamics -I (PHY-103)

1. CO 1: Student gains the knowledge on Fundamentals of Thermodynamics
2. CO 2: Student gets a thorough knowledge different types of reversible andirreversible engines CO 3: Student gets a thorough knowledge on dynamics of Heat flow.
3. CO 4: Student gets a thorough knowledge on various degrees of freedom andmolecular movement. CO 5: Finds the evolution of Quantum Mechanics, a new branch of Physics

Electricity and Magnetism-I (PHY-105) Course Outcomes:

1. CO 1: understand concepts of electric and magnetic fields and electric potential; CO 2: understand the topic of capacitance;
2. C) 3: be able to treat DC and AC circuits;
3. CO 4: understand the Lorentz force law and apply it to solve problems;
4. CO 5: be able to treat the motion of charged objects in two and three dimensions;

Matrices and Statistics (MA-101) Course Outcomes:

1. CO 1: An ability to construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.
2. CO 2: An understanding of the analysis of distributed loads.
3. CO 3: A knowledge of internal forces and moments in members. CO 4: An ability to calculate centroids and moments of inertia

Calculus (MA-103) Course Outcomes:

1. Understand the relationship between the derivative and the definite integral as expressed in both parts of the Fundamental Theorem of Calculus.
2. Locate the x and y intercepts, any undefined points, and any asymptotes.
3. Apply the techniques from the previous section to graph a fourth degree polynomial or higher
4. determine if there is any symmetry to aid in the graphing process.
5. determine the point(s) of intersection of pairs of curves

Three-Dimensional Geometry (MA-105) Course Outcomes:

1. CO 1: Understand how Real Analysis raw materials for growth
2. CO 2: Have comprehensive exposure to the subject of Real Analysis
3. CO 3: Develop the knowledge and confidence to pure Mathematics Understand the role of Real analysis

CO-Po mapping

CH-101	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-103	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-105	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-101	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-103	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-105	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-101	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-103	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-105	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

Lesson Plan for Semester I

Paper 1: Matrices and Statistics (Code: MA-101)

1. Introduction to Matrices: Basic Definitions and Types
2. Symmetric, Skew-Symmetric, Hermitian, and Skew-Hermitian Matrices
3. Elementary Operations on Matrices
4. Rank of a Matrix: Row and Column Rank
5. Inverse of a Matrix
6. Linear Dependence and Independence of Rows and Columns
7. Application of Matrices to Linear Equations
8. Unitary and Orthogonal Matrices
9. Eigenvalues and Eigenvectors: Introduction
10. The Characteristic Equation of a Matrix
11. Cayley-Hamilton Theorem
12. Application of the Cayley-Hamilton Theorem
13. Correlation and Regression: Basic Concepts
14. Coefficient of Correlation: Calculation and Interpretation
15. Rank Correlation
16. Lines of Regression
17. Properties of Regression Coefficients
18. Introduction to Probability Distribution
19. Random Variables and Probability Distributions
20. Binomial Distribution: Definition and Properties
21. Poisson Distribution: Definition and Applications
22. Normal Distribution: Definition and Applications
23. Mean and Variance of Distributions
24. Fitting of Binomial Distribution
25. Fitting of Poisson Distribution

26. Fitting of Normal Distribution
27. Application of Probability Distributions in Real-Life Problems
28. Advanced Problems in Matrices
29. Advanced Problems in Statistics
30. Practice Session on Matrices
31. Practice Session on Statistics
32. Review of Key Concepts in Matrices
33. Review of Key Concepts in Statistics
34. Case Studies Using Matrices
35. Case Studies Using Statistics
36. Preparation for Internal Assessment
37. Discussion on Previous Year Papers
38. Problem-Solving Techniques
39. Revision Session
40. Final Preparatory Session

Paper 2: Calculus (Code: MA-103)

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1. Introduction to Limits: Basic Definitions and Properties
2. Continuous Functions and Classification of Discontinuities
3. Differentiability and Its Basic Concepts
4. Successive Differentiation
5. Leibnitz Theorem and Its Applications
6. Maclaurin Series Expansion
7. Taylor Series Expansion
8. Introduction to Asymptotes in Cartesian Coordinates
9. Intersection of Curves and Their Asymptotes
10. Asymptotes in Polar Coordinates
11. Curvature and Radius of Curvature for Cartesian Curves
12. Curvature for Parametric and Polar Curves
13. Radius of Curvature for Pedal Curves

14. Tangential Polar Equations
15. Centre of Curvature and Its Applications
16. Chord of Curvature
17. Tests for Concavity and Convexity
18. Points of Inflexion and Their Significance
19. Multiple Points: Cusps, Nodes, and Conjugate Points
20. Types of Cusps in Curve Tracing
21. Tracing of Curves in Cartesian Coordinates
22. Tracing of Curves in Parametric Coordinates
23. Tracing of Curves in Polar Coordinates
24. Intrinsic Equations of Curves
25. Indeterminate Forms: Introduction
26. L'Hospital's Rule and Its Applications
27. Partial Differentiation: Basic Concepts
28. Homogeneous Functions and Euler's Theorem
29. Jacobians and Their Properties
30. Total Differentials and Their Applications
31. Chain Rule of Partial Differentiation
32. Applications of Partial Differentiation
33. Advanced Problems in Limits and Continuity
34. Advanced Problems in Differentiation
35. Practice Session on Curve Tracing
36. Practice Session on Indeterminate Forms
37. Preparation for Internal Assessment
38. Discussion on Previous Year Papers
39. Revision Session
40. Final Preparatory Session

Paper 3: Three-Dimensional Geometry (Code: MA-105)

1. Introduction to Three-Dimensional Geometry: Basic Concepts
2. General Equation of Second Degree
3. System of Conics
4. Confocal Conics and Their Properties
5. Polar Equation of a Conic
6. Properties of Polar Equations
7. Three-Dimensional Systems of Coordinates
8. Direction Cosines and Direction Ratios
9. Equation of a Plane
10. Angle Between Two Planes
11. Equation of a Straight Line in 3D Space
12. Condition for Two Lines to Be Coplanar
13. Shortest Distance Between Two Lines
14. Intersection of a Line and a Plane
15. Angle Between a Line and a Plane
16. Sphere: General Equation and Properties
17. Plane Section of a Sphere
18. Sphere Through a Given Circle
19. Tangents to a Sphere
20. Cones: Definition and Types
21. Right Circular Cone and Its Properties
22. Enveloping Cone
23. Reciprocal Cone
24. Cylinders: Right Circular Cylinder
25. Enveloping Cylinder
26. Central Conicoids: Introduction
27. Reduction of General Equation of Second Degree
28. Tangential Properties of Conicoids
29. Tangent Plane and Normal to a Conicoid

30. Generating Lines of Conicoids
31. Plane Sections of Conicoids
32. Intersection of a Plane with a Sphere
33. Intersection of a Plane with a Cone
34. Advanced Problems in Direction Cosines and Ratios
35. Advanced Problems in Sphere and Cones
36. Practice Session on Plane and Line Intersections
37. Preparation for Internal Assessment
38. Discussion on Previous Year Papers
39. Revision Session
40. Final Preparatory Session

Lesson Plan for Chemistry - CH-101

UNIT-I: Atomic Structure (9 Lectures)

1. Lecture 1: Introduction to Atomic Structure: de-Broglie Matter Waves, Heisenberg's Uncertainty Principle
2. Lecture 2: Atomic Orbitals: Concepts and Types
3. Lecture 3: Quantum Numbers: Definitions and Significance
4. Lecture 4: Aufbau and Pauli Exclusion Principles
5. Lecture 5: Hund's Rule of Maximum Multiplicity: Electronic Configurations
6. Lecture 6: Radial and Angular Wave Functions: Concepts and Applications
7. Lecture 7: Probability Distribution Curves for s, p, and d Orbitals
8. Lecture 8: Shapes of Atomic Orbitals: s, p, d
9. Lecture 9: Summary and Review of Atomic Structure

UNIT-II: Periodic Table (9 Lectures)

10. Lecture 10: General Principles of the Periodic Table: Introduction and Overview
11. Lecture 11: Effective Nuclear Charge: Slater's Rules and Applications

12. Lecture 12: Atomic and Ionic Radii: Trends in the Periodic Table
13. Lecture 13: Ionization Energy: Definition, Determination, and Trends
14. Lecture 14: Electron Affinity: Definition, Determination, and Trends
15. Lecture 15: Electronegativity: Methods of Evaluation and Trends
16. Lecture 16: Comparative Analysis of s & p Block Elements in the Periodic Table
17. Lecture 17: Summary of Periodic Table Trends and Their Applications
18. Lecture 18: Review and Problem-Solving Session on Periodic Table Trends

UNIT-III: Covalent Bond (10 Lectures)

19. Lecture 19: Introduction to Covalent Bond: Valence Bond Theory (VBT)
20. Lecture 20: Limitations of Valence Bond Theory and Directional Characteristics of Covalent Bonds
21. Lecture 21: Hybridization: Types and Examples (BeF2, BF3, CH4)
22. Lecture 22: Shapes of Simple Inorganic Molecules and Ions: PF5, SF6, IF7
23. Lecture 23: Valence Shell Electron Pair Repulsion (VSEPR) Theory: Introduction and Applications
24. Lecture 24: VSEPR Theory Applied to NH3, H3O+, SF4
25. Lecture 25: VSEPR Theory Applied to ClF3, ICl−, H2O
26. Lecture 26: Molecular Orbital (MO) Theory: Heteronuclear Diatomic Molecules (CO, NO)
27. Lecture 27: Bond Strength and Bond Energy: Concepts and Calculations
28. Lecture 28: Percentage Ionic Character from Dipole Moment and Electronegativity Difference

UNIT-IV: Ionic Solids (9 Lectures)

29. Lecture 29: Introduction to Ionic Solids: Structures of NaCl, CsCl, ZnS, CaF2
30. Lecture 30: Radius Ratio Effect and Coordination Number in Ionic Structures
31. Lecture 31: Limitations of Radius Ratio Rule: Analysis and Examples
32. Lecture 32: Lattice Defects: Types and Their Effects on Properties
33. Lecture 33: Semiconductors: Introduction and Applications
34. Lecture 34: Lattice Energy: Concepts and Born-Haber Cycle (Mathematical Derivation Excluded)
35. Lecture 35: Solvation Energy and Its Relation with Solubility of Ionic Solids
36. Lecture 36: Polarizing Power and Polarisability of Ions: Fajan's Rule
37. Lecture 37: Summary and Review of Ionic Solids and Their Properties

Lesson Plan for Chemistry - CH-103

UNIT-I: Structure and Bonding

Lecture 1: Localized and Delocalized Chemical Bond

Lecture 2: van der Waals' Interactions

Lecture 3: Resonance: Conditions, Effect, and Applications

Lecture 4: Hyperconjugation and Inductive Effect

Lecture 5: Electromeric Effect & Comparisons

Stereochemistry of Organic Compounds-I

6. Lecture 6: Isomerism: Concepts and Types

7. Lecture 7: Optical Isomerism: Elements of Symmetry, Molecular Chirality

8. Lecture 8: Enantiomers: Properties and Stereogenic Centers

9. Lecture 9: Chiral and Achiral Molecules with Two Stereogenic Centers

10. Lecture 10: Diastereomers: Threo, Erythro, and Meso Compounds

11. Lecture 11: Resolution of Enantiomers, Inversion, Retention, Racemization

UNIT-II: Stereochemistry of Organic Compounds-II

12. Lecture 12: Relative and Absolute Configuration: Sequence Rules

13. Lecture 13: R & S System of Nomenclature

14. Lecture 14: Geometric Isomerism: Configuration and E & Z System

15. Lecture 15: Conformational Analysis of Ethane and n-Butane

16. Lecture 16: Conformations of Cyclohexane: Axial and Equatorial Bonds

17. Lecture 17: Newman Projection, Sawhorse Formulae, Configuration vs. Conformation

UNIT-III: Mechanism of Organic Reactions

18. Lecture 18: Curved Arrow Notation: Drawing Electron Movements

19. Lecture 19: Homolytic and Heterolytic Bond Breaking

20. Lecture 20: Electrophiles and Nucleophiles: Types of Reagents

21. Lecture 21: Types of Organic Reactions: Energy Considerations

22. Lecture 22: Reactive Intermediates: Carbocations, Carbanions, Free Radicals

23. Lecture 23: Carbenes, Arynes, Nitrenes: Formation, Structure & Stability

UNIT-IV: Alkanes and Cycloalkanes

24. Lecture 24: IUPAC Nomenclature of Alkanes and Alkyl Groups

25. Lecture 25: Isomerism in Alkanes: Sources and Methods of Formation

26. Lecture 26: Wurtz, Kolbe, Corey-House Reactions, Decarboxylation of Acids

27. Lecture 27: Cycloalkanes: Nomenclature and Synthesis
28. Lecture 28: Photochemical Cycloaddition, Dehalogenation, Pyrolysis
29. Lecture 29: Baeyer's Strain Theory and Strainless Rings

Lesson Plan for Chemistry - CH-105

Unit 1: Gaseous States (11 Lectures)

1. Lecture 1: Introduction to Gaseous States: General Characteristics
2. Lecture 2: Maxwell's Distribution of Velocities: Overview and Calculations
3. Lecture 3: Calculation of Root Mean Square, Average, and Most Probable Velocities
4. Lecture 4: Collision Parameters: Collision Diameter, Number, Frequency, Mean Free Path
5. Lecture 5: Real Gases vs Ideal Gases: Deviations and Causes
6. Lecture 6: Vander Waal's Equation of State: Derivation and Applications
7. Lecture 7: Boyle's Temperature: Calculation and Significance
8. Lecture 8: Behavior of Real Gases: Explanation Using Vander Waal's Equation
9. Lecture 9: PV Isotherms of Real Gases: Continuity of States
10. Lecture 10: The Laws of Corresponding States: Concepts and Applications
11. Lecture 11: Review and Problem-Solving Session on Gaseous States

Unit 2: Critical Phenomenon (7 Lectures)

12. Lecture 12: Critical Phenomenon: Definitions and Concepts
13. Lecture 13: Determination of Critical Temperature, Pressure, and Volume
14. Lecture 14: PV Isotherms of Real Gases: Analysis and Interpretation
15. Lecture 15: Continuity of States: Explanation Using Isotherms
16. Lecture 16: Critical Constants and Vander Waal's Constants: Relationship
17. Lecture 17: Liquefaction of Gases: Methods and Applications
18. Lecture 18: Review and Discussion on Critical Phenomena

Unit 3: Liquid States (7 Lectures)

19. Lecture 19: Structure of Liquids: Overview and Importance

20. Lecture 20: Surface Tension: Concept and Determination
21. Lecture 21: Viscosity: Definition, Measurement, and Applications
22. Lecture 22: Vapour Pressure: Principles and Measurement Techniques
23. Lecture 23: Optical Rotations: Concept and Determination
24. Lecture 24: Properties of Liquids: Summary and Problem-Solving
25. Lecture 25: Review and Discussion on Liquid States

Unit 4: Solid States and Liquid Crystals (10 Lectures)

26. Lecture 26: Classification of Solids: Overview and Examples
27. Lecture 27: Laws of Crystallography: Constancy of Interfacial Angles, Rationality of Indices, Symmetry
28. Lecture 28: Symmetry Elements in Crystals: Explanation and Examples
29. Lecture 29: Unit Cell and Space Lattice: Definitions and Concepts
30. Lecture 30: Bravais Lattices and Crystal Systems: Classification and Properties
31. Lecture 31: X-Ray Diffraction by Crystals: Principles and Techniques
2. Lecture 32: Bragg's Equation: Derivation and Applications
33. Lecture 33: Determination of Crystal Structure: NaCl and KCl Case Studies
34. Lecture 34: Liquid Crystals: Types, Properties, and Applications
35. Lecture 35: Summary and Review of Solid States and Liquid Crystals

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Lesson Plan **Mechanics** **Paper Code: PHY – 101**

Week 1-3: UNIT I - Vector Calculus and Mechanics (10 Lectures)

1. **Lecture 1:** Introduction to Vector Calculus: Scalars and Vectors
2. **Lecture 2:** Gradient, Divergence, and Curl: Concepts and Applications
3. **Lecture 3:** Line, Surface, and Volume Integrals: Definitions and Calculations
4. **Lecture 4:** Frame of Reference: Inertial and Non-Inertial Frames
5. **Lecture 5:** Galilean Transformation: Concept and Mathematical Formulation
6. **Lecture 6:** Galilean Invariance: Principles and Applications
7. **Lecture 7:** Pseudo Forces in Non-Inertial Frames: Examples and Analysis
8. **Lecture 8:** Rotating Reference Frame: Centrifugal and Coriolis Forces
9. **Lecture 9:** Motion Under Central Force: Concept and Equations
10. **Lecture 10:** Kepler's Laws: Derivation and Physical Interpretation

Week 4-6: UNIT II - Fluid Dynamics and Elasticity (10 Lectures)

1. **Lecture 11:** Ideal Fluids: Properties and Assumptions
2. **Lecture 12:** Equation of Continuity: Derivation and Applications
3. **Lecture 13:** Streamline Flow: Concepts and Examples

4. **Lecture 14:** Rotational and Irrotational Flows: Differences and Analysis
5. **Lecture 15:** Euler's Equation of Fluid Motion: Derivation and Implications
6. **Lecture 16:** Bernoulli's Theorem: Statement, Derivation, and Applications
7. **Lecture 17:** Viscous Fluids: Introduction and Properties
8. **Lecture 18:** Poiseuille's Equation: Derivation and Applications
9. **Lecture 19:** Viscosity by Rotating Cylinder Method: Theory and Experimentation
10. **Lecture 20:** Elasticity: Hook's Law and Elastic Constants of Isotropic Solids

Week 7-9: UNIT III - Elasticity and Surface Tension (10 Lectures)

1. **Lecture 21:** Stress and Strain in Isotropic Homogeneous Medium: Definitions
2. **Lecture 22:** Elastic Moduli: Young's Modulus, Shear Modulus, and Bulk Modulus
3. **Lecture 23:** Relations Between Elastic Moduli: Mathematical Derivation
4. **Lecture 24:** Torsion of Cylinders: Theory and Applications
5. **Lecture 25:** Bending of Beams: Concepts and Equations
6. **Lecture 26:** Internal Energy of a Strained Body: Calculations and Implications
7. **Lecture 27:** Surface Tension: Definition and Measurement
8. **Lecture 28:** Surface Energy: Concept and Applications
9. **Lecture 29:** Capillarity and Applications in Daily Life
10. **Lecture 30:** Problem Solving and Applications in Elasticity and Surface Tension

Week 10-12: UNIT IV - Special Relativity (10 Lectures)

1. **Lecture 31:** Michelson-Morley Experiment: Setup, Results, and Inference
2. **Lecture 32:** Postulates of Special Relativity: Einstein's Principles
3. **Lecture 33:** Lorentz Transformations: Derivation and Implications
4. **Lecture 34:** Length Contraction: Concept and Examples
5. **Lecture 35:** Time Dilation: Theory and Practical Implications
6. **Lecture 36:** Simultaneity in Relativity Theory: Concepts and Paradoxes
7. **Lecture 37:** Addition of Velocities in Special Relativity
8. **Lecture 38:** Relativistic Dynamics: Concepts of Force and Momentum
9. **Lecture 39:** Variation of Mass with Velocity: Derivation and Applications
10. **Lecture 40:** Mass-Energy Relation: $E=mc^2$ and Its Implications

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Lesson plan Thermodynamics PHY – 103

Week 1-3: UNIT I - First Law of Thermodynamics (10 Lectures)

1. **Lecture 1:** Introduction to Thermodynamics and Internal Energy
2. **Lecture 2:** First Law of Thermodynamics: Concept and Mathematical Formulation
3. **Lecture 3:** Joule's Law: Understanding and Applications
4. **Lecture 4:** Applications of the First Law of Thermodynamics in Various Systems
5. **Lecture 5:** Carnot Cycle: Derivation and Understanding
6. **Lecture 6:** Carnot Engine: Efficiency and Real-world Applications
7. **Lecture 7:** Refrigerator and Heat Pumps: Carnot's Approach

8. **Lecture 8:** Reversible and Irreversible Processes: Definitions and Examples
9. **Lecture 9:** Carnot Theorem: Proof and Implications
10. **Lecture 10:** Thermodynamic Scale of Temperature: Understanding and Applications

Week 4-6: UNIT II - Entropy and Thermodynamic Potentials (10 Lectures)

1. **Lecture 11:** Introduction to Entropy: Concept and Definition
2. **Lecture 12:** Calculation of Entropy in Various Processes
3. **Lecture 13:** Entropy and Unavailable Energy: Understanding the Relationship
4. **Lecture 14:** Physical Significance of Entropy: Practical Examples
5. **Lecture 15:** Second Law of Thermodynamics: Different Formulations
6. **Lecture 16:** Thermodynamic Potentials: Definitions and Importance
7. **Lecture 17:** Maxwell's Equations in Thermodynamics: Derivations
8. **Lecture 18:** Applications of Maxwell's Equations: Practical Cases
9. **Lecture 19:** Phase Diagram and Triple Point of a Substance
10. **Lecture 20:** Joule-Thomson Effect: Understanding and Applications

Week 7-9: UNIT III - Kinetic Theory of Gases (10 Lectures)

1. **Lecture 21:** Maxwell-Boltzmann Distribution Law: Derivation and Understanding
2. **Lecture 22:** Evaluation of Root Mean Square (RMS) Velocity
3. **Lecture 23:** Average and Most Probable Speeds of Gas Molecules
4. **Lecture 24:** Mean Free Path: Definition and Calculation
5. **Lecture 25:** Transport Phenomenon: Viscosity, Thermal Conductivity, and Diffusion
6. **Lecture 26:** Degrees of Freedom: Definition and Applications
7. **Lecture 27:** Equipartition of Energy: Theoretical Basis
8. **Lecture 28:** Specific Heat of Gases: Application of Equipartition Theorem
9. **Lecture 29:** Real Gases and Deviations from Ideal Gas Behavior
10. **Lecture 30:** Summary and Problem Solving in Kinetic Theory

Week 10-12: UNIT IV - Black Body Radiation (10 Lectures)

1. **Lecture 31:** Emissive and Absorptive Powers: Definitions and Importance
2. **Lecture 32:** Black Body Radiation: Concept and Historical Background
3. **Lecture 33:** Kirchoff's Law of Radiation: Statement and Applications
4. **Lecture 34:** Intensity and Energy Density of Radiation: Definitions and Calculations
5. **Lecture 35:** Stefan-Boltzmann Law: Derivation and Applications
6. **Lecture 36:** Distribution of Energy in the Spectrum of Black Body Radiation
7. **Lecture 37:** Wein's Distribution Law: Derivation and Understanding
8. **Lecture 38:** Wein's Displacement Law: Implications and Applications
9. **Lecture 39:** Rayleigh-Jeans Law: Derivation and Limitations
10. **Lecture 40:** Planck's Law: Quantum Theory of Black Body Radiation

Lesson plan Wave & Oscillations PHY – 105

Week 1-3: UNIT I - Simple Harmonic Oscillations (SHM) (10 Lectures)

1. **Lecture 1:** Introduction to Simple Harmonic Motion (SHM)
2. **Lecture 2:** Differential Equation of SHM: Derivation and General Solution
3. **Lecture 3:** Amplitude, Frequency, Time Period, and Phase: Definitions and Relationships
4. **Lecture 4:** Velocity and Acceleration in SHM: Equations and Graphical Analysis
5. **Lecture 5:** Kinetic Energy in SHM: Derivation and Time Dependence
6. **Lecture 6:** Potential Energy in SHM: Derivation and Time Dependence
7. **Lecture 7:** Total Energy in SHM: Conservation and Time Average Values
8. **Lecture 8:** Reference Circle and Rotating Vector Representation of SHM
9. **Lecture 9:** Examples and Applications of SHM in Real-World Systems
10. **Lecture 10:** Problem Solving Session: SHM

Week 4-6: UNIT II - Free Oscillations of Systems with One Degree of Freedom (10 Lectures)

1. **Lecture 11:** Introduction to Free Oscillations and Degrees of Freedom
2. **Lecture 12:** Mass-Spring System: Differential Equation and Solution
3. **Lecture 13:** Simple Pendulum: Derivation of Period and Energy Analysis
4. **Lecture 14:** Torsional Pendulum: Concept and Mathematical Formulation
5. **Lecture 15:** Oscillations in a U-Tube: Theory and Equations
6. **Lecture 16:** Compound Pendulum: Centers of Percussion and Oscillation
7. **Lecture 17:** Bar Pendulum: Theory and Applications
8. **Lecture 18:** Comparison of Different Oscillatory Systems
9. **Lecture 19:** Experimental Techniques for Measuring Oscillations
10. **Lecture 20:** Problem Solving Session: One Degree of Freedom Systems

Week 7-9: UNIT III - Systems with Two Degrees of Freedom (10 Lectures)

1. **Lecture 21:** Introduction to Coupled Oscillators: Concept and Examples
2. **Lecture 22:** Normal Coordinates: Definition and Application
3. **Lecture 23:** Normal Modes: Derivation and Understanding
4. **Lecture 24:** Energy Relations in Coupled Oscillators: Energy Transfer
5. **Lecture 25:** Examples of Two Coupled Oscillators: Analytical Solutions
6. **Lecture 26:** Normal Modes of N Coupled Oscillators: General Theory
7. **Lecture 27:** Application of Normal Modes to Physical Systems
8. **Lecture 28:** Experimental Methods for Studying Coupled Oscillators
9. **Lecture 29:** Advanced Topics in Coupled Oscillations: Nonlinearity and Chaos
10. **Lecture 30:** Problem Solving Session: Two Degrees of Freedom Systems

Week 10-12: UNIT IV - Waves (10 Lectures)

1. **Lecture 31:** Introduction to Waves: Plane and Spherical Waves
2. **Lecture 32:** Longitudinal and Transverse Waves: Definitions and Examples

3. **Lecture 33:** Plane Progressive (Travelling) Waves: Mathematical Representation
4. **Lecture 34:** Wave Equation: Derivation and General Solution
5. **Lecture 35:** Particle and Wave Velocities: Concepts and Calculations
6. **Lecture 36:** Differential Equation for Waves: Pressure of a Longitudinal Wave
7. **Lecture 37:** Energy Transport and Intensity of Waves: Derivations
8. **Lecture 38:** Water Waves: Ripple and Gravity Waves
9. **Lecture 39:** Experimental Observation of Waves: Techniques and Measurements
10. **Lecture 40:** Problem Solving Session: Waves

SCHOOL OF BASIC AND APPLIED SCIENCES

(Scheme of Studies & Examinations)

B. Sc. (PCM) I Year (II Semester)

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B. Sc. (PCM) I Year (II Semester) Scheme

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination Scheme			Duration of exam	Credits
				L	P	IA	End Term	Total		
1	Chemistry	CH-102	Inorganic Chemistry	2	0	40	60	100	3	2
2		CH-104	Organic Chemistry	2	0	40	60	100	3	2
3		CH-106	Physical Chemistry	2	0	40	60	100	3	2
4		CH-108	Chemistry Lab-II	0	6	20	30	50	4	3
5	Physics	PHY- 102	Mechanics – 2	2	0	40	60	100	2	2
6		PHY- 104	Thermodynamics – 2	2	0	40	60	100	2	2
7		PHY- 106	Electricity and Magnetism – 2	2	0	40	60	100	2	2
8		PHY- 108	Physics Laboratory		6	20	30	50	4	3
9	Mathematics	MA-102	Sequences and Series& Trigonometry	2	0	40	60	100	3	2
10		MA-104	Ordinary Differential Equations	2	0	40	60	100	3	2
11		MA-106	Vector Calculus and Geometry	2	0	40	60	100	3	2
12	Open Elective Paper			2	0	40	60	100	3	2
TOTAL	20	12			1100		36			

Course outcome

Organic Chemistry (CH-102)

1. Students can gain thorough knowledge about elements of carbon and nitrogen family and concept of catenation, carbides and fluorocarbons.
2. They will know about the elements of oxygen family and have knowledge about the chemical properties of oxides of sulphur.

2. Organic Chemistry (CH-104)

1. To have sound knowledge in alkenes and their properties.
2. Learn the basics of aromaticity and Huckel's rule. To know preparation and chemical reactions of different aromatic hydrcarbons..
3. Sound knowledge of dienes and their chemical reactions.
4. Get knowledge about the mechanism of SN1 and SN2 reactions and other various chemical reactions of alkyl and aryl halides.

3.Physical Chemistry (CH-106)

1. Systematic and coherent understanding of the fundamental concepts in Chemical Kinetics.
2. Students will be able to understand the causes behind the different types of chemical reactions and the temperature dependence of reaction rate.
3. Students will be able to understand the basic principle of the electrical conduction in liquid state and how is it measured.
4. Students will learn the principles of equipment and instruments used in the chemistry laboratory. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state and its' application in different cases.

Mechanics-II (PHY-102) Course Outcomes:

1. CO 1: Understand integration of vectors
2. CO 2: Student gets a thorough knowledge different types of forces that make lifesmoother. CO 3: Derive Stoke's , Greens and Gauss theorems.
3. CO 4: Student gets a thorough knowledge on elastic properties of solids.
4. CO 5: Finds the evolution of theories for understanding the Universe and thedynamic nature of Universe.

Thermodynamics-II (PHY-104) Course Outcomes:

1. CO 1: Student gains the knowledge on Fundamentals of Thermodynamics
2. CO 2: Student gets a thorough knowledge different types of reversible andirreversible engines
3. CO 3: Student gets a thorough knowledge on dynamics of Heat flow.
4. CO 4: Student gets a thorough knowledge on various degrees of freedom andmolecular movement.
5. CO 5: Finds the evolution of Quantum Mechanics, a new branch of Physics

Electricity and Magnetism-II (PHY-106) Course Outcomes:

1. CO 1: understand the sources of magnetic field;
2. CO 2: know the law of EM induction; understand EM induction and inductance;
3. CO 3: understand Maxwell's equations and wave equation;
4. CO 4: perform basic experiments in electricity, magnetism, and optics, and work with other team

Sequence and Series Trigonometry (MA-102) Course Outcomes:

1. CO1: Write programs/functions to compute number theoretic functions.
2. CO 2: Use mathematical induction and other types of proof writing techniques.
3. CO3: Evaluate trigonometric and inverse trigonometric functions.
4. CO4: Solve trigonometric equations and applications.
5. CO5: Apply and prove trigonometric identities.

Ordinary differential Equations (MA-104) Course Outcomes:

1. CO 1: Student will be able to solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
2. CO 2: Student will be able to find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.
3. CO 3: Student will be introduced to the complete solution of a nonhomogeneous differential equation with constant coefficients by the method of undetermined coefficients.
4. CO 4: Student will be able to find the complete solution of a differential equation with constant coefficients by variation of parameters.
5. CO 5: Student will have a working knowledge of basic application problems described bysecond order linear differential equations with constant coefficients.

Vector Calculus and Geometry (MA-106)

1. CO 1: Memorize definition of directional derivative and gradient and illustrate geometric meanings with the aid of sketches.
2. CO 2: Memorize theorem relating directional derivative to gradient and reproduce proof.

3. CO 3: Calculate directional derivatives and gradients.
4. CO 4: Apply gradient to solve problems involving normal vectors to level surfaces.
5. CO 5: Explain the concept of a vector integration a plane and in space.

Co-Po mapping

CH-102	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

CH-104	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

CH-106	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-102	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-104	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-106	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-102	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-104	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-106	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

Lesson Plan for Semester II

Paper 4: Sequences and Series & Trigonometry (Code: MA-102)

1. Introduction to Real Number System and Its Properties
2. Boundedness of the Set of Real Numbers
3. Least Upper Bound and Greatest Lower Bound
4. Neighborhoods, Interior Points, and Isolated Points
5. Limit Points, Open Sets, and Closed Sets
6. Interior and Closure of a Set in Real Numbers
7. Bolzano-Weierstrass Theorem
8. Open Covers and Compact Sets
9. Heine-Borel Theorem
10. Introduction to Sequences: Real Sequences and Their Convergence
11. Theorem on Limits of Sequences
12. Bounded and Monotonic Sequences
13. Cauchy's Sequence and Cauchy's General Principle of Convergence
14. Subsequences and Subsequential Limits

15. Introduction to Infinite Series: Convergence and Divergence
16. Comparison Tests for Positive Term Series
17. Geometric Series: Convergence and Divergence
18. Hyper Harmonic Series or p-Series
19. D'Alembert's Ratio Test
20. Raabe's Test
21. Logarithmic Test
22. Cauchy's Nth Root Test
23. Introduction to Trigonometry: De Moivre's Theorem
24. Applications of De Moivre's Theorem
25. Expansion of Trigonometric Functions
26. Direct Circular and Hyperbolic Functions and Their Properties
27. Inverse Circular Functions and Their Properties
28. Inverse Hyperbolic Functions and Their Properties
29. Logarithm of a Complex Quantity
30. Gregory's Series and Its Applications
31. Summation of Trigonometric Series
32. Advanced Problems in Sequences and Series
33. Advanced Problems in Trigonometric Functions
34. Practice Session on Convergence Tests
35. Practice Session on Trigonometric Expansions
36. Preparation for Internal Assessment
37. Discussion on Previous Year Papers
38. Revision Session
39. Problem-Solving Techniques in Sequences and Series
40. Final Preparatory Session

Paper 5: Ordinary Differential Equations (Code: MA-104)

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1. Introduction to Differential Equations: Basic Definitions
2. Geometrical Meaning of a Differential Equation

3. Exact Differential Equations
4. Integrating Factors and Their Applications
5. First Order Higher Degree Equations Solvable for x, y, p
6. Lagrange's Equations: Definition and Solutions
7. Clairaut's Equations: Introduction and Solutions
8. Equations Reducible to Clairaut's Form
9. Singular Solutions of Differential Equations
10. Orthogonal Trajectories: Cartesian Coordinates
11. Orthogonal Trajectories: Polar Coordinates
12. Linear Differential Equations with Constant Coefficients
13. Homogeneous Linear Ordinary Differential Equations
14. Equations Reducible to Homogeneous Linear Form
15. Linear Differential Equations of Second Order
16. Reduction to Normal Form
17. Transformation by Changing the Dependent Variable
18. Transformation by Changing the Independent Variable
19. Solution by Operators of Non-Homogeneous Equations
20. Reduction of Order of a Differential Equation
21. Method of Variations of Parameters
22. Method of Undetermined Coefficients
23. Ordinary Simultaneous Differential Equations
24. Solution of Simultaneous Equations Involving Operators
25. Simultaneous Equations of the Form $dx/P = dy/Q = dz/R$
26. Total Differential Equations: Introduction
27. Condition for $Pdx + Qdy + Rdz = 0$ to Be Exact
28. General Method of Solving $Pdx + Qdy + Rdz = 0$
29. Method of Auxiliary Equations
30. Applications of Differential Equations in Real-Life Problems
31. Advanced Problems in Exact Differential Equations
32. Advanced Problems in Linear Differential Equations
33. Practice Session on Orthogonal Trajectories

34. Practice Session on Higher Order Differential Equations
35. Preparation for Internal Assessment
36. Discussion on Previous Year Papers
37. Revision Session
38. Problem-Solving Techniques in Differential Equations
39. Final Preparatory Session
40. Recapitulation and Doubt Clearing

Paper 6: Vector Calculus and Geometry (Code: MA-106)

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1. Introduction to Vector Calculus: Basic Concepts
2. Scalar and Vector Products of Three Vectors
3. Product of Four Vectors
4. Reciprocal Vectors
5. Vector Differentiation: Basic Definitions
6. Scalar-Valued Point Functions
7. Vector-Valued Point Functions
8. Derivative Along a Curve
9. Directional Derivatives
10. Gradient of a Scalar Point Function
11. Geometrical Interpretation of Gradient
12. Character of Gradient as a Point Function
13. Divergence of a Vector Point Function
14. Character of Divergence as a Point Function
15. Curl of a Vector Point Function
16. Character of Curl as a Point Function
17. Gradient, Divergence, and Curl of Sums and Products
18. Related Vector Identities
19. Laplacian Operator: Definition and Applications
20. Vector Integration: Introduction
21. Line Integral and Its Applications

22. Surface Integral and Its Applications
23. Volume Integral and Its Applications
24. Gauss's Divergence Theorem
25. Applications of Gauss's Divergence Theorem
26. Green's Theorem and Its Applications
27. Stokes' Theorem and Its Applications
28. Problems Based on Vector Identities
29. General Equation of Second Degree in Geometry
30. Tracing of Conics: Parabola
31. Tracing of Conics: Ellipse
32. Tracing of Conics: Hyperbola
33. Polar Equation of a Conic
34. Properties of Conic Sections in Polar Coordinates
35. Advanced Problems in Vector Calculus
36. Advanced Problems in Conic Sections
37. Preparation for Internal Assessment
38. Discussion on Previous Year Papers
39. Revision Session
40. Final Preparatory Session

Lesson Plan for Chemistry - CH-102

Unit 1: Hydrogen Bonding, Vander Waals Forces, and Metallic Bond

1. Lecture 1: Introduction to Hydrogen Bonding: Definition and Types
2. Lecture 2: Effects of Hydrogen Bonding on Physical Properties
3. Lecture 3: Applications of Hydrogen Bonding in Chemistry
4. Lecture 4: Overview of Vander Waals Forces: Types and Significance
5. Lecture 5: Introduction to Metallic Bond: Basic Concepts
6. Lecture 6: Band Theory of Metallic Bond
7. Lecture 7: Types and Applications of Semiconductors

Unit 2: s-Block Elements and Noble Gases

8. Lecture 8: Comparative Study of s-Block Elements
9. Lecture 9: Diagonal Relationships in s-Block Elements
10. Lecture 10: Hydrides of s-Block Elements: Properties and Functions
11. Lecture 11: Solvation and Complexation Tendencies in s-Block Elements
12. Lecture 12: Chemical Properties and Low Reactivity of Noble Gases
13. Lecture 13: Chemistry of Xenon: Fluorides, Oxides, and Oxyfluorides

Unit 3: p-Block Elements

14. Lecture 14: Comparative Study of p-Block Elements
15. Lecture 15: Boron Family: Diborane - Properties and Structure
16. Lecture 16: Borazine: Chemical Properties and Structure
17. Lecture 17: Trihalides of Boron: Acid Character and Structure
18. Lecture 18: Carbon Family: Catenation and p–d Bonding
19. Lecture 19: Carbides and Fluorocarbons
20. Lecture 20: Silicates and Silicones: Structural Aspects and Uses

Unit 4: Nitrogen, Oxygen, and Halogen Families

21. Lecture 21: Nitrogen Family: Structures of Oxides and Oxyacids
22. Lecture 22: Phosphorus: White, Yellow, and Red Allotropes
23. Lecture 23: Oxygen Family: Oxyacids of Sulfur - Structures and Acid Strength
24. Lecture 24: Hydrogen Peroxide: Structure, Properties, and Uses
25. Lecture 25: Halogen Family: Basic Properties and Types of Interhalogens
26. Lecture 26: Hydro and Oxyacids of Chlorine: Structure and Acid Strength

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Lesson Plan for Chemistry - CH-104

UNIT-I: Alkenes (11 Lectures)

1. Lecture 1: Nomenclature of Alkenes
2. Lecture 2: Mechanisms of Dehydration of Alcohols
3. Lecture 3: Dehydrohalogenation of Alkyl Halides
4. Lecture 4: The Saytzeff Rule
5. Lecture 5: Hofmann Elimination
6. Lecture 6: Physical Properties and Relative Stabilities of Alkenes
7. Lecture 7: Hydrogenation: Mechanism and Reactions
8. Lecture 8: Electrophilic and Free Radical Additions
9. Lecture 9: Markownikoff's Rule and Hydroboration-Oxidation
10. Lecture 10: Oxymercuration-Reduction and Ozonolysis
11. Lecture 11: Hydration, Hydroxylation, and Oxidation with KMnO4

UNIT-II: Arenes and Aromaticity (10 Lectures)

12. Lecture 12: Nomenclature of Benzene Derivatives
13. Lecture 13: Aromatic Nucleus and Side Chain
14. Lecture 14: Huckel Rule and Aromaticity
15. Lecture 15: Aromatic, Antiaromatic, and Non-Aromatic Compounds
16. Lecture 16: Aromatic Electrophilic Substitution: General Mechanism
17. Lecture 17: Nitration and Halogenation of Arenes
18. Lecture 18: Sulphonation and Friedel-Crafts Reaction
19. Lecture 19: Energy Profile Diagrams in Aromatic Substitution
20. Lecture 20: Activating and Deactivating Substituents
21. Lecture 21: Orientation in Aromatic Electrophilic Substitution

UNIT-III: Dienes and Alkynes (9 Lectures)

22. Lecture 22: Nomenclature and Classification of Dienes
23. Lecture 23: Structure of Butadiene and 1,2 and 1,4 Additions
24. Lecture 24: Electrophilic and Free Radical Mechanism in Dienes
25. Lecture 25: Diels-Alder Reaction: Mechanism and Examples
26. Lecture 26: Nomenclature, Structure, and Bonding in Alkynes
27. Lecture 27: Methods of Formation of Alkynes
28. Lecture 28: Chemical Reactions of Alkynes
29. Lecture 29: Acidity of Alkynes
30. Lecture 30: Electrophilic and Nucleophilic Addition Reactions

UNIT-IV: Alkyl and Aryl Halides (9 Lectures)

31. Lecture 31: Nomenclature and Classes of Alkyl Halides
32. Lecture 32: Methods of Formation of Alkyl Halides
33. Lecture 33: Chemical Reactions of Alkyl Halides
34. Lecture 34: Mechanisms and Stereochemistry of SN2 Reactions
35. Lecture 35: Mechanisms and Stereochemistry of SN1 Reactions
36. Lecture 36: Energy Profile Diagrams for SN2 and SN1 Reactions
37. Lecture 37: Formation and Reactions of Aryl Halides
38. Lecture 38: Addition-Elimination Mechanism in Nucleophilic Aromatic Substitution
39. Lecture 39: Elimination-Addition Mechanism in Nucleophilic Aromatic Substitution
40. Lecture 40: Reactivity of Alkyl, Allyl, Vinyl, and Aryl Halides

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Lesson Plan for Chemistry - CH-106

Unit 1: Kinetics-I (7 Lectures)

1. Lecture 1: Introduction to Reaction Kinetics: Rate, Rate Equation
2. Lecture 2: Factors Influencing Reaction Rates: Concentration, Temperature
3. Lecture 3: Pressure, Solvent, Light, and Catalyst Effects
4. Lecture 4: Reaction Order: Definitions and Concepts

5. Lecture 5: Integrated Rate Expressions: Zero, First Order
6. Lecture 6: Second and Third Order Reactions: Half-life Period
7. Lecture 7: Methods for Determining Reaction Order

Unit 2: Kinetics-II (6 Lectures)

8. Lecture 8: Temperature's Effect on Reaction Rate: Arrhenius Equation
9. Lecture 9: Simple Collision Theory: Unimolecular Collisions
10. Lecture 10: Bimolecular Collisions: Theoretical Concepts
11. Lecture 11: Transition State Theory: Overview
12. Lecture 12: Transition State Theory: Bimolecular Reactions
13. Lecture 13: Comparative Analysis of Theories

Unit 3: Electrochemistry-I (8 Lectures)

14. Lecture 14: Electrolytic Conduction: Factors and Concepts
15. Lecture 15: Conductance Types: Specific, Molar, Equivalent
16. Lecture 16: Variation of Conductance with Concentration
17. Lecture 17: Arrhenius Theory of Ionization
18. Lecture 18: Ostwald's Dilution Law and Applications
19. Lecture 19: Debye-Huckel-Onsager's Equation: Introduction
20. Lecture 20: Transport Number: Definition and Determination
21. Lecture 21: Numerical Problems on Conductance and Transport Numbers

Unit 4: Electrochemistry-II (9 Lectures)

22. Lecture 22: Kohlrausch's Law: Definition and Applications
23. Lecture 23: Molar Ionic Conductance: Effects of Viscosity, Temperature
24. Lecture 24: Calculation of Conductance: Weak Electrolytes
25. Lecture 25: Conductometry: Applications in Chemistry
26. Lecture 26: Degree of Dissociation: Determination Methods
27. Lecture 27: Solubility Product of Sparingly Soluble Salts
28. Lecture 28: Conductometric Titrations: Overview and Examples
29. Lecture 29: pH and pKa: Definitions, Buffer Solutions
30. Lecture 30: Buffer Mechanisms and Henderson-Hasselbalch Equation

SCHOOL OF BASIC AND APPLIED SCIENCES

(Scheme of Studies & Examinations)

B. Sc. (PCM) II Year (III Semester)

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UNIVERSITY

B. Sc. (PCM) II Year (III Semester) Scheme

Sr. No.	Subject	Pape r Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH- 201	Inorganic Chemistry	2	0	40	60	100	3	2
2		CH- 203	Elective Paper	2	0	40	60	100	3	2
3		CH- 205	Physical Chemistry	2	0	40	60	100	3	2
4		CH- 207	Chemistry Lab-III	0	6	20	30	50	4	3
5	Physics	PHY- 201	Optics – 1	2	0	40	60	100	3	2
6		PHY- 203	Modern Physics – 1	2	0	40	60	100	3	2
7		PHY- 205	Electronics – 1	2	0	40	60	100	3	2
8		PHY- 207	Physics Lab- III	0	6	20	30	50	4	3
9	Mathematics	MA- 201	Advance Calculus	2	0	40	60	100	3	2
10		MA- 203	Partial Differential Equations	2	0	40	60	100	3	2
11		MA- 205	Elective Paper	2	0	40	60	100	3	2
12		-	-	2	2	40	60	100	3	2
Total				20	14			1100		26

Course Outcomes

Inorganic Chemistry (CH-201) Course Outcomes:

1. CO 1: Have good knowledge about d-block elements particularly of transition elements.
2. CO 2: To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties of some compounds of transition elements.
3. CO 3: To know about the basic concepts of coordination chemistry like EAN, Werner theory of coordination, nomenclature and isomerism in coordination complexes.
4. CO 4: Students can gain knowledge about the properties and reactions in non-aqueous solvents like liquid NH3 and liquid SO2, and also the concept of Acids and Bases.

Organic Chemistry (CH-203) Course Outcomes:

1. CO 1: Have comprehensive knowledge of the synthesis and properties of alcohols and epoxides CO 2: Know about synthesis and properties of phenols and their chemical reactions.
2. CO 3: Have knowledge of Beer-Lambert law, molar absorptivity, different electronic transitions, analysis UV spectra and application of UV spectroscopy in structure elucidation.
3. CO 4: Knowledge about various methods for the preparation of carboxylic acid, carboxylic derivatives (ester, amide, acid chlorides, anhydrides) and their chemical reactions.

Physical Chemistry (CH-205) Course Outcomes:

1. CO 1: To know about different process, functions and 1st law of thermodynamics
2. CO 2: To have knowledge about w, q, dU & dH and Kirchoffs equation
3. CO 3: To understand the basic terms related to chemical equilibrium and derive the law thermodynamically, deduce relation between various equilibrium constants and determining partition coefficient of a solvent dissolved in two immiscible solvents
4. CO 4: To have good knowledge about distribution law and its applications

Optics-I (PHY-201) Course Outcomes:

1. CO 1: Student gains the knowledge on Electromagnetic nature of light. CO 2: Student gets a thorough knowledge optical properties of light.
2. CO 3: Applications of different techniques to correct the aberrations.
3. CO 4: Studies different eye pieces and various methods to produce collimatedparallel beams of

light.

4. CO 5: Finds the applications of diffraction and its classification in day – to – day life.

Modern Physics – 1(PHY-203)

1. CO 1: To understand the difference between Atomic and Molecular spectroscopies.
2. CO 2: Understand the intuitive ideas of the Quantum physics and Nuclear physics.
3. CO 3: Derive Schrodinger time dependent and time independent wave equations
4. CO 4: To understand dual nature of matter
5. CO 5: Gain knowledge on classification of various crystal systems

Electronics-I (PHY-205) Course Outcomes:

1. Understand the diode and transistor characteristics.
2. Verify the rectifier circuits using diodes and implement them using hardware.
3. Design the biasing circuits like self biasing.
4. Design various amplifiers like CE, CC, common source amplifiers and implement them using hardware and also observe their frequency responses
5. Analyze the concepts of SCR and observe its characteristics.

Advance Calculus (MA-201)

Course Outcomes:

1. CO 1: Understand raw materials for growth calculus functions
2. CO 2: Have comprehensive exposure to the subject of Advanced Calculus
3. CO 3: Develop the knowledge and confidence to pursue advanced courses Understand the role of Advanced calculus

Partial differential equations (MA-203) Course Outcomes:

1. CO1: Classify partial differential equations and transform into canonical form
2. CO 2: Solve linear partial differential equations of both first and second order
3. CO 3: Apply partial derivative equation techniques to predict the behaviour of certain Phenomena.
4. CO 4: Apply specific methodologies, techniques and resources to conduct research and Produce innovative results in the area of specialization.
5. CO 5: Extract information from partial derivative models in order to interpret reality.

Co-PO Mapping

CH-201	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-203	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-205	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-201	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-203	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-205	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-201	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-203	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-205	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

Lesson Plan for Semester III

Paper 7: Advanced Calculus (Code: MA-201)

1. Introduction to Advanced Calculus: Basic Concepts
2. Limit and Continuity of Functions of Two Variables
3. Partial Differentiation: Basic Definitions
4. Euler's Theorem on Homogeneous Functions
5. Total Differentials
6. Maxima and Minima of Functions of Two Variables
7. Lagrange's Method of Undetermined Multipliers
8. Curvature: Radius of Curvature
9. Envelopes and Evolutes
10. Multiple Integrals: Double Integration
11. Change of Order of Integration
12. Triple Integration
13. Applications of Double Integration
14. Applications of Triple Integration
15. Beta and Gamma Functions: Definitions
16. Properties of Beta and Gamma Functions
17. Relation Between Beta and Gamma Functions
18. Evaluation of Integrals Using Beta and Gamma Functions
19. Jacobian and Its Applications
20. Vector Differentiation: Gradient, Divergence, and Curl
21. Directional Derivatives and Their Applications
22. Line Integrals and Their Properties
23. Surface Integrals and Their Properties
24. Volume Integrals and Their Properties
25. Green's Theorem in the Plane

26. Stokes' Theorem and Its Applications
27. Gauss's Divergence Theorem
28. Applications of Divergence Theorem
29. Advanced Problems in Partial Differentiation
30. Advanced Problems in Multiple Integrals
31. Practice Session on Beta and Gamma Functions
32. Practice Session on Vector Calculus
33. Preparation for Internal Assessment
34. Discussion on Previous Year Papers
35. Revision Session
36. Problem-Solving Techniques in Advanced Calculus
37. Review of Key Concepts
38. Advanced Problem-Solving Session
39. Final Preparatory Session
40. Recapitulation and Doubt Clearing

Paper 8: Partial Differential Equations (Code: MA-203)

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1. Introduction to Partial Differential Equations: Basic Concepts
2. Formation of Partial Differential Equations
3. First-Order Partial Differential Equations
4. Linear Partial Differential Equations of First Order
5. Lagrange's Method for Solving First-Order PDEs
6. Non-Linear Partial Differential Equations of First Order
7. Charpit's Method for Solving Non-Linear PDEs
8. Standard Forms of First-Order PDEs
9. Clairaut's Equation and Its Solutions
10. Compatible Systems of First-Order Equations
11. Jacobi's Method for Solving PDEs
12. Second-Order Partial Differential Equations

13. Classification of Second-Order PDEs: Elliptic, Parabolic, and Hyperbolic
14. Canonical Forms of Second-Order PDEs
15. Solution of the One-Dimensional Wave Equation
16. Solution of the One-Dimensional Heat Equation
17. Solution of the Two-Dimensional Laplace Equation
18. Separation of Variables: Introduction
19. Application of Separation of Variables in Solving PDEs
20. Fourier Series Solutions for PDEs
21. Boundary Value Problems and Their Solutions
22. Initial Value Problems and Their Solutions
23. Method of Characteristics for First-Order PDEs
24. D'Alembert's Solution of the Wave Equation
25. Laplace Transform Method for Solving PDEs
26. Fourier Transform Method for Solving PDEs
27. Applications of PDEs in Physics and Engineering
28. Advanced Problems in First-Order PDEs
29. Advanced Problems in Second-Order PDEs
30. Practice Session on Canonical Forms
31. Practice Session on Separation of Variables
32. Preparation for Internal Assessment
33. Discussion on Previous Year Papers
34. Revision Session
35. Problem-Solving Techniques in PDEs
36. Review of Key Concepts
37. Advanced Problem-Solving Session
38. Final Preparatory Session
39. Recapitulation and Doubt Clearing
40. Wrap-Up Session

Paper 9: Elective Paper (Statics or Number Theory and Cryptography) (Code: MA-205A/MA-205B)

Option A: Statics (MA-205A)

1. Introduction to Statics: Basic Concepts
2. Forces Acting at a Point
3. Resultant of a System of Coplanar Forces
4. Equilibrium of Forces in Two Dimensions
5. Equilibrium of Forces in Three Dimensions
6. Applications of Lami's Theorem
7. Concept of Centre of Gravity
8. Determination of Centre of Gravity for Various Shapes
9. Friction: Laws of Friction
10. Applications of Friction in Equilibrium Problems
11. Virtual Work: Principle and Applications
12. Forces in Three Dimensions
13. Equilibrium of a Particle in Space
14. Forces Acting on a Rigid Body
15. Parallel Forces: Resultant and Applications
16. Couples and Their Properties
17. Conditions of Equilibrium for Rigid Bodies
18. Analytical Conditions of Equilibrium
19. Reduction of Coplanar Forces
20. Reduction of Forces in Three Dimensions
21. Graphical Statics: Introduction
22. Funicular Polygon for Coplanar Forces
23. Reciprocal Figures in Graphical Statics
24. Simple Applications of Graphical Statics
25. Shearing Force and Bending Moment
26. Applications of Shearing Force in Beams
27. Bending Moment Diagrams

28. Applications of Statics in Real-Life Problems
29. Advanced Problems in Statics
30. Practice Session on Equilibrium
31. Practice Session on Graphical Statics
32. Preparation for Internal Assessment
33. Discussion on Previous Year Papers
34. Revision Session
35. Problem-Solving Techniques in Statics
36. Review of Key Concepts
37. Advanced Problem-Solving Session
38. Final Preparatory Session
39. Recapitulation and Doubt Clearing
40. Wrap-Up Session

Option B: Number Theory and Cryptography (MA-205B)

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1. Introduction to Number Theory: Basic Concepts
2. Divisibility and Division Algorithm
3. Greatest Common Divisor and Euclidean Algorithm
4. Fundamental Theorem of Arithmetic
5. Prime Numbers and Their Properties
6. Congruences: Definition and Basic Properties
7. Linear Congruences and Their Solutions
8. Chinese Remainder Theorem
9. Euler’s Theorem and Its Applications
10. Fermat’s Little Theorem
11. Wilson’s Theorem
12. Multiplicative Inverses and Applications
13. Quadratic Residues and Legendre Symbols
14. Law of Quadratic Reciprocity
15. Diophantine Equations: Introduction

16. Linear Diophantine Equations
17. Pell's Equation and Its Solutions
18. Continued Fractions: Definition and Properties
19. Applications of Continued Fractions
20. Introduction to Cryptography
21. Classical Cryptosystems: Substitution and Transposition Ciphers
22. Cryptanalysis of Classical Ciphers
23. Public Key Cryptography: Basic Concepts
24. RSA Algorithm: Encryption and Decryption
25. Applications of Number Theory in Cryptography
26. Elliptic Curve Cryptography: Introduction
27. Advanced Encryption Standard (AES)
28. Applications of Cryptography in Real-Life Scenarios
29. Advanced Problems in Number Theory
30. Practice Session on Cryptography Algorithms
31. Preparation for Internal Assessment
32. Discussion on Previous Year Papers
33. Revision Session
34. Problem-Solving Techniques in Number Theory
35. Review of Key Concepts in Cryptography
36. Advanced Problem-Solving Session
37. Final Preparatory Session
38. Recapitulation and Doubt Clearing
39. Wrap-Up Session
40. Overview of Future Applications

Lesson Plan for Chemistry - CH-201

UNIT–I: Chemistry of Elements of I Transition Series (6 Lectures)

1. Lecture 1: Introduction to Transition Elements
2. Lecture 2: Position in Periodic Table

3. Lecture 3: General Characteristics & Properties
4. Lecture 4: Structures & Properties of TiO_2
5. Lecture 5: Structures & Properties of $VOCl_2$
6. Lecture 6: Structures & Properties of $FeCl_3$, $CuCl_2$, $Ni(CO)_4$

UNIT–II: Elements of IInd & IIIrd Transition Series (7 Lectures)

7. Lecture 7: Characteristics of IInd & IIIrd Transition Elements
8. Lecture 8: Comparison of 3d, 4d & 5d Elements
9. Lecture 9: Ionic Radii Comparison
10. Lecture 10: Oxidation State Comparison
11. Lecture 11: Magnetic Properties
12. Lecture 12: Spectral Properties
13. Lecture 13: Stereochemistry of Transition Elements

UNIT–III: Coordination Compounds (9 Lectures)

14. Lecture 14: Werner's Coordination Theory
15. Lecture 15: Effective Atomic Number Concept
16. Lecture 16: Introduction to Chelates
17. Lecture 17: Nomenclature of Coordination Compounds
18. Lecture 18: Isomerism in Coordination Compounds I
19. Lecture 19: Isomerism in Coordination Compounds II
20. Lecture 20: Valence Bond Theory I
21. Lecture 21: Valence Bond Theory II
22. Lecture 22: Application of Valence Bond Theory

UNIT–IV: Non-Aqueous Solvents (4 Lectures)

23. Lecture 23: Physical Properties of Solvents
24. Lecture 24: Types & Characteristics of Solvents
25. Lecture 25: Reactions in Liquid NH_3

26. Lecture 26: Reactions in Liquid SO_2

UNIT–V: Acids and Bases, HSAB Concept (4 Lectures)

27. Lecture 27: Arrhenius & Bronsted-Lowry Concepts
28. Lecture 28: Lux-Flood, Solvent System, Lewis Concepts
29. Lecture 29: Relative Strength of Acids & Bases
30. Lecture 30: HSAB Concept, Symbiosis, Electronegativity

Lesson Plan for Chemistry - CH-203

Unit 1: Alcohols and Epoxides (7 Lectures)

1. Lecture 1: Monohydric Alcohols: Nomenclature and Formation
2. Lecture 2: Reduction of Aldehydes and Ketones to Alcohols
3. Lecture 3: Hydrogen Bonding and Acidic Nature of Alcohols
4. Lecture 4: Reactions of Alcohols: Overview
5. Lecture 5: Dihydric Alcohols: Nomenclature and Formation
6. Lecture 6: Oxidative Cleavage of Glycols (Pb(OAc)4 and HIO4)
7. Lecture 7: Pinacol-Pinacolone Rearrangement

Unit 2: Phenols (7 Lectures)

8. Lecture 8: Nomenclature, Structure, and Bonding of Phenols
9. Lecture 9: Preparation and Properties of Phenols
10. Lecture 10: Acidic Character of Phenols vs. Alcohols
11. Lecture 11: Resonance Stabilization of Phenoxide Ion
12. Lecture 12: Electrophilic Aromatic Substitution in Phenols
13. Lecture 13: Mechanisms: Fries and Claisen Rearrangements
14. Lecture 14: Reimer-Tiemann, Kolbe's, Schotten-Baumann Reactions

Unit 3: UV Absorption Spectroscopy (8 Lectures)

15. Lecture 15: Absorption Laws: Beer-Lambert Law and Molar Absorptivity
16. Lecture 16: UV Spectra: Presentation and Analysis

17. Lecture 17: Types of Electronic Transitions
18. Lecture 18: Effect of Conjugation on Absorption
19. Lecture 19: Chromophores and Auxochromes: Concepts
20. Lecture 20: Spectral Shifts: Bathochromic, Hypsochromic, Hyperchromic
21. Lecture 21: UV Spectra of Conjugated Enes and Enones
22. Lecture 22: Woodward-Fieser Rules: Calculation of λmax

Unit 4: Carboxylic Acids & Derivatives (8 Lectures)

23. Lecture 23: Nomenclature, Structure, and Bonding of Carboxylic Acids
24. Lecture 24: Acidity and Substituent Effects on Carboxylic Acids
25. Lecture 25: Preparation and Reactions of Carboxylic Acids
26. Lecture 26: Hell-Volhard Zelinsky Reaction
27. Lecture 27: Reduction and Decarboxylation of Carboxylic Acids
28. Lecture 28: Acid Derivatives: Nomenclature and Preparation
29. Lecture 29: Stability and Interconversion of Acyl Derivatives
30. Lecture 30: Esterification and Hydrolysis Mechanisms (Acidic/Basic)

Lesson Plan for Chemistry - CH-205

Unit 1: Thermodynamics-I (8 Lectures)

1. **Lecture 1:** Introduction to Thermodynamics: Basic Terms
2. Lecture 2: Types of Systems: Intensive vs. Extensive Properties
3. Lecture 3: State and Path Functions: Differentials
4. Lecture 4: Thermodynamic Processes: Concepts of Heat and Work
5. Lecture 5: Zeroth Law: Temperature and Thermal Equilibrium
6. Lecture 6: First Law of Thermodynamics: Internal Energy
7. Lecture 7: Enthalpy: Heat Capacities and Their Relationship
8. Lecture 8: Applications: First Law and Thermodynamic Processes

Unit 2: Thermodynamics-II (8 Lectures)

9. **Lecture 9**: Joule's Law: Ideal and Real Gases

10. Lecture 10: Joule-Thomson Effect: Coefficient and Inversion Temp.
11. Lecture 11: Work and Heat Calculations for Ideal Gases
12. Lecture 12: Isothermal and Adiabatic Expansion: Reversible Processes
13. Lecture 13: Temperature Dependence of Enthalpy: Kirchoff's Equation
14. Lecture 14: Bond Energies: Calculation and Applications
15. Lecture 15: Applications: Expansion Processes and Bond Energy
16. Lecture 16: Review of Thermodynamics: Key Concepts

Unit 3: Chemical Equilibrium (7 Lectures)

17. Lecture 17: Equilibrium Constant and Free Energy: Definitions
18. Lecture 18: Chemical Potential: Thermodynamic Derivation
19. Lecture 19: Law of Chemical Equilibrium: Derivation and Concepts
20. Lecture 20: Temperature Dependence: Van't Hoff Isochore
21. Lecture 21: Van't Hoff Isotherm: Applications
22. Lecture 22: Le-Chatelier's Principle: Clausius-Clapeyron Equation
23. Lecture 23: Applications: Equilibrium in Reactions

Unit 4: Distribution Law (7 Lectures)

24. Lecture 24: Nernst Distribution Law: Derivation
25. Lecture 25: Modifications: Dissociation, Association, Chemical Comb.
26. Lecture 26: Application: Hydrolysis of Aniline Hydrochloride
27. Lecture 27: Application: Potassium Triiodide Complex
28. Lecture 28: Process of Extraction: Distribution Law
29. Lecture 29: Review of Distribution Law: Key Concepts
30. Lecture 30: Summary and Review: Thermodynamics and Equilibrium

Week 1-3: UNIT I - Electrostatics and Gauss's Theorem (10 Lectures)

1. **Lecture 1:** Introduction to Coulomb's Law of Electrostatics: Basic Concepts
2. **Lecture 2:** Electric Intensity and Potential: Definitions and Relations
3. **Lecture 3:** Gauss's Theorem: Statement and Derivation
4. **Lecture 4:** Applications of Gauss's Theorem: Symmetric Charge Distributions
5. **Lecture 5:** Poisson's and Laplace's Equations: Derivation and Physical Significance
6. **Lecture 6:** Deduction from Gauss's Theorem: Potential and Field Calculations
7. **Lecture 7:** Uniqueness Theorem: Statement and Applications
8. **Lecture 8:** Superposition Theorem: Statement and Examples
9. **Lecture 9:** Application of Laplace's Equation to Spherical Charge Distribution
10. **Lecture 10:** Problem Solving Session: Electrostatics and Gauss's Theorem

Week 4-6: UNIT II - Multipolar Expansion and Dipole Interactions (10 Lectures)

1. **Lecture 11:** Introduction to Multipolar Expansion of Scalar Potential: Monopole Term
2. **Lecture 12:** Dipole Term in Multipolar Expansion: Definition and Examples
3. **Lecture 13:** Quadrupole Term in Multipolar Expansion: Concepts and Applications
4. **Lecture 14:** Potential and Field Due to a Dipole: Calculations and Examples
5. **Lecture 15:** Work Done in Deflecting a Dipole: Theory and Calculations
6. **Lecture 16:** Dipole-Dipole Interaction: Electric Dipoles
7. **Lecture 17:** Dipole-Dipole Interaction: Magnetic Dipoles
8. **Lecture 18:** Force on a Dipole in a Non-Homogeneous Field: Derivation and Applications
9. **Lecture 19:** Application Examples: Dipole Interactions in Various Fields
10. **Lecture 20:** Problem Solving Session: Multipolar Expansion and Dipole Interactions

Week 7-9: UNIT III - Polarization and Dielectric Media (10 Lectures)

1. **Lecture 21:** Introduction to Polarization: Concepts and Mechanisms
2. **Lecture 22:** Electric Displacement Vector (D): Definition and Applications
3. **Lecture 23:** Gauss's Theorem in Dielectric Media: Application and Boundary Conditions
4. **Lecture 24:** Boundary Conditions for Electric Fields: Theory and Examples
5. **Lecture 25:** Electrostatic Field Energy: Concepts and Calculations
6. **Lecture 26:** Computation of Capacitance: Parallel Plate Capacitors
7. **Lecture 27:** Spherical Capacitors Containing Dielectrics: Uniform and Non-Uniform Cases
8. **Lecture 28:** Cylindrical Capacitors Containing Dielectrics: Uniform and Non-Uniform Cases
9. **Lecture 29:** Practical Applications: Capacitors in Circuit Design
10. **Lecture 30:** Problem Solving Session: Polarization, Displacement, and Capacitance

Week 10-12: UNIT IV - Boundary Value Problems and Field Solutions (10 Lectures)

1. **Lecture 31:** Introduction to Boundary Value Problems in Electrostatics
2. **Lecture 32:** Field Problems: Point Charge Near a Grounded Conducting Infinite Plane
3. **Lecture 33:** Method of Images: Application to Grounded Conducting Plane
4. **Lecture 34:** Boundary Value Problems in a Uniform External Field: Concepts and Methods
5. **Lecture 35:** Conducting Spherical Shell in a Uniform External Field: Solution
6. **Lecture 36:** Dielectric Sphere in a Uniform External Field: Solution

7. **Lecture 37:** Practical Examples: Boundary Value Problems in Electrostatics
8. **Lecture 38:** Numerical Techniques: Solving Boundary Value Problems
9. **Lecture 39:** Problem Solving Session: Field Problems and Boundary Value Solutions
10. **Lecture 40:** Review and Summary of Electrostatics and Boundary Value Problems

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Lesson plan Magnetism PHY – 203

Week 1-3: UNIT I - Magnetic Induction and Vector Potential (10 Lectures)

1. **Lecture 1:** Introduction to Lorentz Force: Concepts and Derivations
2. **Lecture 2:** Concept of Magnetic Induction: Definition and Applications
3. **Lecture 3:** Force on a Linear Current Element: Derivation and Examples
4. **Lecture 4:** Biot-Savart's Law: Statement and Derivation
5. **Lecture 5:** Magnetic Vector Potential: Definition and Concept
6. **Lecture 6:** Calculation of Magnetic Vector Potential: Straight Wire
7. **Lecture 7:** Magnetic Field Due to a Straight Wire: Calculation and Examples
8. **Lecture 8:** Magnetic Field Due to a Small Current Loop: Theory and Computation
9. **Lecture 9:** Vector Potential and Magnetic Induction in Simple Cases
10. **Lecture 10:** Problem Solving Session: Magnetic Induction and Vector Potential

Week 4-6: UNIT II - Magnetic Dipoles and Ampere's Law (10 Lectures)

1. **Lecture 11:** Introduction to Magnetic Dipoles: Concept and Properties
2. **Lecture 12:** Magnetic Field Due to a Dipole: Theory and Calculations
3. **Lecture 13:** Magnetic Shell: Definition and Applications
4. **Lecture 14:** Ampere's Theorem: Statement and Proof
5. **Lecture 15:** Ampere's Circuital Law: Illustration with a Straight Wire
6. **Lecture 16:** Force Between Long Parallel Current-Carrying Conductors: Derivation and Examples
7. **Lecture 17:** Magnetic Monopole: Concept and Theoretical Basis
8. **Lecture 18:** Comparison Between Static Electric and Magnetic Fields: Key Differences
9. **Lecture 19:** Magnetic Dipole Moment: Definition and Calculations
10. **Lecture 20:** Problem Solving Session: Magnetic Dipoles and Ampere's Law

Week 7-9: UNIT III - Current Distributions and Magnetization (10 Lectures)

1. **Lecture 21:** Free Current and Bound Current: Definitions and Differences
2. **Lecture 22:** Surface and Volume Density of Current Distribution: Concepts and Examples
3. **Lecture 23:** Magnetization: Definition and Physical Significance
4. **Lecture 24:** Non-Uniform Magnetization of Matter: Theory and Computations
5. **Lecture 25:** Ampere's Law in Terms of Free Current Density: Derivation and Applications
6. **Lecture 26:** Introduction to Magnetic Field Intensity (H): Definition and Uses
7. **Lecture 27:** Relation Between B and H Fields: Theory and Examples
8. **Lecture 28:** Magnetic Susceptibility and Permeability: Concepts and Calculations
9. **Lecture 29:** Practical Applications: Magnetization in Materials

10. **Lecture 30:** Problem Solving Session: Current Distributions and Magnetization

Week 10-12: UNIT IV - Boundary Conditions and Magnetic Materials (10 Lectures)

1. **Lecture 31:** Line Integral of H in Terms of Free Current: Derivation and Applications
2. **Lecture 32:** Boundary Conditions for Magnetic Field (B) and Magnetic Field Intensity (H): Theory and Examples
3. **Lecture 33:** Permanently Magnetized Body: Concepts and Examples
4. **Lecture 34:** Magnetic Scalar Potential: Definition and Applications
5. **Lecture 35:** Application of Laplace's Equation to Magnetic Sphere in Uniform Magnetic Field: Derivation and Results
6. **Lecture 36:** Hysteresis in Ferromagnetic Materials: Theory and Observations
7. **Lecture 37:** Energy Loss in Ferromagnetic Materials: Causes and Effects
8. **Lecture 38:** Magnetic Circuit: Concept and Analysis
9. **Lecture 39:** Energy Stored in Magnetic Field: Calculation and Examples
10. **Lecture 40:** Review and Summary: Magnetism Concepts and Problem Solving

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Lesson plan Optics – I PHY – 205 A

Week 1-3: UNIT I - Geometrical Optics and Optical Systems (10 Lectures)

1. **Lecture 1:** Light as Electromagnetic Waves: Overview and Principles
2. **Lecture 2:** Ray Optics: Basics and Geometrical Optics
3. **Lecture 3:** Fermat's Principle: Statement and Applications
4. **Lecture 4:** Reflection and Refraction at Curved Surfaces: Derivations and Examples
5. **Lecture 5:** Dispersion of Light: Basic Concepts and Formulas
6. **Lecture 6:** Dispersive Power of Optical Systems: Definitions and Calculations
7. **Lecture 7:** Dispersive Power of a Prism: Derivation and Applications
8. **Lecture 8:** Optical Systems: Field of View, Entrance and Exit Pupil
9. **Lecture 9:** Practical Examples: Reflection, Refraction, and Dispersion
10. **Lecture 10:** Problem Solving Session: Geometrical Optics and Optical Systems

Week 4-6: UNIT II - Aberrations and Optical Instruments (10 Lectures)

1. **Lecture 11:** Chromatic Aberration: Causes and Methods of Reduction
2. **Lecture 12:** Achromatic Lens Combination: Theory and Calculation
3. **Lecture 13:** Field of View in Optical Instruments: Definitions and Examples
4. **Lecture 14:** Entrance and Exit Pupil: Concepts and Applications
5. **Lecture 15:** Microscopes: Types, Components, and Working Principles
6. **Lecture 16:** Ramsden Eyepiece: Design and Functionality
7. **Lecture 17:** Huygens Eyepiece: Design and Functionality
8. **Lecture 18:** Huygens Principle: Statement and Applications
9. **Lecture 19:** Deduction of Laws of Reflection and Refraction from Huygens Principle
10. **Lecture 20:** Problem Solving Session: Aberrations and Optical Instruments

Week 7-9: UNIT III - Interference and Interferometers (10 Lectures)

1. **Lecture 21:** Fresnel's Bi-Prism: Principle and Applications
2. **Lecture 22:** Interference in Thin Films: Theory and Examples
3. **Lecture 23:** Fringes of Equal Inclination: Formation and Analysis
4. **Lecture 24:** Fringes of Equal Thickness: Formation and Analysis
5. **Lecture 25:** Newton's Rings: Formation, Calculation, and Applications
6. **Lecture 26:** Michelson's Interferometer: Principle and Uses
7. **Lecture 27:** Application of Michelson's Interferometer in Fine Structure Studies
8. **Lecture 28:** Multiple Beam Interference: Reflected and Transmitted Patterns
9. **Lecture 29:** Fabry-Perot Interferometer: Principle, Working, and Applications
10. **Lecture 30:** Problem Solving Session: Interference and Interferometers

Week 10-12: UNIT IV - Diffraction and Resolution (10 Lectures)

1. **Lecture 31:** Fresnel and Fraunhofer Diffraction: Classification and Concepts
2. **Lecture 32:** Fresnel's Half-Period Zones: Explanation and Applications
3. **Lecture 33:** Rectilinear Propagation of Light: Explanation and Examples
4. **Lecture 34:** Zone Plate: Concept and Applications
5. **Lecture 35:** Fraunhofer Diffraction Due to a Single Slit: Theory and Patterns
6. **Lecture 36:** Fraunhofer Diffraction Due to a Double Slit: Theory and Patterns
7. **Lecture 37:** Fraunhofer Diffraction Due to a Circular Aperture: Qualitative Analysis
8. **Lecture 38:** Plane Diffraction Grating (Transmission): Theory and Calculation
9. **Lecture 39:** Rayleigh Criterion of Resolution: Definition and Applications
10. **Lecture 40:** Resolving Power of Optical Systems: Prism, Telescope, Microscope, and Grating

SCHOOL OF BASIC AND APPLIED SCIENCES

(Scheme of Studies & Examinations)

B. Sc. (PCM) II Year (IV Semester)

RAFFLES
UNIVERSITY

B. Sc. (PCM) II Year (IV Semester) Scheme

Sr. No.	Subject	Pap er Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credit s
				L	P	IA	End Term	Total		
1	Chemistry	CH- 202	Elective Paper	2	0	40	60	100	3	2
2		CH- 204	Organic Chemistry	2	0	40	60	100	3	2
3		CH- 206	Physical Chemistry	2	0	40	60	100	3	2
4		CH- 208	Chemistry Lab-IV	0	6	40	60	100	4	3
5	Physics	PHY- 202	Optics – 2	2	0	40	60	100	2	2
6		PHY- 204	Modern Physics – 2	2	0	40	60	100	2	2
7		PHY- 206	Electronics – 2	2	0	40	60	100	2	2
8		PHY- 208	Physics Lab- IV		6	40	60	100	4	3
9	Mathematics	MA- 202	Linear programmin g	2	0	40	60	100	3	2
10		MA- 204	Special Functions and Integral Transforms	2	0	40	60	100	3	2
11		MA- 206	Elective Paper	2	0	40	60	100	3	2
12	Open Elective Paper	-	-	2	0	40	60	100	3	2
TOTAL				40	12			1100		26

Course Outcomes

Inorganic Chemistry (CH-202) Course Outcomes:

1. Have good knowledge about d-block elements particularly of transition elements.
2. To study the bonding of 3d elements. To recapitulate the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbital's in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters. Students will be able to calculate the spectroscopic terms for various metal ions.
3. To study the comparison between 3d elements with 4d and 5d elements with reference to ionic radii, oxidation state, magnetic properties and spectral properties some compounds of transition elements.
4. To know about position of f block elements in periodic table and their general characteristics. To study the occurrence and separation of lanthanides and lanthanide compounds. Have knowledge of actinides their existence and general properties.
5. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.

Organic Chemistry (CH-204) Course Objective:

1. Able To describe absorptions of various functional groups and applications of IR spectroscopy. To know the application of IR spectroscopy in structure elucidation.
2. To synthesize and know reactions of amines.
3. To discuss synthetic application of diazonium salts and other nitro compounds.
4. Get knowledge about the preparation of aliphatic, aromatic aldehydes and ketones and various important name reactions of aldehydes and ketones.

Physical Chemistry (CH-206)

1. Systematic and coherent understanding of the fundamental concepts in Physical chemistry.
2. Students will be able to understand the fundamentals of thermodynamics and electrochemistry.
3. Students will be able to understand the solve problems using the properties and relationships of thermodynamic equations. Students will have understanding of thermodynamic fundamentals for application in applied thermodynamics.
4. Students will gain the knowledge of instrumentation in electrochemistry. Students would also acquire theoretical as well as practical information about the electrical conduction in liquid state.

Statistical Mechanics (PHY-202)

1. CO 1: Student gains the knowledge on fundamentals of Statistical Mechanics
2. CO 2: Student gets a thorough knowledge on different systems and ensembles.
3. CO 3: The role of partition function in scientific problem solving.
4. CO 4: Applies the statistics accordingly to different classes of particles.
5. CO 5: Applies the statistics for various quantum possible applications.

Quantum Mechanics-I (PHY-204):

1. CO 1: Student gains the knowledge on fundamentals of Quantum Mechanics
2. CO 2: Student gets a thorough knowledge on dual nature of matter and itsverification.
3. CO 3: The dynamics of fundamental particles are studied using Schrodinger timedependent and time independent wave equations.
4. CO 4: Eigen states and eigen values gives the knowledge of allowed and forbiddenenergy regions.
5. CO 5: Applies the Quantum conditions for various quantum applications.

Optics-II (PHY-206)

1. CO 1: Student gains the knowledge on basic principles of light and its applications.
2. CO 2: Student gets a thorough knowledge on types of polarization and its production andapplications. CO 3: Student gains the demonstrated knowledge on diffraction phenomenon of light.
3. CO 4: Gains a comprehensive knowledge on construction of a hologram
4. CO 5: Gains a demonstrated knowledge on 3 level laser system and atomic interferencelasing without inversion.

Linear Programming (MA-202:

1. CO1: Understand a basic thoughtfulness for linear programming problem CO2: Apply the techniques of LPP to solve real world problems
2. CO3: Judge Importance of solution obtained in terms of uniqueness, bound and optimality
3. CO4: Formulate mathematical model for management and technical problems using LPP concepts. CO5: Create an interest to solve transportation and assignment problems with its physical significance.

Special Functions and Integral (MA-204):

1. CO 1: understand integral calculus and special functions of various engineering problem and to know the application of some basic mathematical methods via all these special functions.
2. CO 2: explain the applications and the usefulness of these special functions.

3. CO 3: classify and explain the functions of different types of differential equations.
4. CO4: understand purpose and functions of the gamma and beta functions, Fourier series and Transformation.
5. CO 5: use the gamma function, beta function and special functions to: evaluate different typesof integral calculus problems and Fourier series to solve differential equations.

Special Functions and Integral Transform (MA-204)

1. CO1: Explain the applications and the usefulness of these special functions.
2. CO2: Classify and explain the functions of different types of differential equations.
3. CO3: To determine types of PDEs which may be solved by application of special functions?
4. CO4: To analyse properties of special functions by their integral representations and symmetries.
5. CO5: Identified the application of some basic mathematical methods via all these special functions.
6. CO6: Apply these techniques to solve and analyse various mathematical problems.

Co-PO mapping

CH-202	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-204	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

CH-206	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

PHY-202	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

PHY-204	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

PHY-206	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

MA-202	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

MA-204	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-206	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

Lesson Plan for Semester IV

Paper 10: Linear Programming (Code: MA-202)

1. Introduction to Linear Programming: Basic Concepts
2. Formulation of Linear Programming Problems (LPP)
3. Graphical Method for Solving LPP: Feasible Region
4. Optimal Solution Using Graphical Method
5. Special Cases in Graphical Method: Unbounded, Infeasible, and Multiple Solutions

6. Introduction to the Simplex Method
7. Theory of the Simplex Method
8. Simplex Algorithm: Basic Feasible Solutions
9. Artificial Variables: Big M Method
10. Two-Phase Simplex Method
11. Duality in Linear Programming: Introduction
12. Formulation of Dual Problems
13. Economic Interpretation of Duality
14. Dual Simplex Method
15. Sensitivity Analysis in LPP
16. Transportation Problems: Introduction
17. North-West Corner Rule for Initial Solution
18. Vogel's Approximation Method (VAM)
19. Optimality Test: MODI Method
20. Assignment Problems: Introduction
21. Hungarian Method for Assignment Problems
22. Variations of the Assignment Problem
23. Integer Programming: Basic Concepts
24. Cutting Plane Method for Integer Solutions
25. Branch and Bound Method
26. Game Theory: Introduction
27. Two-Person Zero-Sum Games
28. Saddle Point and Mixed Strategy
29. Graphical Solution of 2xN and Mx2 Games
30. Principle of Dominance in Game Theory
31. Sequencing Problems: Introduction
32. Solution of Sequencing Problems
33. Queuing Theory: Introduction
34. Poisson and Exponential Distributions in Queuing
35. Applications of Linear Programming in Real-Life Problems
36. Advanced Problems in Linear Programming
37. Preparation for Internal Assessment

38. Discussion on Previous Year Papers
39. Revision Session
40. Final Preparatory Session

Paper 11: Special Functions and Integral Transforms (Code: MA-204)

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1. Introduction to Special Functions
2. Gamma Function: Definition and Properties
3. Beta Function: Definition and Properties
4. Relation Between Beta and Gamma Functions
5. Evaluation of Integrals Using Gamma and Beta Functions
6. Legendre's Differential Equation
7. Legendre Polynomials: Properties
8. Rodrigues' Formula for Legendre Polynomials
9. Orthogonality of Legendre Polynomials
10. Generating Function for Legendre Polynomials
11. Bessel's Differential Equation
12. Bessel Functions: Definition and Properties
13. Generating Function for Bessel Functions
14. Recurrence Relations for Bessel Functions
15. Orthogonality of Bessel Functions
16. Hermite's Differential Equation
17. Hermite Polynomials: Properties
18. Recurrence Relations for Hermite Polynomials
19. Orthogonality of Hermite Polynomials
20. Chebyshev Polynomials: Introduction and Properties
21. Recurrence Relations for Chebyshev Polynomials
22. Fourier Series: Introduction
23. Expansion of Functions in Fourier Series
24. Even and Odd Functions in Fourier Series
25. Half-Range Fourier Series

26. Introduction to Integral Transforms
27. Laplace Transforms: Definition and Properties
28. Inverse Laplace Transform
29. Applications of Laplace Transforms to Differential Equations
30. Fourier Transforms: Definition and Properties
31. Applications of Fourier Transforms
32. Hankel Transforms: Introduction
33. Properties and Applications of Hankel Transforms
34. Z-Transforms: Introduction
35. Applications of Z-Transforms
36. Advanced Problems in Special Functions
37. Advanced Problems in Integral Transforms
38. Preparation for Internal Assessment
39. Discussion on Previous Year Papers
40. Final Preparatory Session

Paper 12: Elective Paper (Programming in C and Numerical Methods or Differential Geometry and Tensor Analysis) (Code: MA-206A/MA-206B)

Option A: Programming in C and Numerical Methods (MA-206A)

1. Introduction to Programming in C: Basic Concepts
2. Structure of a C Program
3. Data Types, Variables, and Constants in C
4. Operators and Expressions in C
5. Control Statements: if-else, switch, for, while, do-while
6. Functions in C: Definition and Usage
7. Recursion and Iteration
8. Arrays in C: Single and Multidimensional
9. Strings in C: Handling and Operations
10. Pointers in C: Basic Concepts
11. Dynamic Memory Allocation in C
12. Structures and Unions in C

13. File Handling in C
14. Introduction to Numerical Methods
15. Solution of Non-Linear Equations: Bisection and Newton-Raphson Methods
16. Solution of Simultaneous Linear Equations: Gauss Elimination Method
17. Matrix Inversion Using Gauss-Jordan Method
18. Interpolation: Newton's and Lagrange's Methods
19. Numerical Differentiation and Integration
20. Trapezoidal and Simpson's Rule
21. Solution of Ordinary Differential Equations: Euler's Method
22. Runge-Kutta Methods for ODEs
23. Numerical Solutions for Partial Differential Equations
24. Finite Difference Method
25. Application of C Programming in Numerical Methods
26. Error Analysis in Numerical Methods
27. Case Studies Using Numerical Methods
28. Advanced Problems in C Programming
29. Advanced Problems in Numerical Methods
30. Practice Session on Programming Techniques
31. Practice Session on Numerical Techniques
32. Preparation for Internal Assessment
33. Discussion on Previous Year Papers
34. Revision Session
35. Problem-Solving Techniques in C Programming
36. Problem-Solving Techniques in Numerical Methods
37. Final Preparatory Session
38. Recapitulation and Doubt Clearing
39. Project Work on C Programming and Numerical Methods
40. Project Presentation and Review

Option B: Differential Geometry and Tensor Analysis (MA-206B)

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1. Introduction to Differential Geometry
2. Curves in Space: Parametric Equations
3. Curvature and Torsion of Curves
4. Serret-Frenet Formulas
5. Curves in Euclidean Space
6. Osculating Plane, Rectifying Plane, and Normal Plane
7. Surfaces in Space: Parametric Equations
8. First Fundamental Form
9. Second Fundamental Form
10. Curvature of Surfaces: Gaussian and Mean Curvature
11. Geodesics on Surfaces
12. Equations of Geodesics
13. Geodesic Curvature
14. Gauss-Bonnet Theorem
15. Introduction to Tensor Analysis
16. Tensors as Generalized Vectors
17. Covariant and Contravariant Tensors
18. Tensor Algebra: Basic Operations
19. Metric Tensor and Associated Tensor Fields
20. Christoffel Symbols and Their Properties
21. Covariant Differentiation
22. Riemannian Geometry: Basic Concepts
23. Riemann-Christoffel Curvature Tensor
24. Ricci Tensor and Scalar Curvature
25. Applications of Tensor Analysis in Physics
26. Advanced Problems in Differential Geometry
27. Advanced Problems in Tensor Analysis
28. Practice Session on Curves and Surfaces
29. Practice Session on Tensor Calculations
30. Preparation for Internal Assessment
31. Discussion on Previous Year Papers
32. Revision Session

33. Problem-Solving Techniques in Differential Geometry
34. Problem-Solving Techniques in Tensor Analysis
35. Final Preparatory Session
36. Recapitulation and Doubt Clearing
37. Advanced Topics in Geometry
38. Advanced Topics in Tensor Fields
39. Project Work on Differential Geometry and Tensor Analysis
40. Project Presentation and Review

Lesson Plan for Chemistry - CH-202

UNIT-I: Chemistry of f-block elements (10 Lectures)

1. Lecture 1: Introduction to f-block elements: Overview and significance.
2. Lecture 2: Lanthanides: Electronic structure and oxidation states.
3. Lecture 3: Lanthanide Contraction: Causes and consequences.
4. Lecture 4: Ionic radii and complex formation in lanthanides.
5. Lecture 5: Occurrence and isolation of lanthanides.
6. Lecture 6: Important compounds of lanthanides.
7. Lecture 7: Actinides: General features and electronic structure.
8. Lecture 8: Comparison of Lanthanides and Actinides.
9. Lecture 9: Separation techniques for Np, Pu, and Am from U.
10. Lecture 10: Actinides vs. Transition Elements: Properties.

UNIT-II: Theory of Qualitative and Quantitative Inorganic Analysis-I (10 Lectures)

11. Lecture 11: Introduction to inorganic analysis: Acidic radicals.
12. Lecture 12: Identification of common acidic radicals.
13. Lecture 13: Chemistry of analysis: Typical combinations of acid radicals.
14. Lecture 14: Interference in acidic radicals: Causes.
15. Lecture 15: Removal of interference: Methods and techniques.
16. Lecture 16: Chemistry of basic radicals: An overview.

17. Lecture 17: Precipitation: Theory and types.
18. Lecture 18: Co-precipitation: Mechanisms and examples.
19. Lecture 19: Post-precipitation: Factors and effects.
20. Lecture 20: Purification of precipitates: Methods.

UNIT-III: Theory of Qualitative and Quantitative Inorganic Analysis-II (10 Lectures)

21. Lecture 21: Group analysis of basic radicals: Principles.
22. Lecture 22: Separation of cations: Group-wise analysis.
23. Lecture 23: Precipitation reactions: Key concepts.
24. Lecture 24: Co-precipitation in analysis: Practical aspects.
25. Lecture 25: Handling post-precipitation in experiments.
26. Lecture 26: Identifying interfering radicals: Case studies.
27. Lecture 27: Advanced techniques in purification.
28. Lecture 28: Application of qualitative analysis in industry.
29. Lecture 29: Quantitative analysis: Introduction and importance.
30. Lecture 30: Final review and application in inorganic chemistry.

Lesson Plan for Chemistry - CH-204

Unit 1: Infrared (IR) Absorption Spectroscopy (7 Lectures)

1. Lecture 1: Introduction to IR Spectroscopy: Molecular Vibrations
2. Lecture 2: Hooke's Law: Selection Rules and IR Band Positions
3. Lecture 3: Intensity and Measurement of IR Spectra
4. Lecture 4: Fingerprint Region and Characteristic Absorptions
5. Lecture 5: Interpretation of IR Spectra: Simple Organic Compounds
6. Lecture 6: Functional Groups in IR Spectroscopy
7. Lecture 7: Applications of IR in Structure Elucidation

Unit 2: Amines (8 Lectures)

8. Lecture 8: Structure and Nomenclature of Amines
9. Lecture 9: Physical Properties of Amines
10. Lecture 10: Separation Techniques for Amines

11. Lecture 11: Structural Features Affecting Amines' Basicity

12. Lecture 12: Preparation of Alkyl Amines: Methods and Reactions

13. Lecture 13: Preparation of Aryl Amines: Techniques and Examples

14. Lecture 14: Electrophilic Aromatic Substitution in Aryl Amines

15. Lecture 15: Reactions of Amines with Nitrous Acid

Unit 3: Diazonium Salts and Nitro Compounds (8 Lectures)

16. Lecture 16: Diazotization Mechanism and Structure of Benzene Diazonium Chloride

17. Lecture 17: Replacement of Diazo Group by Various Groups

18. Lecture 18: Reduction of Diazonium Salts and Coupling Reactions

19. Lecture 19: Preparation and Reactions of Nitro Alkanes

20. Lecture 20: Preparation and Reactions of Nitro Arenes

21. Lecture 21: Electrophilic Substitution in Nitro Arenes

22. Lecture 22: Reduction of Nitro Compounds: Mechanisms and Media

23. Lecture 23: Synthetic Applications of Diazonium Salts and Nitro Compounds

Unit 4: Aldehydes and Ketones (7 Lectures)

24. Lecture 24: Nomenclature and Structure of Carbonyl Group

25. Lecture 25: Synthesis of Aldehydes: Methods and Applications

26. Lecture 26: Synthesis of Ketones: Techniques and Importance

27. Lecture 27: Reactivity Comparison of Aldehydes and Ketones

28. Lecture 28: Nucleophilic Additions: Mechanisms and Examples

29. Lecture 29: Oxidation and Reduction Reactions in Aldehydes and Ketones

30. Lecture 30: Key Reactions: Wittig, Mannich, Perkin, and Cannizaro

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Lesson Plan for Chemistry - CH-206

Unit 1: Thermodynamics-III (7 Lectures)

1. Lecture 1: Second Law of Thermodynamics: Introduction and Need

2. Lecture 2: Statements of the Second Law

3. Lecture 3: Carnot's Cycle: Efficiency and Theorem
4. Lecture 4: Thermodynamic Scale of Temperature
5. Lecture 5: Concept of Entropy: Definition and State Function
6. Lecture 6: Entropy Changes in Physical Processes
7. Lecture 7: Entropy as Criteria of Spontaneity and Equilibrium

Unit 2: Thermodynamics-IV (7 Lectures)

8. Lecture 8: Third Law of Thermodynamics: Nernst Heat Theorem

9. Lecture 9: Residual Entropy and Absolute Entropy
10. Lecture 10: Gibbs and Helmholtz Functions: Definitions
11. Lecture 11: Criteria for Equilibrium and Spontaneity: A and G
12. Lecture 12: Variation of G and A with Pressure and Volume
13. Lecture 13: Variation of G and A with Temperature
14. Lecture 14: Applications and Advantages of G and A

Unit 3: Electrochemistry-III (8 Lectures)

15. Lecture 15: Electrolytic and Galvanic Cells: Basics

16. Lecture 16: Reversible and Irreversible Cells
17. Lecture 17: EMF of Cells: Measurement and Significance
18. Lecture 18: Standard Cell and Thermodynamic Quantities
19. Lecture 19: Nernst Equation and Electrode Reactions
20. Lecture 20: Standard Hydrogen Electrode and Reference Electrodes
21. Lecture 21: Electrochemical Series: Definition and Applications
22. Lecture 22: Metal-Metal Ion and Redox Electrodes

Unit 4: Electrochemistry-IV (8 Lectures)

23. Lecture 23: Concentration Cells with Transference

24. Lecture 24: Concentration Cells without Transference
25. Lecture 25: Liquid Junction Potential
26. Lecture 26: Application of EMF Measurements: Valency of Ions
27. Lecture 27: Solubility Product and Activity Coefficient
28. Lecture 28: Potentiometric Titrations: Acid-Base
29. Lecture 29: Potentiometric Titrations: Redox
30. Lecture 30: Determination of pH: Hydrogen and Glass Electrodes

Lesson plan Statistical Mechanics PHY – 202

Week 1-3: UNIT I - Classical and Quantum Description of Statistical Systems (10 Lectures)

1. **Lecture 1:** Introduction to Statistical Mechanics: Microstates and Macrostates
2. **Lecture 2:** Classical Description: Phase Space and Its Importance
3. **Lecture 3:** Quantum Description: Wave Functions and Quantum States
4. **Lecture 4:** Concept of Ensemble: Definition and Types
5. **Lecture 5:** Hypothesis of Equal A Priori Probability: Concept and Implications
6. **Lecture 6:** Microstates and Macrostates in Detail: Classical and Quantum Views
7. **Lecture 7:** Isolated Systems in Equilibrium: Basic Concepts and Examples
8. **Lecture 8:** Phase Space vs. Wave Functions: Comparative Analysis
9. **Lecture 9:** Statistical Ensembles: Concept and Definitions
10. **Lecture 10:** Problem Solving Session: Microstates, Macrostates, and Ensembles

Week 4-6: UNIT II - Ensembles and Partition Functions (10 Lectures)

1. **Lecture 11:** Micro-canonical Ensemble: Definition and Properties
2. **Lecture 12:** Canonical Ensemble: Definition and Applications
3. **Lecture 13:** Grand Canonical Ensemble: Concepts and Uses
4. **Lecture 14:** Partition Function: Concept and Calculation for Various Ensembles
5. **Lecture 15:** System in Thermal Equilibrium with Heat Bath: Analysis and Examples
6. **Lecture 16:** Law of Equipartition of Energy: Derivation and Applications
7. **Lecture 17:** Limits of Validity of Equipartition Theorem: Theory and Examples
8. **Lecture 18:** Application of Equipartition Theorem: Classical Systems
9. **Lecture 19:** Practical Examples: Partition Functions and Ensemble Analysis
10. **Lecture 20:** Problem Solving Session: Ensembles and Partition Functions

Week 7-9: UNIT III - Quantum Statistics and Distribution Laws (10 Lectures)

1. **Lecture 21:** Introduction to Quantum Statistics: Basic Principles
2. **Lecture 22:** Gibbs' Paradox: Statement and Resolution
3. **Lecture 23:** Identical Particles and Symmetry Requirements: Quantum Perspective
4. **Lecture 24:** Derivation of Fermi-Dirac Statistics: Micro-canonical Ensemble Approach
5. **Lecture 25:** Derivation of Bose-Einstein Statistics: Micro-canonical Ensemble Approach
6. **Lecture 26:** Classical Limit of Quantum Statistics: Overview and Applications
7. **Lecture 27:** Comparison of Fermi-Dirac and Bose-Einstein Statistics: Key Differences
8. **Lecture 28:** Quantum Statistics in Low and High Temperature Limits
9. **Lecture 29:** Applications of Quantum Statistics: Examples and Case Studies
10. **Lecture 30:** Problem Solving Session: Quantum Statistics and Distribution Laws

Week 10-12: UNIT IV - Bose-Einstein Distribution and Applications (10 Lectures)

1. **Lecture 31:** Bose-Einstein Distribution Law: Derivation and Explanation
2. **Lecture 32:** Application of Bose-Einstein Statistics to Derive Planck’s Law
3. **Lecture 33:** Rayleigh-Jeans Law as a Limiting Case of Planck’s Law: Derivation and Discussion

4. **Lecture 34:** Wien's Law as a Limiting Case of Planck's Law: Derivation and Discussion
5. **Lecture 35:** Phonons and Lattice Vibrations: Concept and Theory
6. **Lecture 36:** Specific Heat of Solids: Einstein's Theory and Debye's Theory
7. **Lecture 37:** Comparison of Einstein and Debye Theories: Key Points
8. **Lecture 38:** Bose-Einstein Condensation: Theory and Applications
9. **Lecture 39:** Practical Examples: Application of Statistical Mechanics in Modern Physics
10. **Lecture 40:** Review and Summary: Statistical Mechanics and Quantum Statistics

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Lesson plan Quantum Mechanics PHY – 204

Week 1-3: UNIT I - Foundations of Quantum Mechanics (10 Lectures)

1. **Lecture 1:** Introduction to Quantum Mechanics: Historical Background and Key Concepts
2. **Lecture 2:** de Broglie Hypothesis: Wave-Particle Duality
3. **Lecture 3:** Compton Effect: Explanation and Significance
4. **Lecture 4:** Davisson-Germer Experiment: Theory and Results
5. **Lecture 5:** Heisenberg Uncertainty Principle: Statement, Implications, and Examples
6. **Lecture 6:** Wave Function: Concept and Physical Meaning
7. **Lecture 7:** Group Velocity and Phase Velocity: Definitions and Relationships
8. **Lecture 8:** Classical Velocity vs. Group Velocity: Analysis and Comparison
9. **Lecture 9:** Principle of Superposition: Application to Quantum Mechanics
10. **Lecture 10:** Problem Solving Session: de Broglie Hypothesis, Uncertainty Principle, and Wave Functions

Week 4-6: UNIT II - Quantum Mechanics Postulates and Operators (10 Lectures)

1. **Lecture 11:** Basic Postulates of Quantum Mechanics: Overview and Discussion
2. **Lecture 12:** Dynamical Variables as Linear Hermitian Operators: Definitions and Examples
3. **Lecture 13:** Eigenvalue Equation for Operators: Theory and Applications
4. **Lecture 14:** Momentum Operator: Definition and Physical Interpretation
5. **Lecture 15:** Energy Operator: Schrödinger Equation and its Role
6. **Lecture 16:** Angular Momentum Operators: Definitions and Properties
7. **Lecture 17:** Measurement of Quantum Variables: Results and Interpretation
8. **Lecture 18:** Expectation Values: Calculation and Significance
9. **Lecture 19:** Operator Algebra: Commutation Relations and Implications
10. **Lecture 20:** Problem Solving Session: Quantum Mechanics Postulates and Operators

Week 7-9: UNIT III - Quantum Mechanics Formalism (10 Lectures)

1. **Lecture 21:** Commutation Relations Between Operators: Theory and Examples
2. **Lecture 22:** Compatible Observables: Definition and Simultaneous Measurement
3. **Lecture 23:** Ehrenfest Theorem: Statement and Applications
4. **Lecture 24:** Time-Dependent Schrödinger Equation: Derivation and Applications
5. **Lecture 25:** Time-Independent Schrödinger Equation: Theory and Examples
6. **Lecture 26:** Eigenstates and Eigenvalues: Concepts and Calculations

7. **Lecture 27:** Normalization of Wave Functions: Procedure and Importance
8. **Lecture 28:** Ortho-Normality of Wave Functions: Definitions and Applications
9. **Lecture 29:** Physical Interpretation of Wave Functions: Probability Densities
10. **Lecture 30:** Problem Solving Session: Schrödinger Equation, Eigenstates, and Normalization

Week 10-12: UNIT IV - Quantum Potential Wells and Barrier Penetration (10 Lectures)

1. **Lecture 31:** One-Dimensional Potential Well: Concept and Analysis
2. **Lecture 32:** Boundary Conditions for Potential Wells: Derivations and Examples
3. **Lecture 33:** Penetration of Rectangular Potential Barrier: Theory and Calculations
4. **Lecture 34:** Reflection Coefficient: Derivation and Physical Meaning
5. **Lecture 35:** Transmission Coefficient: Derivation and Physical Meaning
6. **Lecture 36:** Alpha Decay: Quantum Mechanical Explanation and Examples
7. **Lecture 37:** Application of Quantum Mechanics to Tunneling Phenomena
8. **Lecture 38:** Quantum Mechanics in Higher Dimensions: Overview
9. **Lecture 39:** Review of Quantum Mechanics Concepts: Summary and Integration
10. **Lecture 40:** Comprehensive Problem Solving Session: Potential Wells, Barrier Penetration, and Quantum Phenomena

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Lesson plan Elective paper (Optics – II) PHY – 206 A

Week 1-3: UNIT I - Polarization and Optical Activity (10 Lectures)

1. **Lecture 1:** Introduction to Polarization: Concept and Importance
2. **Lecture 2:** States of Polarization: Linear, Circular, and Elliptical
3. **Lecture 3:** Double Refraction: Explanation Using Electromagnetic Theory
4. **Lecture 4:** Huygens' Construction for Uniaxial Crystals: Theory and Examples
5. **Lecture 5:** Polaroids: Types, Working Principles, and Applications
6. **Lecture 6:** Circularly and Elliptically Polarized Light: Characteristics and Analysis
7. **Lecture 7:** Fresnel's Explanation of Optical Activity: Theory and Implications
8. **Lecture 8:** Bi-Quartz and Half Shade Polarimeter: Design and Usage
9. **Lecture 9:** Applications of Polarization in Optics: Practical Examples
10. **Lecture 10:** Problem Solving Session: Polarization, Optical Activity, and Instruments

Week 4-6: UNIT II - Diffraction and Gratings (10 Lectures)

1. **Lecture 11:** Introduction to Diffraction: Basic Concepts and Definitions
2. **Lecture 12:** Fresnel's Diffraction: Principles and Examples
3. **Lecture 13:** Zone Plate: Concept, Construction, and Applications
4. **Lecture 14:** Diffraction Due to a Straight Edge: Theory and Calculations
5. **Lecture 15:** Fraunhofer Diffraction Due to a Single Slit: Analysis and Patterns
6. **Lecture 16:** Fraunhofer Diffraction Due to Double Slits: Interference and Diffraction
7. **Lecture 17:** Plane Transmission Grating: Theory, Design, and Applications
8. **Lecture 18:** Resolving Power of a Grating: Calculation and Examples
9. **Lecture 19:** Practical Applications of Diffraction and Gratings in Optical Systems

10. **Lecture 20:** Problem Solving Session: Diffraction, Gratings, and Practical Applications

Week 7-9: UNIT III - Holography (10 Lectures)

1. **Lecture 21:** Introduction to Holography: Principles and Concepts
2. **Lecture 22:** Production of Holograms: Process and Techniques
3. **Lecture 23:** Analysis of Holograms: Methods and Applications
4. **Lecture 24:** Observing Small Object Deformations Using Holography
5. **Lecture 25:** Holographic Optical Instruments: Types and Uses
6. **Lecture 26:** Pattern Recognition Using Holography: Techniques and Applications
7. **Lecture 27:** Volume Holograms: Theory and Practical Applications
8. **Lecture 28:** Modifications in Holography: Recent Advances and Innovations
9. **Lecture 29:** Case Studies: Holography in Modern Optical Systems
10. **Lecture 30:** Problem Solving Session: Holography and Optical Instrumentation

Week 10-12: UNIT IV - Laser Theory and Atomic Interaction (10 Lectures)

1. **Lecture 31:** Introduction to Laser Theory: Basic Principles and Concepts
2. **Lecture 32:** Electric Dipole Interaction: Theory and Applications
3. **Lecture 33:** Simple Laser Theory: Components and Operation
4. **Lecture 34:** Three-Level Laser Systems: Theory and Examples
5. **Lecture 35:** Atomic Interference: Concepts and Applications in Lasers
6. **Lecture 36:** Lasing Without Inversion: Principles and Practical Examples
7. **Lecture 37:** Correlated Emission Lasers: Theory and Applications
8. **Lecture 38:** Motion of a Two-Level Atom in a Quantized Light Field: Analysis and Results
9. **Lecture 39:** Recent Advances in Laser Technology: Innovations and Applications
10. **Lecture 40:** Problem Solving Session: Laser Theory, Atomic Interaction, and Modern Applications

SCHOOL OF BASIC AND APPLIED SCIENCES

(Scheme of Studies & Examinations)

B. Sc. (PCM) III Year (V Semester)

RAFFLES
UNIVERSITY

B. Sc. (PCM) III Year (V Semester) Scheme

Sr.No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-301	Inorganic Chemistry	2	0	20	30	50	3	2
2		CH-303	Organic Chemistry	2	0	20	30	50	3	2
3		CH-305	Elective Paper	2	0	20	30	50	3	2
4		CH-307	Chemistry Lab-V	0	6	20	30	50	4	3
5	Physics	PHY-301	Solid State Physics	2	0	20	30	50	3	2
6		PHY-303	Advance Electronic	2	0	20	30	50	3	2
7		PHY-305	Elective Paper	2	0	20	30	50	3	2
8		PHY-307	Physics Lab-V	0	6	20	30	50	4	3
9	Mathematics	MA-301	Real Analysis	2	0	20	30	50	3	2
10		MA-303	Modern algebra	2	0	20	30	50	3	2
11		MA-305	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				20	12			600		26

NOTE: - 1. Abbreviations: L=Lecture, T= Tutorials, P= Practical's, IA = Internal Assessment

Marks distribution of Internal Assessment (IA) for Theory Subjects should be 50% midterm Examination + 50% Assignments/Tutorials/Special activity viz: PPT, Quiz Test

Elective paper: MA-305A:-Dynamics OR MA-305B: Discrete Mathematics PHY-305A:- Quantum Mechanics - II OR PHY-305B: Classical

MechanicsCH-305A:- Physical Chemistry OR CH-305B: Green Chemistry

Open Elective Paper: BE-301: Basic Electrical IL-301: Introductory Law, HV-301: Human Value

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Course Outcomes

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1. Inorganic Chemistry (CH-301) Course Outcomes:

1. To summarize the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbitals in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters.
2. To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.
3. To study the magnetic properties of transition metal complexes and various types of magnetic materials and their magnetic susceptibility.
4. Have knowledge about orgal level diagrams for d1 and d9 electronic states and the electronic spectrum of [Ti(H2O)6]+3complex ion.

2. Organic Chemistry (CH-303) Course Outcomes:

1. Get knowledge about the principle of nuclear magnetic resonance.
2. To elucidate the structure of various molecules by using PMR spectra.
3. To have knowledge about classification, structures and important reactions of carbohydrates
4. Sound knowledge of organometallic compounds.

3.Physical Chemistry (CH-305) Course Outcomes:

1. To know about dual characteristic of matter and extend this fact to obtain postulates of quantum mechanics and quantum-mechanical operators, apply Schrödinger equation to determine the physical observables for particle in a box.
2. To have knowledge about dipole moment, magnetic permeability and susceptibility

3. To have sound knowledge about the consequences of interaction of radiation with matter resulting into various types of spectra.
4. To be able to solve various numerical problems related to spectroscopy.
5. Student gains the knowledge on various nuclear models and properties ofnuclei
6. Student gets a thorough knowledge on alpha, beta, gamma decay
7. The Geiger Nuttel law, Range of alpha particles and their disintegrationlaws are thoroughly understood.
8. Types of nuclear accelerators and their basic principles of operation arethoroughly studied.
9. Student gains knowledge on how to control a nuclear chain reaction and how to attain the nuclear stability.

PHY-301 Solid State Physics Course Outcomes:

1. Student gains the knowledge on fundamentals of Crystal structure
2. Student gets a thorough knowledge on different techniques for studying crystal structures
3. Applications of reciprocal lattice for crystal structure studies.
4. Studies the different types of magnetic materials
5. Studies the real time applications of superconducting materials and the corresponding science.

PHY-303 Advance Electronic Course Outcomes:

1. Student gains the knowledge on functioning of FET and MOSFET for practical applications
2. Student gets a thorough knowledge functioning of OP AMPs
3. Student applies OP Amps for various mathematical operations like addition, subtraction, integration, differentiation, etc.
4. Studies the Amplitude and frequency modulations and its detection techniques.
5. Finds the applications of digital electronics in day – to – day life and could design them.

MA-303 Modern algebra Course Outcomes:

1. After completing the course, the students will be able to learn :
2. The importance of group in algebra.
3. The importance of a ring as a fundamental object in algebra.
4. The importance of group in algebra.
5. The concept of a module as a generalization of a vector space and

6. an Abelian group.
7. Homomorphism and isomorphism, Cayley's theorem, Normal subgroups, Quotient group.
8. The concept of Sub ring Homomorphism and isomorphism, field, Field of quotients of an integral domain

MA-301 Real Analysis Course Outcomes:

1. Students will be able to demonstrate competence with elementary properties of sets by proving identities involving union and intersection and Cartesian Products of sets.
2. Students will be able to demonstrate competence with elementary properties of functions by proving results involving composite functions and inverse functions.
3. Students will be able to use mathematical induction to prove results involving natural numbers.
4. Students will be able to demonstrate competence with the algebraic and order properties of real numbers.
5. Students will be able to demonstrate competence with properties of real numbers by finding supremum and infimum of sets and using the completeness property of real numbers.

CO-PO mapping

CH-301	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-303	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

CH-305	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-301	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

PHY-303	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

PHY-305	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

MA-301	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

MA-303	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-305	PO									
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

Paper 13: Real Analysis (Code: MA-301)

1. Introduction to Real Analysis: Basic Concepts
2. Sequences of Real Numbers: Definition and Properties
3. Limit of a Sequence
4. Convergence and Divergence of Sequences
5. Monotonic Sequences and Their Properties
6. Subsequences and Bolzano-Weierstrass Theorem
7. Cauchy Sequences and Their Convergence
8. Series of Real Numbers: Introduction
9. Convergence of Series: Definition and Basic Tests
10. Comparison Test and Limit Comparison Test
11. Ratio Test and Root Test

12. Alternating Series and Leibniz's Test
13. Absolute and Conditional Convergence
14. Power Series: Definition and Radius of Convergence
15. Uniform Convergence of Series
16. Weierstrass M-Test
17. Functions of a Real Variable: Limits and Continuity
18. Properties of Continuous Functions
19. Uniform Continuity
20. Differentiability of Real-Valued Functions
21. Mean Value Theorems: Rolle's, Lagrange's, and Cauchy's
22. Taylor's Theorem and Series Expansions
23. Maxima and Minima of Functions
24. Sequences and Series of Functions
25. Pointwise and Uniform Convergence
26. Integration of Real-Valued Functions
27. Riemann Integration: Definition and Properties
28. Improper Integrals: Types and Convergence
29. Tests for Convergence of Improper Integrals
30. Beta and Gamma Functions in Integration
31. Functions of Bounded Variation
32. Differentiation of Improper Integrals
33. Metric Spaces: Definition and Examples
34. Open and Closed Sets in Metric Spaces
35. Completeness in Metric Spaces
36. Compactness and Connectedness in Metric Spaces
37. Advanced Problems in Real Analysis
38. Preparation for Internal Assessment
39. Discussion on Previous Year Papers
40. Final Preparatory Session

Paper 14: Modern Algebra (Code: MA-303)

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1. Introduction to Modern Algebra: Basic Concepts

2. Groups: Definition and Examples
3. Subgroups and Their Properties
4. Cyclic Groups and Their Characteristics
5. Permutation Groups and Symmetric Groups
6. Cosets and Lagrange's Theorem
7. Normal Subgroups and Factor Groups
8. Group Homomorphisms and Isomorphisms
9. Kernel of a Homomorphism
10. Fundamental Theorem of Homomorphisms
11. Cayley's Theorem
12. Direct Product of Groups
13. Introduction to Rings: Definition and Examples
14. Subrings and Ideals
15. Ring Homomorphisms and Isomorphisms
16. Quotient Rings
17. Integral Domains and Fields
18. Field of Quotients of an Integral Domain
19. Euclidean Rings and Principal Ideal Domains
20. Polynomials over a Ring
21. Division Algorithm for Polynomials
22. Roots of Polynomials
23. Irreducibility Criteria for Polynomials
24. Introduction to Vector Spaces: Definition and Examples
25. Subspaces and Their Properties
26. Linear Independence and Basis
27. Dimension of a Vector Space
28. Linear Transformations: Definition and Properties
29. Matrix Representation of Linear Transformations
30. Rank and Nullity Theorem
31. Algebra of Linear Transformations
32. Eigenvalues and Eigenvectors
33. Diagonalization of Matrices
34. Cayley-Hamilton Theorem
35. Inner Product Spaces

36. Orthogonality in Inner Product Spaces
37. Advanced Problems in Modern Algebra
38. Preparation for Internal Assessment
39. Discussion on Previous Year Papers
40. Final Preparatory Session

Paper 15: Elective Paper (Dynamics or Discrete Mathematics) (Code: MA-305A/MA-305B)

Option A: Dynamics (MA-305A)

1. Introduction to Dynamics: Basic Concepts
2. Kinematics of a Particle: Rectilinear Motion
3. Kinematics of a Particle: Curvilinear Motion
4. Projectile Motion and Its Applications
5. Relative Motion: Frames of Reference
6. Newton's Laws of Motion
7. Work, Energy, and Power
8. Conservation of Linear Momentum
9. Impact of Bodies: Elastic and Inelastic Collisions
10. Conservation of Angular Momentum
11. Motion Under Central Forces
12. Planetary Motion and Kepler's Laws
13. Motion of a Rigid Body: Angular Velocity and Acceleration
14. Kinetic Energy of Rotation
15. Moment of Inertia and Its Calculation
16. Motion of a Body Rolling on a Horizontal Plane
17. Motion of a Body Rolling Down an Inclined Plane
18. Gyroscopic Motion
19. Motion of a Top
20. Simple Harmonic Motion
21. Damped Harmonic Motion
22. Forced Oscillations and Resonance
23. Motion in a Resisting Medium
24. Orbital Velocity and Escape Velocity

25. Motion in Non-Inertial Frames
26. Coriolis Force and Its Effects
27. Advanced Problems in Projectile Motion
28. Advanced Problems in Rotational Motion
29. Practice Session on Work and Energy
30. Practice Session on Collisions
31. Preparation for Internal Assessment
32. Discussion on Previous Year Papers
33. Revision Session
34. Problem-Solving Techniques in Dynamics
35. Review of Key Concepts
36. Advanced Problem-Solving Session
37. Final Preparatory Session
38. Recapitulation and Doubt Clearing
39. Case Studies in Dynamics
40. Wrap-Up Session

Option B: Discrete Mathematics (MA-305B)

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1. Introduction to Discrete Mathematics: Basic Concepts
2. Propositional Logic and Its Applications
3. Predicate Logic and Quantifiers
4. Methods of Proof: Direct, Indirect, and Contradiction
5. Set Theory: Definitions and Operations
6. Relations: Properties and Types
7. Equivalence Relations and Partitions
8. Functions: Types and Properties
9. Pigeonhole Principle
10. Principles of Mathematical Induction
11. Recurrence Relations: Definition and Solutions
12. Homogeneous Recurrence Relations
13. Non-Homogeneous Recurrence Relations
14. Generating Functions

15. Solution of Recurrence Relations Using Generating Functions
16. Introduction to Graph Theory
17. Types of Graphs and Their Properties
18. Subgraphs, Isomorphism, and Eulerian Paths
19. Hamiltonian Circuits and Graph Coloring
20. Planar Graphs and Euler's Formula
21. Trees and Their Applications
22. Spanning Trees and Minimum Spanning Trees
23. Algorithms for Minimum Spanning Trees
24. Boolean Algebra: Introduction and Applications
25. Boolean Functions and Their Simplification
26. Lattices and Their Properties
27. Introduction to Automata Theory
28. Finite Automata and Regular Languages
29. Introduction to Combinatorics
30. Counting Principles: Permutations and Combinations
31. Inclusion-Exclusion Principle
32. Advanced Problems in Logic and Set Theory
33. Advanced Problems in Recurrence Relations
34. Practice Session on Graph Theory
35. Practice Session on Combinatorics
36. Preparation for Internal Assessment
37. Discussion on Previous Year Papers
38. Revision Session
39. Problem-Solving Techniques in Discrete Mathematics
40. Final Preparatory Session

Lesson Plan for Chemistry - CH-301

Unit 1: Metal-Ligand Bonding in Transition Metal Complexes (7 Lectures)

1. Lecture 1: Introduction to Metal-Ligand Bonding: Overview
2. Lecture 2: Valence Bond Theory: Limitations and Challenges
3. Lecture 3: Introduction to Crystal-Field Theory: Basics

4. Lecture 4: Spectrochemical Series: Definition and Importance
5. Lecture 5: Crystal Field Splitting in Octahedral Complexes
6. Lecture 6: Tetrahedral Complexes: Crystal Field Splitting
7. Lecture 7: Square Planar Complexes: Crystal Field Splitting

Unit 2: Thermodynamic and Kinetic Aspects of Metal Complexes (8 Lectures)

8. Lecture 8: Jahn-Teller Effect: Overview and Significance
9. Lecture 9: Thermodynamic Stability of Metal Complexes: Basics
10. Lecture 10: Factors Influencing Stability: Key Concepts
11. Lecture 11: Substitution Reactions in Metal Complexes: Overview
12. Lecture 12: Pt(II) Complexes: Substitution Reactions
13. Lecture 13: Kinetic vs Thermodynamic Control in Reactions
14. Lecture 14: Ligand Substitution Mechanisms: Introduction
15. Lecture 15: Factors Affecting Reaction Rates in Complexes

Unit 3: Magnetic Properties of Transition Metal Complexes (7 Lectures)

16. Lecture 16: Types of Magnetic Behavior in Complexes
17. Lecture 17: Spin-Only Formula: Application and Examples
18. Lecture 18: Orbital Contribution to Magnetic Moments
19. Lecture 19: L-S Coupling: Concept and Importance
20. Lecture 20: Spectroscopic Ground States: Determination
21. Lecture 21: Magnetic Moment Data: Application in 3d Metals
22. Lecture 22: Interpretation of Magnetic Properties

Unit 4: Electron Spectra of Transition Metal Complexes (8 Lectures)

23. Lecture 23: Introduction to Electronic Transitions in Complexes
24. Lecture 24: Selection Rules for d-d Transitions: Explanation
25. Lecture 25: Appearance of Colour in Transition Metal Complexes
26. Lecture 26: Orgel Diagram: Energy Levels for d1 States
27. Lecture 27: Orgel Diagram: Energy Levels for d9 States
28. Lecture 28: Case Study: [Ti(H2O)6]+3 Spectrum Analysis
29. Lecture 29: Interpretation of Electronic Spectra: Basic Approach
30. Lecture 30: Summary and Review of Transition Metal Complexes

Lesson Plan for Chemistry - CH-303

Unit 1: NMR Spectroscopy-I (7 Lectures)

1. Lecture 1: Principle of Nuclear Magnetic Resonance
2. Lecture 2: Introduction to Proton NMR
3. Lecture 3: Number of Signals, Peak Areas, and Integration
4. Lecture 4: Equivalent vs. Nonequivalent Protons
5. Lecture 5: Chemical Shift, Shielding, and Deshielding
6. Lecture 6: Proton Counting and Signal Splitting
7. Lecture 7: Coupling Constants

Unit 2: NMR Spectroscopy-II (8 Lectures)

8. Lecture 8: Factors Affecting Chemical Shift
9. Lecture 9: Ethyl Bromide NMR Spectrum
10. Lecture 10: NMR Spectra of n-Propyl and Isopropyl Bromide
11. Lecture 11: NMR of 1,1-Dibromoethane and 1,1,2-Tribromoethane
12. Lecture 12: NMR of Ethanol and Acetaldehyde
13. Lecture 13: NMR of Ethyl Acetate and Toluene
14. Lecture 14: NMR of Benzaldehyde and Acetophenone
15. Lecture 15: Introduction to Carbon NMR and Chemical Shift Values

Unit 3: Carbohydrates-I (8 Lectures)

16. Lecture 16: Classification and Nomenclature of Carbohydrates
17. Lecture 17: Monosaccharides and Osazone Formation
18. Lecture 18: Inter-conversion of Glucose and Fructose
19. Lecture 19: Chain Lengthening and Shortening of Aldoses
20. Lecture 20: Configuration of Monosaccharides and Diastereomers
21. Lecture 21: Conversion of Glucose into Mannose
22. Lecture 22: Formation of Glycosides, Ethers, and Esters
23. Lecture 23: Determination of Ring Size for Glucose and Fructose

Unit 4: Carbohydrates-II & Organometallic Compounds (7 Lectures)

24. Lecture 24: Structures of Ribose and Deoxyribose
25. Lecture 25: Introduction to Disaccharides: Maltose, Sucrose, Lactose
26. Lecture 26: Introduction to Polysaccharides: Starch, Cellulose
27. Lecture 27: Organomagnesium Compounds: Grignard Reagents

28. Lecture 28: Formation and Reactions of Grignard Reagents
29. Lecture 29: Organolithium and Organozinc Compounds: Formation
30. Lecture 30: Chemical Reactions of Organolithium and Organozinc Compounds

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Lesson Plan for Chemistry - CH-305

Unit I: Quantum Mechanics-I (7 Lectures)

1. Lecture 1: Introduction to Quantum Mechanics: Black-body Radiation, Planck's Law
2. Lecture 2: Photoelectric Effect: Concepts and Applications
3. Lecture 3: Heat Capacity of Solids and Compton Effect
4. Lecture 4: Wave Function: Significance and Interpretation
5. Lecture 5: Quantum Mechanical Operators: Commutation Relations
6. Lecture 6: Heisenberg Uncertainty Principle: Position and Momentum
7. Lecture 7: Particle in a 1D Box: Wave Function and Energy

Unit II: Physical Properties and Molecular Structure (7 Lectures)

8. Lecture 8: Optical Activity and Polarization: Clausius-Mossotti Equation
9. Lecture 9: Dipole Moment: Measurement and Structural Implications
10. Lecture 10: Magnetic Permeability and Susceptibility: Concepts and Determination
11. Lecture 11: Paramagnetism and Diamagnetism: Properties and Examples
12. Lecture 12: Ferromagnetism: Principles and Applications
13. Lecture 13: Application of Magnetic Susceptibility in Molecular Structure
14. Lecture 14: Orientation of Dipoles in Electric Fields

Unit III: Spectroscopy-I (8 Lectures)

15. Lecture 15: Introduction to Spectroscopy: Electromagnetic Spectrum and Regions
16. Lecture 16: Born-Oppenheimer Approximation: Statement and Importance
17. Lecture 17: Rotational Spectra of Diatomic Molecules: Rigid Rotator Model 18. Lecture 18: Selection Rules and Spectral Intensity Distribution
19. Lecture 19: Determination of Bond Length and Isotope Effect
20. Lecture 20: Non-Rigid Rotor: Qualitative Description
21. Lecture 21: Maxwell-Boltzmann Distribution: Population Distribution
22. Lecture 22: Degrees of Freedom: Translational, Rotational, Vibrational

Unit IV: Spectroscopy-II (8 Lectures)

23. Lecture 23: Infrared Spectra: Simple Harmonic Oscillator Model
24. Lecture 24: Selection Rules and Pure Vibrational Spectra

25. Lecture 25: Force Constant and Bond Energies: Determination
26. Lecture 26: Effects of Anharmonic Motion and Isotopic Substitution
27. Lecture 27: Raman Spectra: Polarizability and Quantum Theory
28. Lecture 28: Pure Rotational Raman Spectra: Selection Rules
29. Lecture 29: Pure Vibrational Raman Spectra: Diatomic Molecules
30. Lecture 30: Vibrational Frequencies of Functional Groups: Overview and Applications

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Lesson plan Solid State Physics PHY – 301

Week 1-3: UNIT I - Crystalline and Glassy Forms (10 Lectures)

1. **Lecture 1:** Introduction to Crystalline and Glassy Forms: Overview and Significance
2. **Lecture 2:** Liquid Crystals: Properties, Types, and Applications
3. **Lecture 3:** Crystal Structure and Periodicity: Basic Concepts
4. **Lecture 4:** Lattice and Basis: Definitions and Examples
5. **Lecture 5:** Crystal Translational Vectors and Axes: Understanding Symmetry
6. **Lecture 6:** Unit Cell and Primitive Cell: Definitions and Calculations
7. **Lecture 7:** Wigner-Seitz Primitive Cell: Construction and Importance
8. **Lecture 8:** Symmetry Operations for Two-Dimensional Crystals: Group Theory Basics
9. **Lecture 9:** Bravais Lattices in Two and Three Dimensions: Classification and Examples
10. **Lecture 10:** Crystal Planes, Miller Indices, and Interplanar Spacing

Week 4-6: UNIT II - X-ray Diffraction and Reciprocal Lattice (10 Lectures)

1. **Lecture 11:** Introduction to X-ray Diffraction: Basic Principles
2. **Lecture 12:** Bragg's Law: Derivation and Applications
3. **Lecture 13:** Experimental Methods in X-ray Diffraction: Techniques and Instruments
4. **Lecture 14:** K-space and Reciprocal Lattice: Concepts and Physical Significance
5. **Lecture 15:** Reciprocal Lattice Vectors: Derivation and Examples
6. **Lecture 16:** Reciprocal Lattice to a Simple Cubic Lattice: Calculations
7. **Lecture 17:** BCC and FCC Structures: Reciprocal Lattice Analysis
8. **Lecture 18:** HCP Structure: Reciprocal Lattice and Applications
9. **Lecture 19:** Case Studies: X-ray Diffraction in Material Science
10. **Lecture 20:** Problem Solving Session: X-ray Diffraction and Reciprocal Lattices

Week 7-9: UNIT III - Magnetic Materials (10 Lectures)

1. **Lecture 21:** Introduction to Magnetic Materials: Types and Properties
2. **Lecture 22:** Hall Effect: Theory, Experimental Setup, and Applications
3. **Lecture 23:** Diamagnetism: Concept and Materials
4. **Lecture 24:** Paramagnetism: Theory and Materials
5. **Lecture 25:** Ferromagnetism: Properties and Applications
6. **Lecture 26:** Electron Spin and Magnetic Moment: Quantum Mechanical Explanation
7. **Lecture 27:** Magnetic Susceptibility: Measurement and Applications
8. **Lecture 28:** Magnetism in Materials: Practical Applications and Case Studies
9. **Lecture 29:** Problem Solving Session: Magnetic Properties and Susceptibility

10. **Lecture 30:** Review Session: Key Concepts in Magnetism

Week 10-12: UNIT IV - Superconductivity (10 Lectures)

1. **Lecture 31:** Historical Introduction to Superconductivity: Discovery and Early Research
2. **Lecture 32:** Survey of Superconductivity: Key Concepts and Materials
3. **Lecture 33:** Superconducting Systems: Low Tc and High Tc Superconductors
4. **Lecture 34:** Isotopic Effect: Theory and Experimental Evidence
5. **Lecture 35:** Critical Magnetic Field and Meissner Effect: Explanation and Applications
6. **Lecture 36:** London Theory and Pippard's Equation: Theoretical Foundations
7. **Lecture 37:** Classification of Superconductors: Type I and Type II
8. **Lecture 38:** BCS Theory of Superconductivity: Key Concepts and Applications
9. **Lecture 39:** Practical Applications of Superconductivity: Power and Technology
10. **Lecture 40:** Problem Solving Session: Superconductivity, BCS Theory, and Applications

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Lesson plan Advance Electronics PHY – 303

Week 1-3: UNIT I - Field Effect Transistors (FETs) (10 Lectures)

1. **Lecture 1:** Introduction to Field Effect Transistors (FETs): Overview and Types
2. **Lecture 2:** JFET Structure and Basic Operation: Construction and Working Principles
3. **Lecture 3:** JFET Static, Drain, and Transfer Characteristics: Analysis and Graphical Representation
4. **Lecture 4:** Pinch-Off and Saturation Region in JFETs: Concept and Applications
5. **Lecture 5:** Common Source FET Amplifier: Circuit Design and Operation
6. **Lecture 6:** Small Signal Low Frequency Equivalent Circuit: Voltage Gain in FET Amplifiers
7. **Lecture 7:** Introduction to MOSFETs: EMOSFET and DMOSFET Structures and Operations
8. **Lecture 8:** MOSFET Drain and Transfer Characteristics: Analysis and Graphical Representation
9. **Lecture 9:** CMOS Technology: Introduction, Principles, and Applications
10. **Lecture 10:** Problem Solving Session: FET Characteristics and Applications

Week 4-6: UNIT II - Operational Amplifiers (Op-Amps) (10 Lectures)

1. **Lecture 11:** Introduction to Operational Amplifiers (Op-Amps): Ideal Characteristics
2. **Lecture 12:** Concept of Virtual Ground in Op-Amps: Understanding and Applications
3. **Lecture 13:** Important Terms in Op-Amps: Offset Voltage, CMRR, and Slew Rate
4. **Lecture 14:** Applications of Op-Amps: Designing Inverting and Non-Inverting Amplifiers
5. **Lecture 15:** Differential Amplifier Using Op-Amps: Design and Analysis
6. **Lecture 16:** Schmitt Trigger Circuit Using Op-Amps: Working and Applications
7. **Lecture 17:** Integrator and Differentiator Circuits Using Op-Amps: Design and Applications
8. **Lecture 18:** Practical Considerations in Op-Amp Circuits: Real-World Examples
9. **Lecture 19:** Case Studies: Op-Amp Applications in Signal Processing
10. **Lecture 20:** Problem Solving Session: Op-Amp Circuits and Applications

Week 7-9: UNIT III - Communication Principles (10 Lectures)

1. **Lecture 21:** Introduction to Communication Principles: Basics and Importance
2. **Lecture 22:** Modulation Techniques: Elementary Theory of Amplitude Modulation (AM)

3. **Lecture 23:** Amplitude Modulation (AM): Modulation Index and Signal Representation
4. **Lecture 24:** Detection of AM Waves: Techniques and Applications
5. **Lecture 25:** Frequency Modulation (FM): Elementary Theory and Modulation Index
6. **Lecture 26:** Frequency Modulation (FM): Signal Representation and Applications
7. **Lecture 27:** Detection of FM Waves: Techniques and Circuit Design
8. **Lecture 28:** Comparison of AM and FM: Advantages, Disadvantages, and Applications
9. **Lecture 29:** Problem Solving Session: Modulation and Detection Techniques
10. **Lecture 30:** Case Studies: Real-World Applications of AM and FM

Week 10-12: UNIT IV - Digital Electronics (10 Lectures)

1. **Lecture 31:** Introduction to Digital Electronics: Basic Concepts and Logic Gates
2. **Lecture 32:** AND, OR, NOT Gates: Truth Tables, Circuits Using Diodes and Transistors
3. **Lecture 33:** NAND and NOR Gates as Universal Gates: Design and Applications
4. **Lecture 34:** Combination of Gates for Different Boolean Functions: Practical Examples
5. **Lecture 35:** De Morgan's Theorem: Explanation and Applications
6. **Lecture 36:** Half Adder and Full Adder Circuits: Design and Analysis
7. **Lecture 37:** Digital Comparator, Decoder, and Encoder: Principles and Circuits
8. **Lecture 38:** Multiplexer and Demultiplexer: Design, Applications, and Circuit Examples
9. **Lecture 39:** Digital to Analog and Analog to Digital Conversion: Techniques and Applications
10. **Lecture 40:** Problem Solving Session: Digital Electronics Circuits and Applications

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Lesson plan Quantum Mechanics PHY – 305

Unit I: History and Foundations of Quantum Mechanics (10 Lectures)

1. **Lecture 1**: Introduction to Quantum Mechanics - Historical Context and Importance.
2. **Lecture 2**: Planck's Quantum Hypothesis and Black Body Radiation.
3. **Lecture 3**: Nature of Light - Wave-Particle Duality and de Broglie Hypothesis.
4. **Lecture 4**: Heisenberg's Uncertainty Principle - Concept and Applications.
5. **Lecture 5**: Compton Effect - Explanation and Experimental Evidence.
6. **Lecture 6**: Phase Velocity vs. Group Velocity - Mathematical Relations.
7. **Lecture 7**: Relation between Phase Velocity and Group Velocity in Quantum Mechanics.
8. **Lecture 8**: Experimental Verifications of Quantum Concepts - Early Experiments.
9. **Lecture 9**: Mathematical Foundations of Wave-Particle Duality.
10. **Lecture 10**: Summary and Problem-Solving Session on Unit I.

Unit II: Linear Operators and Quantum Mechanics (10 Lectures)

1. **Lecture 11**: Introduction to Linear Operators in Quantum Mechanics.
2. **Lecture 12**: Momentum Operator and its Applications.
3. **Lecture 13**: Energy Operator and Hamiltonian in Quantum Systems.
4. **Lecture 14**: Eigenvalue Problem - Introduction and Significance.
5. **Lecture 15**: Hermitian and Unitary Operators - Properties and Applications.
6. **Lecture 16**: Expectation Values and their Physical Significance.
7. **Lecture 17**: Commutator Brackets and their Role in Quantum Mechanics.
8. **Lecture 18**: Uncertainty Relations and their Derivation.
9. **Lecture 19**: Application of Uncertainty Principle in Quantum Systems.

10. **Lecture 20**: Summary and Problem-Solving Session on Unit II.

Unit III: Schrödinger's Wave Equation (10 Lectures)

1. **Lecture 21**: Introduction to Schrödinger's Wave Equation.
2. **Lecture 22**: Derivation of 1-D Time-Dependent Schrödinger Equation.
3. **Lecture 23**: 2-D and 3-D Time-Dependent Schrödinger Equation - General Form.
4. **Lecture 24**: Time-Independent Schrödinger Equation - Concepts and Derivation.
5. **Lecture 25**: Eigenvalues and Eigenfunctions - Physical Meaning.
6. **Lecture 26**: Wave Functions - Significance, Orthogonality, and Normalization.
7. **Lecture 27**: Probability Current Density - Concept and Calculation.
8. **Lecture 28**: Applications of Schrödinger's Equation - Introduction.
9. **Lecture 29**: Case Studies: Simple Quantum Systems.
10. **Lecture 30**: Summary and Problem-Solving Session on Unit III.

Unit IV: Applications of Schrödinger's Wave Equation (10 Lectures)

1. **Lecture 31**: Free Particle in 1-D, 2-D, 3-D Box - Solutions and Interpretation.
2. **Lecture 32**: Energy Quantization and Momentum in a Box.
3. **Lecture 33**: One-Dimensional Step Potential ($E > V_0$) - Reflection and Transmission.
4. **Lecture 34**: One-Dimensional Step Potential ($E < V_0$) - Penetration Depth.
5. **Lecture 35**: One-Dimensional Potential Barrier ($E > V_0$) - Transmission Coefficient.
6. **Lecture 36**: One-Dimensional Potential Barrier ($E < V_0$) - Tunneling and Applications.
7. **Lecture 37**: Brief Overview of Harmonic Oscillator in Quantum Mechanics.
8. **Lecture 38**: Energy Levels and Eigenfunctions of the Harmonic Oscillator.
9. **Lecture 39**: Real-World Applications of Quantum Tunneling and Harmonic Oscillators.
10. **Lecture 40**: Comprehensive Review and Problem-Solving Session on Unit IV

SCHOOL OF BASIC AND APPLIED SCIENCES

(Scheme of Studies & Examinations of B.Sc. w. e. f. 2022-23 onwards) B.Sc. (PCM) III Year (VI)

RAFFLES
UNIVERSITY

B.Sc. (PCM) III Year (VI) Scheme

Sr. No.	Subject	Paper Code No.	Name of Paper	Teaching scheme Hrs/Week		Examination Scheme			Duration of exam Hour	Credits
				L	P	IA	End Term Exam	Total		
1	Chemistry	CH-302	Elective Paper	2	0	20	30	50	3	2
2		CH-304	Organic Chemistry	2	0	20	30	50	3	2
3		CH-306	Physical Chemistry	2	0	20	30	50	3	2
4		CH-308	Chemistry Lab-VI	0	6	20	30	50	4	3
5	Physics	PHY-302	Atomic, Molecular physics	2	0	20	30	50	3	2
6		PHY-304	Nuclear Physics	2	0	20	30	50	3	2
7		PHY-306	Elective Paper	2	0	20	30	50	3	2
8		PHY-308	Physics Lab-VI	0	6	20	30	50	4	3
9	Mathematics	MA-302	Complex Analysis	2	0	20	30	50	3	2
10		MA-304	Linear Algebra	2	0	20	30	50	3	2
11		MA-306	Elective Paper	2	0	20	30	50	3	2
12	Open Elective Paper	-	-	2	0	20	30	50	3	2
TOTAL				20	12			600		26

Course Outcomes

Inorganic Chemistry (CH-302) Course Outcomes:

1. To get the detailed understanding of Bonding in homonuclear and heteronuclear molecules using the molecular orbital theory.
2. To study the nomenclature, classification, preparation and bonding in organometallic compounds and of metal carbonyls also.
3. To know about basic concepts of bioinorganic chemistry with reference to metal ions present in biological systems. To understand the biochemistry of oxygen carriers especially hemoglobin and myoglobin.
4. To know about various inorganic clusters compounds with special reference to silicones and phosphazenes.

Organic Chemistry (CH-304) Course Outcomes:

1. To gain knowledge about aromatic behaviour and basicity of simple heterocyclic compounds (pyridine, piperidine and pyrrole).
2. To know about 5 and 6 membered heterocyclic rings , basicity of and the preparation and reactions of indole, quinoline and isoquinoline.
3. To get knowledge about the acidity of α-hydrogens of diethyl malonate, ethyl acetoacetate and the synthesis and Keto-enol tautomerism of ethyl acetoacetate.
4. To learn about the essential amino acids, peptides and proteins. To get the knowledge about their structure and properties.

Physical Chemistry (CH-306) Course Outcomes:

1. Systematic and coherent understanding of the fundamental concepts in Physical chemistry.
2. Students will be able to understand the basic principle of electronic spectroscopy and the energy related to every colour imparted by chemicals. They will also gain the clear physical interpretation of chemical bonding and molecular structure.
3. The course curriculum is expected to develop an inquisitive feature among the students through suitable questions and experimental investigation.
4. Students will be having clear knowledge of how light is important to chemical reactions and how the amount of molecules in a solution affects the nature of a solution which is beneficial for the applied field.
5. Students will gain the knowledge of different phases of materials and their co-existence

Nuclear Physics (PHY-304) Course Outcomes:

1. Student gains the knowledge on various nuclear models and properties of nuclei
2. Student gets a thorough knowledge on alpha, beta, gamma decay
3. The Geiger Nuttel law, Range of alpha particles and their disintegration laws are thoroughly understood.
4. Types of nuclear accelerators and their basic principles of operation are thoroughly studied.
5. Student gains knowledge on how to control a nuclear chain reaction and how to attain the nuclear stability.

Atomic Physics (PHY-302) Course Outcomes:

1. Student gains the knowledge on basic principles of optical Fibre communication.
2. Student gets a thorough knowledge on basics of Laser functioning and different types of lasers and their applications.
3. Student gains the demonstrated knowledge on storing and retrieving information from Holograms and the principles behind it.
4. Gains a comprehensive knowledge on various blocks of optical Fibre communication systems including source, couplers, receivers, sensors.
5. Gains a demonstrated knowledge on digital communication system.

Complex analysis (MA-302) Course Outcomes:

1. Represent complex numbers algebraically and geometrically
2. Analyze limit, continuity and differentiation of functions of complex variables.
3. Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.
4. Understand Cauchy theorem and Cauchy integral formulas and apply these to evaluate complex contour integrals.
5. Represent functions as Taylor and Laurent series; classify singularities and poles; find residues and evaluate complex integrals using the residue theorem.

Linear Algebra (MA-304) Course Outcomes:

1. Understand the concepts of vector spaces, subspaces, bases, dimension and their properties.
2. Relate matrices and linear transformations, compute Eigen values and Eigen vectors of linear transformations.
3. Learn properties of inner product spaces and determine orthogonality in inner product spaces.
4. Obtain various variants of diagonalisation of linear transformations.
5. Realise the importance of adjoint of a linear transformation and its canonical form.

Co-PO mapping

CH-302	PO									
	1	2	3	4	5	6	7	8	9	10
CO 1	3	3	3	3	2	3	3	1	1	2
CO 2	2	2	2	2	1	2	2	2	2	1
CO 3	2	1	2	1	2	2	1	3	1	2
CO 4	2	2	1	2	2	1	1	2	1	1
CO 5	1	1	2	1	2	1	3	2	2	1

CH-304	PO									
	1	2	3	4	5	6	7	8	9	10
CO 1	3	3	3	3	2	3	3	1	1	2
CO 2	2	2	2	2	1	2	2	2	2	1
CO 3	2	1	2	1	2	2	1	3	1	2
CO 4	2	2	1	2	2	1	1	2	1	1
CO 5	1	1	2	1	2	1	3	2	2	1

CH-306	PO									
	1	2	3	4	5	6	7	8	9	10
CO 1	3	3	3	3	2	3	3	1	1	2
CO 2	2	2	2	2	1	2	2	2	2	1
CO 3	2	1	2	1	2	2	1	3	1	2
CO 4	2	2	1	2	2	1	1	2	1	1
CO 5	1	1	2	1	2	1	3	2	2	1

PHY-302	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

PHY-304	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

PHY-306	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

CO

MA-302	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-304	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

MA-306	PO										
CO		1	2	3	4	5	6	7	8	9	10
	1	3	3	3	3	2	3	3	1	1	2
	2	2	2	2	2	1	2	2	2	2	1
	3	2	1	2	1	2	2	1	3	1	2
	4	2	2	1	2	2	1	1	2	1	1
	5	1	1	2	1	2	1	3	2	2	1

Lesson Plan for Semester VI

Paper 16: Complex Analysis (Code: MA-302)

1. Introduction to Complex Numbers and Their Properties
2. Complex Functions: Definition and Examples
3. Limits and Continuity of Complex Functions
4. Differentiability and Analyticity
5. Cauchy-Riemann Equations
6. Harmonic Functions and Their Properties
7. Mappings by Elementary Functions
8. Mobius Transformations: Definition and Properties
9. Fixed Points and Inversion
10. Conformal Mappings
11. Complex Integration: Basic Concepts
12. Cauchy's Theorem for a Rectangle
13. Cauchy's Theorem for a Disk
14. Cauchy's Integral Formula
15. Generalized Cauchy's Integral Formula
16. Morera's Theorem
17. Liouville's Theorem
18. Fundamental Theorem of Algebra
19. Maximum Modulus Theorem
20. Taylor Series and Laurent Series
21. Zeros of Analytic Functions
22. Singularities of Complex Functions
23. Residues and Residue Theorem
24. Evaluation of Definite Integrals Using Residue Theorem
25. Argument Principle
26. Rouche's Theorem
27. Contour Integration
28. Evaluation of Improper Integrals

29. Introduction to Meromorphic Functions
30. Poisson's Integral Formula
31. Schwarz Reflection Principle
32. Applications of Complex Analysis in Engineering and Physics
33. Advanced Problems in Complex Integration
34. Advanced Problems in Conformal Mappings
35. Practice Session on Series Expansions
36. Practice Session on Residue Calculus
37. Preparation for Internal Assessment
38. Discussion on Previous Year Papers
39. Revision Session
40. Final Preparatory Session

Paper 17: Linear Algebra (Code: MA-304)

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1. Introduction to Linear Algebra: Basic Concepts
2. Vector Spaces: Definitions and Examples
3. Subspaces and Their Properties
4. Linear Combinations and Span
5. Linear Independence and Dependence
6. Basis and Dimension of a Vector Space
7. Coordinates Relative to a Basis
8. Change of Basis in Vector Spaces
9. Introduction to Linear Transformations
10. Kernel and Image of a Linear Transformation
11. The Rank-Nullity Theorem
12. Matrix Representation of Linear Transformations
13. Algebra of Linear Transformations
14. Inverse of a Linear Transformation
15. Eigenvalues and Eigenvectors
16. Characteristic Equation of a Matrix
17. Diagonalization of Matrices

18. Cayley-Hamilton Theorem
19. Applications of Cayley-Hamilton Theorem
20. Inner Product Spaces: Definitions and Examples
21. Norms and Distances in Inner Product Spaces
22. Orthogonality in Inner Product Spaces
23. Gram-Schmidt Orthogonalization Process
24. Orthogonal and Unitary Matrices
25. Quadratic Forms: Definition and Classification
26. Reduction of Quadratic Forms
27. Sylvester's Law of Inertia
28. Canonical Forms of Quadratic Forms
29. Jordan Canonical Form of a Matrix
30. Minimal Polynomial of a Matrix
31. Rational and Jordan Forms
32. Applications of Linear Algebra in Geometry
33. Advanced Problems in Vector Spaces
34. Advanced Problems in Linear Transformations
35. Practice Session on Diagonalization
36. Practice Session on Quadratic Forms
37. Preparation for Internal Assessment
38. Discussion on Previous Year Papers
39. Revision Session
40. Final Preparatory Session

Paper 18: Elective Paper (Numerical Analysis or Mathematical Statistics) (Code: MA-306A/MA-306B)

Option A: Numerical Analysis (MA-306A)

1. Introduction to Numerical Analysis: Basic Concepts
2. Error Analysis: Types and Propagation of Errors
3. Solution of Non-Linear Equations: Bisection Method
4. Newton-Raphson Method
5. Secant Method
6. Fixed-Point Iteration Method

7. Solution of Systems of Linear Equations: Gauss Elimination
8. Gauss-Seidel Method
9. LU Decomposition Method
10. Matrix Inversion Using Gauss-Jordan Method
11. Interpolation: Newton’s Forward and Backward Interpolation
12. Lagrange Interpolation
13. Newton’s Divided Difference Interpolation
14. Hermite Interpolation
15. Spline Interpolation
16. Numerical Differentiation: Forward, Backward, and Central Differences
17. Numerical Integration: Trapezoidal Rule
18. Simpson’s 1/3 Rule
19. Simpson’s 3/8 Rule
20. Romberg Integration
21. Numerical Solutions of Ordinary Differential Equations: Euler’s Method
22. Modified Euler’s Method
23. Runge-Kutta Methods
24. Predictor-Corrector Methods
25. Numerical Solutions of Partial Differential Equations: Finite Difference Method
26. Crank-Nicolson Method
27. Solution of Elliptic PDEs
28. Solution of Parabolic PDEs
29. Solution of Hyperbolic PDEs
30. Applications of Numerical Analysis in Science and Engineering
31. Advanced Problems in Numerical Solutions of Equations
32. Advanced Problems in Interpolation and Differentiation
33. Practice Session on Numerical Integration
34. Practice Session on PDEs
35. Preparation for Internal Assessment
36. Discussion on Previous Year Papers
37. Revision Session
38. Problem-Solving Techniques in Numerical Analysis
39. Final Preparatory Session
40. Recapitulation and Doubt Clearing

Option B: Mathematical Statistics (MA-306B)

1. Introduction to Mathematical Statistics: Basic Concepts
2. Probability Theory: Definitions and Properties
3. Random Variables: Discrete and Continuous
4. Probability Distributions: Binomial and Poisson Distributions
5. Normal Distribution and Its Applications
6. Moment Generating Functions
7. Mathematical Expectation and Its Properties
8. Variance and Covariance
9. Joint Distributions: Marginal and Conditional Distributions
10. Chebyshev's Inequality
11. Law of Large Numbers
12. Central Limit Theorem
13. Sampling Distributions: Definitions and Types
14. Point Estimation: Methods and Properties
15. Maximum Likelihood Estimation
16. Confidence Intervals for Mean, Variance, and Proportion
17. Hypothesis Testing: Basic Concepts
18. Tests of Significance: Z-Test, T-Test
19. Chi-Square Test and F-Test
20. Analysis of Variance (ANOVA)
21. Correlation and Regression Analysis
22. Simple and Multiple Regression
23. Non-Parametric Tests: Sign Test, Wilcoxon Test
24. Kruskal-Wallis Test
25. Introduction to Bayesian Statistics
26. Bayesian Inference and Estimation
27. Decision Theory: Loss Functions and Risk
28. Applications of Mathematical Statistics in Research
29. Advanced Problems in Probability Distributions
30. Advanced Problems in Estimation and Hypothesis Testing
31. Practice Session on Regression Analysis

32. Practice Session on Non-Parametric Tests
33. Preparation for Internal Assessment
34. Discussion on Previous Year Papers
35. Revision Session
36. Problem-Solving Techniques in Mathematical Statistics
37. Review of Key Concepts
38. Final Preparatory Session
39. Recapitulation and Doubt Clearing
40. Wrap-Up Session

Lesson Plan for Chemistry - CH-302

Unit 1: Molecular Orbital Theory (7 Lectures)

1. Lecture 1: Introduction to VBT and LCAO Method
2. Lecture 2: MO Diagrams of C_2 and N_2
3. Lecture 3: MO Diagram of O_2, Bond Order Calculation
4. Lecture 4: MO Diagrams of Halogens, Color Correlation
5. Lecture 5: Non-Crossing Rule Explanation
6. Lecture 6: MO of Heteronuclear Molecules: CO
7. Lecture 7: MO of HX Molecules

Unit 2: Organometallic Chemistry (8 Lectures)

8. Lecture 8: Introduction and Classification of Organometallics
9. Lecture 9: π-Acidity of Ligands and Stretching Frequencies
10. Lecture 10: 18 Electron Rule Overview
11. Lecture 11: Alkyls of Li, Al, Hg - Preparation and Properties
12. Lecture 12: Bonding in Alkyls of Li, Al, Hg
13. Lecture 13: Metal-Ethylenic Complexes: Zeise's Salt
14. Lecture 14: Organometallic Catalysis: Oxidative Addition
15. Lecture 15: Reductive Elimination, Hydrogenation of Olefins

Unit 3: Bioinorganic Chemistry (8 Lectures)

16. Lecture 16: Essential and Trace Elements in Biology
17. Lecture 17: Metalloporphyrins: Structure and Function
18. Lecture 18: Haemoglobin: Structure and Biological Role
19. Lecture 19: Myoglobin: Structure and Oxygen Binding

20. Lecture 20: Alkali Metal Ions in Biological Processes
21. Lecture 21: Alkaline Earth Metal Ions, Focus on Ca^{2+}
22. Lecture 22: Nitrogen Fixation: Biological Mechanisms
23. Lecture 23: Nitrogenase: Structure and Function

Unit 4: Silicones and Phosphazenes (7 Lectures)

24. Lecture 24: Introduction to Silicones: Preparation Methods
25. Lecture 25: Properties and Uses of Silicones
26. Lecture 26: Phosphazenes: Preparation Techniques
27. Lecture 27: Phosphazenes: Structure and Properties
28. Lecture 28: Applications of Silicones in Industry
29. Lecture 29: Phosphazenes in Material Science
30. Lecture 30: Summary and Revision Session

Lesson Plan for Chemistry - CH-304

Unit 1: Heterocyclic Compounds-I (7 Lectures)

1. Lecture 1: Introduction to Heterocyclic Compounds
2. Lecture 2: Aromatic Characteristics of Pyrrole, Furan, Thiophene
3. Lecture 3: Aromatic Characteristics of Pyridine
4. Lecture 4: Synthesis of Pyrrole, Furan, Thiophene
5. Lecture 5: Synthesis of Pyridine; Electrophilic Substitution Mechanism
6. Lecture 6: Nucleophilic Substitution in Pyridine Derivatives
7. Lecture 7: Basicity: Pyridine, Piperidine, Pyrrole

Unit II: Heterocyclic Compounds-II & Organosulphur Compounds (8 Lectures)

8. Lecture 8: Condensed Heterocycles: Introduction
9. Lecture 9: Indole: Preparation, Fisher Indole Synthesis
10. Lecture 10: Quinoline: Preparation, Skraup Synthesis
11. Lecture 11: Isoquinoline: Preparation, Bischler-Napieralski Synthesis
12. Lecture 12: Electrophilic Substitution in Quinoline, Isoquinoline
13. Lecture 13: Organosulphur Compounds: Nomenclature, Structure
14. Lecture 14: Thiols, Thioethers: Formation, Reactions
15. Lecture 15: Sulphonic Acids, Sulphonamides: Reactions, Detergents

Unit III: Organic Synthesis via Enolates & Synthetic Polymers (8 Lectures)

16. Lecture 16: Enolates: Acidity of Hydrogens, Alkylation
17. Lecture 17: Synthesis of Ethyl Acetoacetate: Claisen Condensation
18. Lecture 18: Keto-Enol Tautomerism of Ethyl Acetoacetate
19. Lecture 19: Addition Polymerization: Free Radical Vinyl
20. Lecture 20: Ionic Vinyl Polymerization, Ziegler-Natta Polymerization
21. Lecture 21: Condensation Polymerization: Polyesters, Polyamides
22. Lecture 22: Phenol Formaldehyde Resins: Formation, Uses
23. Lecture 23: Natural and Synthetic Rubbers: Overview

Unit IV: Amino Acids, Peptides & Proteins (7 Lectures)

24. Lecture 24: Classification of Amino Acids: Properties, Isoelectric Point
25. Lecture 25: Preparation of α-Amino Acids
26. Lecture 26: Structure and Nomenclature of Peptides
27. Lecture 27: Classification of Proteins: Primary & Secondary Structure
28. Lecture 28: Peptide Structure Determination: End Group Analysis
29. Lecture 29: Peptide Synthesis: Classical, Solid-Phase Methods
30. Lecture 30: Secondary Structure of Proteins: Helices, Sheets

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Lesson Plan for Chemistry - CH-306

Unit I: Spectroscopy-III (8 Lectures)

1. Lecture 1: Introduction to Electronic Spectrum
2. Lecture 2: Potential Energy Curves: Bonding and Antibonding MOs
3. Lecture 3: Selection Rules in Electronic Transitions
4. Lecture 4: Franck-Condon Principle: Basics
5. Lecture 5: Sigma (σ) Molecular Orbitals and Transitions
6. Lecture 6: Pi (π) Molecular Orbitals and Transitions
7. Lecture 7: Non-bonding (n) Orbitals and Transitions
8. Lecture 8: Energy Levels in MOs: Overview

Unit II: Photochemistry (8 Lectures)

9. Lecture 9: Radiation-Matter Interaction: Introduction
10. Lecture 10: Thermal vs Photochemical Processes
11. Lecture 11: Grotthus-Draper Law and Stark-Einstein Law
12. Lecture 12: Jablonski Diagram: Excited State Processes
13. Lecture 13: Fluorescence and Phosphorescence
14. Lecture 14: Non-Radiative Processes: Internal Conversion
15. Lecture 15: Intersystem Crossing: Concepts
16. Lecture 16: Quantum Yield and Photosensitized Reactions

Unit III: Solutions (8 Lectures)

17. Lecture 17: Ideal and Non-Ideal Solutions
18. Lecture 18: Concentration Expressions: Activity and Coefficients
19. Lecture 19: Colligative Properties: Overview
20. Lecture 20: Raoult's Law and Vapor Pressure Lowering
21. Lecture 21: Osmosis: Law and Molecular Weight Determination
22. Lecture 22: Boiling Point Elevation and Freezing Point Depression
23. Lecture 23: Thermodynamic Derivations for Colligative Properties
24. Lecture 24: Abnormal Molar Mass: Degree of Dissociation

Unit IV: Phase Equilibrium (6 Lectures)

25. Lecture 25: Phase Equilibrium: Introduction and Key Terms
26. Lecture 26: Gibbs Phase Rule: Derivation and Application
27. Lecture 27: One-Component Systems: Water and Sulfur
28. Lecture 28: Two-Component Systems: Solid-Liquid Equilibria
29. Lecture 29: Simple Eutectics: Pb-Ag System
30. Lecture 30: Desilverisation of Lead: Process and Significance

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Lesson plan Atomic, Molecular and Laser Physics PHY – 302

UNIT I: Thermodynamics (10 Lectures)

1. **Lecture 1:** Introduction to the First Law of Thermodynamics; Internal Energy and Joule's Law.
2. **Lecture 2:** Applications of the First Law; Carnot Cycle and Engine.
3. **Lecture 3:** Reversible and Irreversible Processes; Carnot Theorem.
4. **Lecture 4:** Thermodynamic Scale of Temperature.
5. **Lecture 5:** Introduction to Entropy; Calculation of Entropy in Various Processes.
6. **Lecture 6:** Entropy and Unavailable Energy; Physical Significance of Entropy.
7. **Lecture 7:** Second Law of Thermodynamics; Introduction to Thermodynamic Potentials.
8. **Lecture 8:** Maxwell's Equations; Application of Maxwell's Equations.
9. **Lecture 9:** Phase Diagram and Triple Point of a Substance; Joule-Thomson Effect.
10. **Lecture 10:** Review and Problem-Solving Session on Thermodynamics.

UNIT II: Classical and Fluid Mechanics (10 Lectures)

1. **Lecture 11:** Background of Vector Calculus; Gradient, Divergence, and Curl.
2. **Lecture 12:** Line, Surface, and Volume Integrals; Frame of Reference.
3. **Lecture 13:** Galilean Transformation and Invariance; Inertial and Non-Inertial Frames.
4. **Lecture 14:** Pseudo Forces; Rotating Reference Frame, Centrifugal, and Coriolis Forces.
5. **Lecture 15:** Motion under Central Force; Kepler's Laws.
6. **Lecture 16:** Conservative and Non-Conservative Forces.
7. **Lecture 17:** Ideal Fluids; Equation of Continuity and Streamline Flow.
8. **Lecture 18:** Euler's Equation and Bernoulli's Theorem; Viscous Fluids.
9. **Lecture 19:** Elasticity: Hooke's Law, Elastic Constants of Isotropic Solids.
10. **Lecture 20:** Review and Problem-Solving Session on Classical and Fluid Mechanics.

UNIT III: Quantum Mechanics and Atomic Structure (10 Lectures)

1. **Lecture 21:** Review of History of Quantum Mechanics; Planck's Quantum Hypothesis.
2. **Lecture 22:** Nature of Light; de Broglie Waves and Wave-Particle Duality.
3. **Lecture 23:** Heisenberg's Uncertainty Principle; Compton Effect.
4. **Lecture 24:** Linear Operators; Momentum and Energy Operators.
5. **Lecture 25:** Schrödinger Equation: Derivation of Time-Dependent and Time-Independent Forms.
6. **Lecture 26:** Eigenvalues, Eigenfunctions, and their Significance.
7. **Lecture 27:** Application of Schrödinger Wave Equation: Particle in a Box.
8. **Lecture 28:** One-Dimensional Step Potential; Reflection and Transmission Coefficients.
9. **Lecture 29:** Brief Overview of Harmonic Oscillator in Quantum Mechanics.
10. **Lecture 30:** Review and Problem-Solving Session on Quantum Mechanics.

UNIT IV: Atomic Structure and Spectroscopy (10 Lectures)

1. **Lecture 31:** Early Models of Atomic Structure; Hydrogen Atom Spectrum.
2. **Lecture 32:** Bohr Model; Franck-Hertz Experiment; Discovery of Hydrogen Isotopes.
3. **Lecture 33:** Correspondence Principle; Spectra of Hydrogen-like Atoms.
4. **Lecture 34:** Magnetic Moment due to Orbital Motion; Normal Zeeman Effect.
5. **Lecture 35:** Quantum Mechanics Applied to Hydrogen Atom; Stern-Gerlach Experiment.
6. **Lecture 36:** Spin-Orbit Coupling; Fine Structure of Hydrogen Atom Spectrum.
7. **Lecture 37:** Many-Electron Atoms: Hund's Rule and Periodic Table; Alkali Spectra.
8. **Lecture 38:** Rotational and Vibrational Spectroscopy; Diatomic Molecules.
9. **Lecture 39:** Raman Effect and Introduction to LASERs; He-Ne LASER.
10. **Lecture 40:** Final Review and Problem-Solving Session on Atomic Structure and Spectroscopy.

Lesson plan Nuclear Physics PHY – 304

UNIT I: Nuclear Composition, Properties, and Stability (10 Lectures)

1. **Lecture 1:** Introduction to Nuclear Physics: Historical Perspective, Fundamental Concepts
2. **Lecture 2:** Nuclear Composition: Protons, Neutrons, and Isotopes
3. **Lecture 3:** Nuclear Properties: Charge, Spin, and Magnetic Moment

4. **Lecture 4:** Nuclear Mass: Mass Spectrometry and Mass Deficit
5. **Lecture 5:** Nuclear Binding Energy: Concepts and Calculations
6. **Lecture 6:** Nuclear Size Determination: Scattering Experiments, Radii
7. **Lecture 7:** Semi-Empirical Mass Formula: Application and Limitations
8. **Lecture 8:** Nuclear Stability: Binding Energy and the Valley of Stability
9. **Lecture 9:** Introduction to Nuclear Models: Liquid Drop and Shell Models
10. **Lecture 10:** Review of UNIT I and Problem-Solving Session

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UNIT II: Radioactive Decay and Interaction of Radiation with Matter (10 Lectures)

1. **Lecture 11:** Alpha Decay: Mechanism, Energy Release, and Theoretical Models
2. **Lecture 12:** Beta Decay: Fermi Theory, Energy Spectrum, and Neutrino Hypothesis
3. **Lecture 13:** Gamma Decay: Electromagnetic Transitions, Multipolarity, Internal Conversion
4. **Lecture 14:** Interaction of Radiation with Matter: Overview and Key Concepts
5. **Lecture 15:** Energy Loss of Charged Particles: Bethe-Bloch Formula, Stopping Power
6. **Lecture 16:** Absorption of Gamma Rays: Photoelectric Effect, Compton Scattering, Pair Production
7. **Lecture 17:** Attenuation of Radiation: Attenuation Coefficients and Applications
8. **Lecture 18:** Radiation Dose: Concepts, Units, and Biological Effects
9. **Lecture 19:** Radiation Protection and Shielding: Materials and Techniques
10. **Lecture 20:** Review of UNIT II and Problem-Solving Session

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UNIT III: Nuclear Accelerators and Detectors (10 Lectures)

1. **Lecture 21:** Introduction to Nuclear Accelerators: Basic Principles
2. **Lecture 22:** Linear Accelerator: Design, Working Principle, and Applications
3. **Lecture 23:** Cyclotron: Principles, Construction, and Uses
4. **Lecture 24:** Betatron: Principles, Design, and Applications
5. **Lecture 25:** Synchrotron: Principles, Operation, and Applications
6. **Lecture 26:** Radiation Detectors: General Principles and Classification
7. **Lecture 27:** Gas-Filled Detectors: Ionization Chamber, Proportional Counter, Geiger-Müller Counter
8. **Lecture 28:** Scintillation Detectors: Materials, Mechanism, and Applications
9. **Lecture 29:** Semiconductor Detectors: Design, Function, and Use in Nuclear Physics
10. **Lecture 30:** Review of UNIT III and Problem-Solving Session

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UNIT IV: Nuclear Reactions, Reactors, and Applications (10 Lectures)

1. **Lecture 31:** Introduction to Nuclear Reactions: Types and Characteristics
2. **Lecture 32:** Conservation Laws in Nuclear Reactions: Energy, Momentum, and Quantum Numbers
3. **Lecture 33:** Q-Value of Nuclear Reactions: Definition, Calculation, and Significance
4. **Lecture 34:** Reaction Threshold: Concept and Examples
5. **Lecture 35:** Nuclear Reactors: Basic Principles, Components, and Types
6. **Lecture 36:** Fission Reactors: Mechanism, Control, and Energy Production
7. **Lecture 37:** Fusion Reactors: Mechanism, Challenges, and Future Prospects
8. **Lecture 38:** Nuclear Energy: Advantages, Risks, and Environmental Impact

9. **Lecture 39:** Applications of Nuclear Physics: Medicine, Industry, and Research
10. **Lecture 40:** Review of UNIT IV and Comprehensive Course Review

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Lesson plan Electromagnetic Theory PHY – 304

Unit I: Foundations of Electromagnetic Theory (10 Lectures)

1. **Lecture 1**: Introduction to Electromagnetic Theory, Overview of Maxwell's equations, Historical context and significance
2. **Lecture 2**: Maxwell's Equations, Differential form of Gauss's laws
3. **Lecture 3**: Maxwell's Equations, Differential form of Faraday's law and Ampère's law
4. **Lecture 4**: Displacement Current and Ampère's Law, Concept of displacement current, Modification of Ampère's law
5. **Lecture 5**: Vector and Scalar Potentials, Definitions and significance, Relations to electromagnetic fields
6. **Lecture 6**: Gauge Transformations, Lorentz gauge, Coulomb gauge, Applications and simplifications
7. **Lecture 7**: Boundary Conditions at Interfaces, Continuity of fields at dielectric boundaries
8. **Lecture 8**: Wave Equations, Derivation from Maxwell's equations, Solutions in free space
9. **Lecture 9**: Plane Waves in Dielectric Media, Characteristics and propagation
10. **Lecture 10**: Poynting Theorem and Energy Density, Poynting vector and energy flow, Electromagnetic field momentum and angular momentum density

Unit II: Reflection, Refraction, and Waves in Conducting Media (10 Lectures)

1. **Lecture 11**: Reflection and Refraction at Interfaces, Snell's law and Fresnel equations
2. **Lecture 12**: Fresnel Formulae and Brewster's Angle, Derivation and applications, Total internal reflection
3. **Lecture 13**: Waves in Conducting Media, Reflection at metallic surfaces
4. **Lecture 14**: Waves in Conducting Media, Skin depth and frequency dependence
5. **Lecture 15**: Maxwell's Equations in Microscopic Media, Plasmas and the plasma frequency
6. **Lecture 16**: Propagation of Waves in the Ionosphere, Refractive index and ionized gases
7. **Lecture 17**: Energy Loss and Attenuation in Conductors, Detailed analysis and applications
8. **Lecture 18**: Practical Examples of Reflection and Refraction, Real-world applications and problem-solving
9. **Lecture 19**: Mid-Term Review, Review of Units I and II
10. **Lecture 20**: Mid-Term Exam, Assessment of understanding and problem-solving skills

Unit III: Polarization and Anisotropic Media (10 Lectures)

1. **Lecture 21**: Polarization of Electromagnetic Waves, Linear polarization
2. **Lecture 22**: Circular and Elliptical Polarization, Descriptions and mathematical treatments
3. **Lecture 23**: Propagation in Anisotropic Media, Dielectric tensor and wave behavior
4. **Lecture 24**: Fresnel's Formula in Anisotropic Media, Application to uniaxial crystals
5. **Lecture 25**: Double Refraction, Phenomenon and practical examples
6. **Lecture 26**: Nicol Prism and Polarizing Devices, Operation and uses
7. **Lecture 27**: Production of Circularly and Elliptically Polarized Light, Techniques and equipment
8. **Lecture 28**: Babinet Compensator and Analysis, Description and applications
9. **Lecture 29**: Problem-Solving Session, Exercises and examples on polarization
10. **Lecture 30**: Review and Applications of Polarization, Real-world applications and case studies

Unit IV: Waveguides and Optical Fibers (10 Lectures)

1. **Lecture 31**: Introduction to Waveguides, Basics and types
2. **Lecture 32**: Coaxial Transmission Lines, Analysis and applications
3. **Lecture 33**: Modes in Rectangular Waveguides, TE and TM modes
4. **Lecture 34**: Energy Flow and Attenuation in Waveguides, Detailed analysis and calculations
5. **Lecture 35**: Rectangular Resonant Cavities, Principles and applications
6. **Lecture 36**: Planar Optical Waveguides, Basics and characteristics
7. **Lecture 37**: Planar Dielectric Waveguides, Conditions of continuity and phase shift
8. **Lecture 38**: Eigenvalue Equations for Waveguides, Derivations and solutions
9. **Lecture 39**: Phase and Group Velocity of Guided Waves, Analysis and practical considerations
10. **Lecture 40**: Final Review and Exam, Comprehensive review of all units, Final assessment

DEPARTMENT OF BOTANY

RAFFLES UNIVERSITY

Syllabus for M.Sc. BOTANY

Choice Based Credit System

(With effect from the Session 2022 – 2024)

RAFFLES UNIVERSITY, NEEMRANA SCHOOL OF BASIC AND APPLIED SCIENCES

DEPARTMENT OF BOTANY

RAFFLES UNIVERSITY
SOBAS

Total Credits = 106 Total Marks = 2650

Programme Outcomes:

1. To acquaint students with recent knowledge and techniques in basic and applied biological sciences.
2. To develop understanding of organismal, cellular, biochemical and environmental basis of life
3. To provide insight into ethical implications of biological research for environmental protection and good laboratory practices and biosafety.
4. To develop problem solving innovative thinking with robust communication and writing skills in youth with reference to biological, environmental and nutritional sciences.
5. To understand the applications of biotic material in health, medicine and food security for human well being and sustainable development.
6. To impart practical and project based vocational training for preparing youth for a career in research and entrepreneurship in fields of life sciences for self reliance.

Program Specific Outcomes (PSOs):

1. Biodiversity of lower and higher plants along with their taxonomic status. The students will have in-depth knowledge about physiology and metabolism of plants.
2. Students will be able to gain in-depth knowledge regarding ethnobotany, conservation status and strategies of economically important plants.
3. This program aims to critically engage students with concepts of ecological principles, biodiversity, population, community, ecosystem structure and function, importance of environment and the problems related with it at local and global level.
4. The students will have strong base knowledge of physiological, cellular and molecular aspects of plants biology. It will help them venture into advanced research areas.
5. This program will help students to be aware of good laboratory practices in microbial technology and plant biotechnology.

SEMESTER – I

Paper – BOT-101 Algae & Fungi

Credit -4 MM-80+20 T: 3hrs

Objectives: To educate and train the students for professional and research career in the field of Algology & Mycology.

Outcomes:

1. CO1 The students will be inspired to become aware and comprehend the broader aspects of Algology.
2. CO2 The learning outcome will be aimed towards advanced academic education to broaden the knowledge its Biodiversity, Ecological significance and Economic importance of algae.
3. CO3 The students will be inspired to become well versed with the fungal world in terms of recent researches.
4. CO4 Economic importance of Fungi with regards to its deleterious and beneficial aspects. Modern economic importance of Lichens. Working knowledge of biological laboratories and research centres in India.

BOT-101											
PO											
		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	3	2	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	2	1	2	1	2	2	1	3	1	2
CO	CO 4	2	2	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Algae

1. Lecture 1-2: Criteria for Algal Classification
2. Lecture 1: Introduction to Algae and Classification Criteria (Pigments, Reserve Food)
3. Lecture 2: Flagella and Their Taxonomic Importance
4. Lecture 3-4: Systems of Classification and Recent Trends
5. Lecture 3: Historical Classification Systems
6. Lecture 4: Recent Trends and Modern Classification Approaches

7. Lecture 5-6: Thallus Organization and Evolutionary Trends
8. Lecture 5: Thallus Organization in Algae
9. Lecture 6: Evolutionary Trends in Algal Thallus
10. Lecture 7-8: Economic Importance of Algae
11. Lecture 7: Algae as Food and Feed
12. Lecture 8: Industrial Uses and Algal Biofertilizers

    Unit II: Algal Biodiversity and Ecology
13. Lecture 9-10: Biodiversity of Algae in Various Habitats
14. Lecture 9: Terrestrial and Freshwater Algae
15. Lecture 10: Marine Algae
16. Lecture 11-12: Ecological Diversity of Algae in Unusual Habitats
17. Lecture 11: Thermal, Psychrophilic, and Subaerial Habitats
18. Lecture 12: Symbiotic Algae
19. Lecture 13-14: Algal Blooms and Red Tides
20. Lecture 13: Dynamics of Algal Blooms
21. Lecture 14: Red Tides and Their Consequences
22. Lecture 15-16: Algae as Phytoplankton
23. Lecture 15: Major Components of Phytoplankton
24. Lecture 16: Ecological Role of Algae in Aquatic Systems
25. Lecture 17-20: Morphological Features and Life Cycles of Major Algal Divisions
26. Lecture 17: Cyanophyta and Chlorophyta
27. Lecture 18: Xanthophyta and Bacillariophyta
28. Lecture 19: Phaeophyta and Rhodophyta
29. Lecture 20: Case Studies: Spirulina, Gonyaulax, Laminaria, Gelidium, and Batrachospermum

    Unit III: Fungi
30. Lecture 21-22: General Characters of Fungi
31. Lecture 21: Thallus Organization, Nutrition, and Reproduction
32. Lecture 22: Classification Systems (Ainsworth & Bisby, Alexopoulos et al.)
33. Lecture 23-24: Phylogeny of Fungi
34. Lecture 23: Characters Used in Classification
35. Lecture 24: Phylogenetic Relationships Among Major Groups
36. Lecture 25-28: Major Groups of Fungi
37. Lecture 25: Myxomycota and Mastigomycota
38. Lecture 26: Zygomycota and Ascomycota
39. Lecture 27: Basidiomycota and Mitosporic Fungi
40. Lecture 28: Case Studies: Rhizopus, Neurospora, Polyporus, Drechslera, and Colletotrichum
41. Lecture 29-30: Fungal Spores and Their Dispersal
42. Lecture 29: Types of Spores
43. Lecture 30: Spores and Their Mechanisms of Dispersal
44. Lecture 31-32: Fungal Reproduction and Genetics
45. Lecture 31: Homothallism, Heterothallism, and Alternation of Generations
46. Lecture 32: Parasitism and Parasitic Fungi

Unit IV: Economic Importance of Fungi

47. Lecture 33-34: Fungi in Nutrient Cycling and Decomposition
48. Lecture 33: Nutrient Cycling and Humus Formation
49. Lecture 34: Decomposition, Decay, and Timber Deterioration
50. Lecture 35-36: Plant Diseases Caused by Fungi
51. Lecture 35: Potato Blights, Grapes Downy Mildew, Bajra Green Ear Disease
52. Lecture 36: Apple Scab, Karnal Bunt, Wheat Rust, Groundnut Tikka Disease
53. Lecture 37-38: Introduction to Lichens
54. Lecture 37: Structure and Classification of Lichens
55. Lecture 38: Reproduction and Economic Importance of Lichens
56. Lecture 39-40: Review and Case Studies
57. Lecture 39: Review of Algal and Fungal Biodiversity, Ecology, and Economic Importance
58. Lecture 40: Case Studies and Current Research Trends in Algae and Fungi

Paper – BOT-102 – Bryophytes, Pteridophytes and Paleobotany

Credit -4 MM-80+20 T: 3hrs

Objectives: The course has been conceived to equip students with the knowledge of characteristics, structure and development of gametophyte and sporophyte in bryophytes & pteridophytes.

Outcomes:

1. CO1 Classify and distinguish bryophytes and pteridophytes from other groups of plants
2. CO2 Learn about the origin and evolution of sporophyte, heterospory, origin of seed habit, evolutionary trends in stele and spore producing organs.
3. CO3 Describe the ecological, economic significance of bryophytes and pteridophytes and learn fossilization processing
4. CO4 Appreciate role of these group of plants in understanding basic concepts of morphogenesis, apogamy, apospory and regulation of development in vitro.

BOT-102											
PO											
CO		1	2	3	4	5	6	7	8	9	10
	CO 1	2	3	3	2	2	3	3	1	1	2
	CO 2	2	2	2	2	1	2	2	3	2	1
	CO 3	3	1	2	1	2	2	1	3	1	3
	CO 4	2	2	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Bryophytes

1. Lecture 1-2: General Characteristics of Bryophytes
2. Lecture 1: Overview of Bryophytes - Definition, Habitat, and Importance
3. Lecture 2: General Characteristics and Unique Features
4. Lecture 3-4: Classification of Bryophytes
5. Lecture 3: Classification up to Orders and Classes
6. Lecture 4: Key Characteristics of Major Classes (Hepaticopsida, Bryopsida, Anthocerotopsida)
7. Lecture 5-6: Structure and Development of Gametophytes and Sporophytes
8. Lecture 5: Structure and Development of Gametophytes (Marchantiales, Jungermanniales)
9. Lecture 6: Structure and Development of Sporophytes (Sphagnales, Funariales,

Polytrichales, Anthocerotales)

10. Lecture 7-8: Detailed Study of Selected Genera
11. Lecture 7: Marchantiales (Plagiochasma, Notothylus) and Sphagnales (Sphagnum)
12. Lecture 8: Funariales (Physcomitrella) and Polytrichales (Polytrichum)

Unit II: Bryophyte Reproduction and Ecology

13. Lecture 9-10: Protonemal Differentiation and Bud Formation
14. Lecture 9: Regulation of Protonemal Differentiation
15. Lecture 10: Bud Formation and Development
16. Lecture 11-12: Biology of Reproduction
17. Lecture 11: In Vitro Regulation of Gametangia Formation - Physical and Chemical Factors
18. Lecture 12: Cytology of Bryophytes - Apogamy and Apospory
19. Lecture 13-14: Ecological Importance of Bryophytes
20. Lecture 13: Bryophytes as Indicators of Pollution and Minerals
21. Lecture 14: Role of Bryophytes in Ecological Succession

Unit III: Pteridophytes

22. Lecture 15-16: General Characteristics of Pteridophytes
23. Lecture 15: Overview and Classification of Pteridophytes
24. Lecture 16: Key Characteristics and Evolutionary Significance
25. Lecture 17-18: Comparative Morphology and Classification
26. Lecture 17: Comparative Morphology of Lycopodium, Isoetes, Ophioglossum
27. Lecture 18: Classification and Reproduction of Azolla
28. Lecture 19-20: Evolution and Significance
29. Lecture 19: Origin and Evolution of Stele
30. Lecture 20: Heterospory, Seed Habit, and Ecological Significance

Unit IV: Paleobotany

31. Lecture 21-22: Introduction to Paleobotany
32. Lecture 21: History and Scope of Paleobotany
33. Lecture 22: Formation and Types of Fossils
34. Lecture 23-24: Techniques and Geological Time Scale
35. Lecture 23: Techniques for Studying Fossils
36. Lecture 24: Geological Time Scale and Its Relevance
37. Lecture 25-26: Brief Account of Key Paleobotanical Groups
38. Lecture 25: Pteridospermales
39. Lecture 26: Cycadeoidales
40. Lecture 27-28: Paleobotany and Evolution of Vascular Plants
41. Lecture 27: Evolution of Vascular Plants
42. Lecture 28: Contributions of Paleobotany to Understanding Plant Evolution
43. Lecture 29-30: Review and Case Studies
44. Lecture 29: Comprehensive Review of Bryophytes and Pteridophytes
45. Lecture 30: Case Studies and Current Research Trends in Bryophytes and Pteridophytes
46. Additional Lectures (31-40): Advanced Topics and Practical Sessions
47. Lecture 31-32: Advanced Topics in Bryophytes
48. Lecture 31: Recent Advances in Bryophyte Research
49. Lecture 32: Bryophytes in Environmental Management

50. Lecture 33-34: Advanced Topics in Pteridophytes
51. Lecture 33: Recent Advances in Pteridophyte Research
52. Lecture 34: Pteridophytes in Conservation and Restoration
53. Lecture 35-36: Advanced Paleobotany
54. Lecture 35: Modern Techniques in Paleobotany
55. Lecture 36: Fossil Evidence and Plant Evolution
56. Lecture 37-40: Practical Sessions and Student Presentations
57. Lecture 37: Laboratory Session: Identification of Bryophyte and Pteridophyte Specimens
58. Lecture 38: Field Trip: Observation of Bryophyte and Pteridophyte Habitats
59. Lecture 39: Student Presentations on Research Topics
60. Lecture 40: Review and Final Examination Preparation

Paper – BOT-103 - CYTOGENETICS AND PLANT BREEDING

Credit -4 MM-80+20 T: 3hrs

Objective: The purpose of this paper is to acquaint the students about structure and functions of a chromosome in detail. The course also explains the chromosomal variations and their effects on biological system. Further, it aims to draw attention to methods used for crop improvement.

Outcomes:

1. CO1 The students get acquainted about the different cytogenetic and molecular techniques used for genome analysis.
2. CO2 This course will enable the students to use linkage and recombination frequencies in gene mapping.
3. CO3 The students get familiarised about role of chromosomes in sex determination and generation of variations.
4. CO4 The students will know about the methods that can be used to create the desired genotype/phenotype.

BOT-103											
PO											
CO		1	2	3	4	5	6	7	8	9	10
	CO 1	2	1	3	2	2	3	3	1	1	2
	CO 2	2	2	2	3	1	2	2	2	2	1
	CO 3	2	3	2	1	2	2	1	3	1	3
	CO 4	2	2	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Chromatin Structure and Organization

1. Lecture 1-2: Chromosome Structure and DNA Packaging
2. Lecture 1: Introduction to Chromatin Structure; DNA Packaging and Histone Proteins
3. Lecture 2: Chromosome Structure: Nucleosomes and Higher-order Structures
4. Lecture 3-4: Euchromatin and Heterochromatin
5. Lecture 3: Characteristics and Functions of Euchromatin
6. Lecture 4: Characteristics and Functions of Heterochromatin
7. Lecture 5-6: Organization of Plastid and Mitochondrial Genomes
8. Lecture 5: Plastid Genome Organization and Function
9. Lecture 6: Mitochondrial Genome Structure and Function

10. Lecture 7-8: Special Chromosomes
11. Lecture 7: Structure and Behavior of Polytene Chromosomes
12. Lecture 8: Lampbrush Chromosomes and Sex Chromosomes
13. Lecture 9-10: Karyotype Analysis and Techniques
14. Lecture 9: Karyotype Analysis: Methods and Evolutionary Significance
15. Lecture 10: Techniques: FISH, GISH, and Flow Cytometry

    Unit II: Cell Cycle, Chromosome Banding, and Linkage
16. Lecture 11-12: Cell Cycle
17. Lecture 11: Phases of the Cell Cycle and Checkpoints
18. Lecture 12: Regulation of the Cell Cycle: Cyclins, CDKs, and Checkpoints
19. Lecture 13-14: Chromosome Banding Techniques
20. Lecture 13: Overview of Chromosome Banding Techniques
21. Lecture 14: Applications of Banding Techniques in Karyotyping
22. Lecture 15-16: Linkage and Crossing Over
23. Lecture 15: Molecular Mechanisms of Crossing Over
24. Lecture 16: Role of Enzymes in Crossing Over and Linkage Groups
25. Lecture 17-18: Chromosome Mapping
26. Lecture 17: Two-point Test Crosses: Methods and Analysis
27. Lecture 18: Three-point Test Crosses: Techniques and Applications

    Unit III: Sex Determination and Chromosome Variation
28. Lecture 19-20: Sex Determination
29. Lecture 19: Chromosomal Sex Determination in Plants and Animals
30. Lecture 20: Gene Determining Sex in Drosophila and Humans; Gene Dosage Compensation
31. Lecture 21-22: Structural Alterations in Chromosomes
32. Lecture 21: Origin and Meiosis of Chromosome Alterations: Duplications and Deficiencies
33. Lecture 22: Inversions and Translocations: Breeding Behavior and Effects
34. Lecture 23-24: Variation in Chromosome Number
35. Lecture 23: Haploids, Aneuploidy, and Euploidy: Definitions and Examples
36. Lecture 24: Polyploidy: Origin, Production, Effects, and Uses in Crop Improvement

    Unit IV: Principles of Plant Breeding
37. Lecture 25-26: Principles of Plant Breeding
38. Lecture 25: Basic Principles and Objectives of Plant Breeding
39. Lecture 26: Methods for Breeding Self- and Cross-pollinated Crops
40. Lecture 27-28: Heterosis and Hybrid Vigor
41. Lecture 27: Concepts of Heterosis and Hybrid Vigor
42. Lecture 28: Utility of Hybrids in Genetics and Plant Breeding
43. Lecture 29-30: Asexual Breeding Systems
44. Lecture 29: Methods for Breeding Vegetatively Propagated Crops
45. Lecture 30: Non-conventional Breeding Methods and Gene Variability
46. Lecture 31-32: Male Sterility
47. Lecture 31: Concept and Classification of Male Sterility
48. Lecture 32: Genetic Control, Inheritance Patterns, and Breeding Utility

49. Lecture 33-34: Advanced Topics in Plant Breeding
50. Lecture 33: Current Trends in Plant Breeding Research
51. Lecture 34: Case Studies in Modern Plant Breeding Techniques
52. Lecture 35-36: Review and Practical Applications
53. Lecture 35: Comprehensive Review of Chromatin Structure, Cell Cycle, and Chromosome Variation
54. Lecture 36: Practical Applications: Laboratory Techniques and Data Analysis
55. Lecture 37-38: Student Presentations
56. Lecture 37: Student Presentations on Selected Topics
57. Lecture 38: Discussion and Feedback on Presentations
58. Lecture 39-40: Final Review and Examination Preparation
59. Lecture 39: Review of Key Concepts and Preparation Strategies
60. Lecture 40: Final Examination and Course Wrap-Up

Paper – BOT-104 – ECOLOGY

Credit -4 MM- 80+20 T: 3hrs

Objectives: Critically engage with concepts of Ecological principles and importance of environment and the problems related with it at global and local level.

Outcomes:

1. CO1 Students will be able to understand about limiting factors controlling distribution and growth of organisms.
2. CO2 Students will be able to develop insights about the concepts of populations, community and ecosystems and can use in management of natural resources for sustainable development.
3. CO3 Students will be able to comprehend interactions among components of ecosystems for better stability.
4. CO4 By understanding the concept of ecological principles and environmental issues, the students will be able to develop attitude, value system and ethics towards environmental related issues.

BOT-104											
PO											
CO		1	2	3	4	5	6	7	8	9	10
	CO 1	2	3	3	2	2	3	1	1	1	2
	CO 2	3	2	2	2	1	2	2	2	2	1
	CO 3	1	1	2	1	2	2	1	3	1	2
	CO 4	2	1	1	2	2	1	3	2	1	1

Lecture Plan:

Unit I: The Environment and Population Ecology
Lecture 1-2: The Environment
Lecture 1: Physical and Biotic Environments; Abiotic and Biotic Interactions
Lecture 2: Tolerance Ranges, Limiting Factors, and Ecotypes
Lecture 3-4: Habitat and Niche
Lecture 3: Concept of Habitat and Niche; Niche Width and Overlap
Lecture 4: Fundamental vs. Realized Niche; Resource Partitioning and Character Displacement
Lecture 5-6: Population Ecology
Lecture 5: Concepts and Characteristics of Populations; Population Growth and Regulation
Lecture 6: Species Interactions: Mutualism, Competition, Allelopathy, Predation, Parasitism
Lecture 7-8: Life History Strategies and Metapopulations
Lecture 7: Life History Strategies: r- and K-Selection

Lecture 8: Metapopulations: Demes, Dispersal, Interdemic Extinctions, and Age-Structured Populations
Unit II: Community Structure and Ecological Succession
Lecture 9-10: Community Structure and Organization
Lecture 9: Nature of Communities; Community Structure and Its Attributes
Lecture 10: Species Diversity; Edges and Ecotones; Vegetation Characteristics
Lecture 11-12: Analytical and Synthetic Methods
Lecture 11: Analytical Methods for Studying Vegetation
Lecture 12: Synthetic Characters and Methods of Analysis
Lecture 13-14: Ecological Succession
Lecture 13: Types of Succession and Mechanisms
Lecture 14: Changes Involved in Succession; Concept of Climax
Unit III: Ecosystem Organization
Lecture 15-16: Ecosystem Structure and Functions
Lecture 15: Structure and Functions of Ecosystems
Lecture 16: Primary Production: Global Patterns and Controlling Factors
Lecture 17-18: Energy Dynamics
Lecture 17: Trophic Levels, Energy Flow Pathways, and Ecological Efficiencies
Lecture 18: Global Biogeochemical Cycles: Carbon, Nitrogen, Phosphorus, and Sulfur
Lecture 19-20: Ecosystem Stability
Lecture 19: Ecosystem Stability: Resistance and Resilience
Lecture 20: Case Studies and Examples of Ecosystem Stability
Unit IV: Biogeography and Global Environmental Change
Lecture 21-22: Biogeography
Lecture 21: Major Terrestrial Biomes and Their Characteristics
Lecture 22: Theory of Island Biogeography and Biogeographical Zones of India
Lecture 23-24: Speciation, Extinction, and Endemism
Lecture 23: Speciation and Extinction Processes
Lecture 24: Endemism and Its Implications
Lecture 25-26: Global Atmosphere Changes
Lecture 25: Environmental Pollution and Its Impact
Lecture 26: Global Environmental Changes: CO_2 Fertilization, Global Warming, Sea Level Rise, and UV Radiation
Lecture 27-28: Review and Case Studies
Lecture 27: Review of Key Concepts in Ecology and Biogeography
Lecture 28: Case Studies on Global Environmental Change and Ecosystem Dynamics
Lecture 29-30: Practical Applications
Lecture 29: Laboratory Session: Analyzing Vegetation and Community Structure
Lecture 30: Field Trip: Observations of Local Ecosystems and Succession
Lecture 31-32: Advanced Topics in Ecology
Lecture 31: Current Research Trends in Ecology and Environmental Science
Lecture 32: Applications of Ecological Principles in Conservation and Management
Lecture 33-34: Student Presentations
Lecture 33: Student Presentations on Selected Topics in Ecology

Lecture 34: Discussion and Feedback on Presentations
Lecture 35-36: Review and Final Exam Preparation
Lecture 35: Comprehensive Review of Ecology and Biogeography
Lecture 36: Final Exam Preparation and Q&A
Lecture 37-40: Special Topics and Emerging Issues
Lecture 37: Emerging Issues in Global Ecology
Lecture 38: Innovations in Ecological Research Methods
Lecture 39: Future Directions in Biogeography and Environmental Science
Lecture 40: Course Wrap-Up and Final Examination

Semester II

Paper – BOT-201 – Microbiology and Biostatistics

Credit -4 MM- 80+20 T: 3hrs

Objectives: The Course has been conceived to equip the students with the knowledge of various microbial pathogens and their effect on human affairs. In addition, the course also deals with growth, collection and maintenance of microbes, their interactions and control different therapeutic methods.

Outcomes:

1. CO1 To acquaint the students with the knowledge of various microbes (viruses, bacteriophages, and Cyanobacteria their impacts Biological Importance.
2. CO2 The Course has been conceived to equip the students with the knowledge of various laboratory conditions for their culture and maintenance of microorganisms in terms of their control through physical and chemical methods.
3. CO3 It is aimed to impart knowledge about microbial interactions in the wider context of Environmental Microbiology biological laboratories and research centres in India.
4. CO4 Working knowledge of biostatistics and there importance in the plant sciences while discussing the results & findings in terms of correlations, regressions and other details.

BOT-201											
PO											
		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	3	2	2	3	3	1	2	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	1	1	2	1	2	2	1	3	1	2
CO	CO 4	2	1	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Virology and Cyanobacteria
Lecture 1-2: Structure & Replication of Viruses and Bacteriophages
Lecture 1: Structure of Viruses and Bacteriophages; Types of Viral Nucleic Acids and Proteins
Lecture 2: Replication Cycles of Viruses and Bacteriophages: Lytic and Lysogenic Phases
Lecture 3-4: Transmission and Control of Viruses

Lecture 3: Transmission Routes of Plant Viruses; Preventive Measures
Lecture 4: Control Strategies for Plant Viruses; Vaccines and Antiviral Agents
Lecture 5-6: Isolation & Purification of Plant Viruses
Lecture 5: Techniques for Isolation of Plant Viruses
Lecture 6: Purification Methods and Applications
Lecture 7-8: Diseases Caused by Viruses
Lecture 7: Tobacco Mosaic Virus (TMV): Symptoms, Transmission, and Management
Lecture 8: Tristeza of Citrus: Disease Mechanism, Impact, and Control Measures
Lecture 9-10: Cyanobacteria
Lecture 9: Salient Features of Cyanobacteria; Structure and Classification
Lecture 10: Biological Importance of Cyanobacteria: Ecological Roles and Applications
Unit II: Microbial Growth and Control
Lecture 11-12: Growth, Culture, and Maintenance of Microorganisms
Lecture 11: Growth Phases and Measurement Techniques
Lecture 12: Culture Methods and Maintenance of Microorganisms
Lecture 13-14: Environmental Factors Influencing Microbial Growth
Lecture 13: Physical Factors: Temperature, pH, Osmotic Pressure
Lecture 14: Chemical Factors: Nutrients, Oxygen Requirements
Lecture 15-16: Control of Micro-organisms: Physical Methods
Lecture 15: High Temperature Sterilization, Dry Heat, Moist Heat, and Filtration
Lecture 16: Low Temperature, Lyophilization, and Radiation
Lecture 17-18: Control of Micro-organisms: Chemical Methods
Lecture 17: Disinfectants and Antiseptics: Types and Uses
Lecture 18: Evaluation of Chemical Agents and Their Efficacy
Unit III: Microbial Interactions and Environmental Microbiology
Lecture 19-20: Microbial Interactions
Lecture 19: Types of Symbiosis: Commensalism, Synergism, Mutualism
Lecture 20: Case Studies: Lichens, Nitrogen-Fixing Symbiosis, Mycorrhizae
Lecture 21-22: Environmental Microbiology
Lecture 21: Microbiology of Freshwater and Marine Environments
Lecture 22: Microbiology of Extreme Environments; Biofilms
Lecture 23-24: Bioremediation and Bioleaching
Lecture 23: Principles and Methods of Bioremediation
Lecture 24: Bioleaching: Techniques and Applications in Mining and Waste Management
Unit IV: Biostatistics
Lecture 25-26: Data Description and Graphical Representation
Lecture 25: Data Tabulation and Graphical Representation Techniques
Lecture 26: Types of Graphs and Their Uses in Data Analysis
Lecture 27-28: Measures of Central Tendency and Dispersion
Lecture 27: Mean, Mode, Median, and Range
Lecture 28: Standard Deviation and Variance
Lecture 29-30: Statistical Significance and Tests
Lecture 29: Understanding Types of Errors and Level of Significance
Lecture 30: F-Test, T-Test, and Chi-Square Test: Applications and Interpretation

Lecture 31-32: Regression and Correlation
Lecture 31: Simple Linear Regression: Concepts and Calculations
Lecture 32: Correlation Analysis: Types and Interpretation
Lecture 33-34: Review and Case Studies
Lecture 33: Review of Key Concepts in Virology, Microbiology, and Biostatistics
Lecture 34: Case Studies and Practical Applications
Lecture 35-36: Practical Applications and Laboratory Techniques
Lecture 35: Laboratory Techniques: Virus Isolation, Microbial Culturing
Lecture 36: Statistical Software: Data Analysis and Interpretation
Lecture 37-38: Student Presentations
Lecture 37: Student Presentations on Selected Topics
Lecture 38: Discussion and Feedback
Lecture 39-40: Final Review and Examination Preparation
Lecture 39: Comprehensive Review of Course Topics
Lecture 40: Final Exam Preparation and Q&A

Paper-BOT-202: Natural Resources and Biodiversity

Credit -4 MM-80+20 T: 3hrs

Objectives: This course aims to develop knowledge regarding natural resources and their utilization. This also aims to critically engage students with biodiversity-its status, monitoring and conservation.

Outcomes: After completion of course the students will be able to understand

1. CO1 Resources and their sustainable uses.
2. CO2 Environmental issues at global and local level.
3. CO3 Ecosystem Restoration
4. CO4 Conservation status and strategies, sustainable indicators

BOT-202											
PO											
CO		1	2	3	4	5	6	7	8	9	10
	CO 1	3	2	3	3	2	3	3	1	2	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	1	2	2	1	2	2	1	3	1	2
	CO 4	2	1	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Resources and Environmental Pollution
Lecture 1-2: Types of Resources
Lecture 1: Introduction to Resources; Renewable vs. Non-Renewable Resources
Lecture 2: Resource Degradation: Causes and Consequences; Conservation Strategies
Lecture 3-4: Land Resources
Lecture 3: Land Degradation and Desertification: Processes and Impacts
Lecture 4: Management of Waste Lands in India: Approaches and Case Studies
Lecture 5-6: Water Resources
Lecture 5: Water Pools and Hydrological Cycles; Surface Water vs. Ground Water
Lecture 6: Water Use and Management; Issues in Water Resources Management
Lecture 7-8: Environmental Pollution
Lecture 7: Types of Pollution: Air, Water, and Soil; Sources and Effects
Lecture 8: Pollution Control Measures and Management Strategies
Unit II: Forest Resources, Energy Resources, and Ecosystem Restoration
Lecture 9-10: Forest Resources
Lecture 9: Importance of Forests; Forest Resources and Non-Timber Products
Lecture 10: Forest Resources of India; Forest Management Practices
Lecture 11-12: Energy Resources

Lecture 11: Types of Energy Resources; Renewable Energy Sources: Wind, Wave, Biomass
Lecture 12: Bioconversion Technologies, Energy Plantations, and Petrocrops
Lecture 13-14: Ecosystem Restoration and Environmental Impact Assessment
Lecture 13: Principles of Ecosystem Restoration; Methods and Case Studies
Lecture 14: Environmental Impact Assessment (EIA): Overview and Process
Unit III: Conservation Principles and Biodiversity
Lecture 15-16: Principles of Resource Conservation
Lecture 15: Conservation Principles and Strategies; Sustainable Use of Resources
Lecture 16: Case Studies on Successful Conservation Strategies
Lecture 17-18: Biological Diversity
Lecture 17: Importance of Biological Diversity; Concepts and Levels of Biodiversity
Lecture 18: Threats to Biodiversity: Habitat Loss, Exotic Species, Pollution, Extinctions
Lecture 19-20: IUCN Categories and Global Patterns
Lecture 19: IUCN Categories of Threat; Assessment and Classification
Lecture 20: Distribution and Global Patterns of Biodiversity; Hotspots and Conservation Priorities
Lecture 21-22: Hotspots of Biodiversity
Lecture 21: Terrestrial and Marine Biodiversity Hotspots
Lecture 22: Biodiversity Hotspots in India: Characteristics and Conservation Efforts
Unit IV: Biodiversity Conservation and Sustainable Development
Lecture 23-24: In Situ Conservation
Lecture 23: Protected Areas in India: Wildlife Sanctuaries, National Parks, Biosphere Reserves
Lecture 24: Conservation of Wetlands, Mangroves, and Coral Reefs
Lecture 25-26: Ex Situ Conservation
Lecture 25: Principles and Practices of Ex Situ Conservation; Field Gene Banks and Seed Banks
Lecture 26: Cryopreservation Techniques and Applications
Lecture 27-28: Sustainable Development
Lecture 27: Concept and Principles of Sustainable Development; Strategies for Implementation
Lecture 28: Sustainability Indicators and Measurement
Lecture 29-30: Review and Case Studies
Lecture 29: Comprehensive Review of Resources Management, Biodiversity, and Conservation Topics
Lecture 30: Case Studies on Conservation Projects and Sustainable Development Initiatives
Lecture 31-32: Practical Applications and Fieldwork
Lecture 31: Laboratory Session: Analyzing Environmental Data and Conservation Techniques
Lecture 32: Field Trip: Observations and Assessments of Local Conservation Efforts
Lecture 33-34: Student Presentations
Lecture 33: Student Presentations on Selected Topics in Resources Management and Conservation
Lecture 34: Discussion and Feedback on Presentations
Lecture 35-36: Final Review and Examination Preparation
Lecture 35: Comprehensive Review of Course Material
Lecture 36: Final Exam Preparation and Q&A
Lecture 37-40: Emerging Issues and Innovations
Lecture 37: Emerging Issues in Environmental Conservation

Paper – BOT-203 – Gymnosperms &Ethnobotany

Credit -4 MM- 80+20 T: 3hrs

Objective: This course is intended to provide the basic understanding of morphology and reproduction in pteridophytes and gymnosperms. It also describes the modern methods of propagation of gymnosperms.

Outcomes:

1. CO1 Classify and distinguish gymnosperms from other groups of plants.
2. CO2 Trace evolutionary trends in development of male and female gametophytes
3. CO3 Learn about economic importance of gymnosperms and modern methods of their propagation.
4. CO4 Explain the ethnobotany, its history, significance, methods and techniques used in ethnobotanical study and research.

BOT-203											
PO											
CO		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	2	2	2	3	3	1	2	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	1	2	2	1	2	2	1	3	1	2
	CO 4	2	1	1	2	2	1	1	2	1	1

Lecture Plan: Gymnosperms and Ethnobotany

Unit I: Classification and Distribution of Gymnosperms
Lecture 1-2: Classification and Distribution
Lecture 1: Classification of Gymnosperms: Overview and Phylogenetic Relationships
Lecture 2: Distribution of Gymnosperms in India: Geographic and Ecological Aspects
Lecture 3-4: Family Profiles
Lecture 3: Lyginopteridaceae: Characteristics and Historical Significance
Lecture 4: Medullosaceae, Glossopteridaceae, Caytoniaceae: Key Features and Fossil Records
Unit II: Orders and Comparative Structures
Lecture 5-6: General Account of Orders
Lecture 5: Cycadeoidales (Cycadeoidea): Structure, Characteristics, and Historical Context
Lecture 6: Pentoxylales, Cordiatales: Overview and Key Features
Lecture 7-8: Comparative Structure and Reproduction
Lecture 7: Cycadales (Zamia): Structure, Reproductive Strategies
Lecture 8: Ginkgoales (Ginkgo): Structure, Reproduction, and Evolutionary Significance
Unit III: Specific Gymnosperm Orders and Economic Importance

Lecture 9-10: Coniferales and Welwitschiales
Lecture 9: Coniferales (Pinus and Taxus): Morphology, Reproduction, and Adaptations
Lecture 10: Welwitschiales (Welwitschia): Unique Features and Ecological Role
Lecture 11-12: Gnetales
Lecture 11: Gnetales (Gnetum): Characteristics, Structure, and Reproduction
Lecture 12: Economic Importance of Gymnosperms: Uses and Contributions to Industry
Lecture 13-14: Modern Propagation Methods
Lecture 13: Somatic Embryogenesis in Gymnosperms
Lecture 14: Haploids and Protoplast Culture: Techniques and Applications
Unit IV: Ethnobotany
Lecture 15-16: Introduction to Ethnobotany
Lecture 15: History and Importance of Ethnobotany; Key Concepts and Disciplines
Lecture 16: Ethnomedicobotany, Ethnozoology, Ethnoveterinary, Ethnomusicology, and Ethnoagriculture: Definitions and Examples
Lecture 17-18: Wild Edible Plants
Lecture 17: Wild Edible Plants Used as Emergency Food by Tribals in India
Lecture 18: Methods and Techniques in Ethnobotanical Study and Research
Lecture 19-20: Traditional Plants and Cultural Significance
Lecture 19: Traditional Plants: Cereals, Pulses, Vegetables, Spices, Mushrooms, and Wild Edible Fruits and Seeds
Lecture 20: Plants in Folk Songs, Proverbs, Sacred Groves, and the Impact of Modernization
Lecture 21-22: Review and Case Studies
Lecture 21: Review of Gymnosperms and Ethnobotany Topics
Lecture 22: Case Studies on Ethnobotanical Research and Conservation
Lecture 23-24: Practical Applications
Lecture 23: Laboratory Session: Identification and Classification of Gymnosperms
Lecture 24: Field Trip: Observations of Gymnosperms and Ethnobotanical Practices
Lecture 25-26: Student Presentations
Lecture 25: Student Presentations on Gymnosperms and Ethnobotany Topics
Lecture 26: Discussion and Feedback on Presentations
Lecture 27-28: Final Review and Examination Preparation
Lecture 27: Comprehensive Review of Course Material
Lecture 28: Final Exam Preparation and Q&A
Lecture 29-30: Emerging Issues and Innovations
Lecture 29: Emerging Issues in Gymnosperm Research and Ethnobotany
Lecture 30: Innovations and Future Directions in Gymnosperm Studies and Ethnobotanical Research
Lecture 31-32: Advanced Topics
Lecture 31: Recent Advances in Gymnosperm Genetics and Biotechnology
Lecture 32: Advanced Methods in Ethnobotanical Research
Lecture 33-34: Course Wrap-Up
Lecture 33: Integration of Gymnosperms and Ethnobotany Knowledge
Lecture 34: Final Examination and Course Summary

Paper – BOT-204 – Molecular Genetics

Credit -4 MM- 80+20 T: 3hrs

Objective: This course is intended to provide the basic understanding of biological processes such as DNA replication, transposition and mutations. A key thrust of this paper is towards the molecular mechanisms involved in the control of gene expression and regulation.

Outcome:

1. CO1 The students will have enhanced understanding of genome structure, evolution and its replication. CO2 This course will impart the knowledge of basics of mutations and their importance; DNA repair mechanisms.
2. CO3 The students will learn about the methods of genetic recombination in bacteria
3. CO4 The students will gain insight into the principle mechanisms of genome expression and its regulation.

BOT-204											
PO											
CO		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	2	2	2	3	2	3	2	2
	CO 2	2	2	2	2	1	2	2	2	2	1
	CO 3	1	2	2	1	2	2	1	1	1	2
	CO 4	2	1	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Eukaryotic Genome and DNA Replication
Lecture 1-2: Eukaryotic Genome
Lecture 1: Forms of DNA in Eukaryotes; C-value Paradox and Its Implications
Lecture 2: Unique and Repetitive DNA Sequences; Gene Families; Hybridization Kinetics and Split Genes
Lecture 3-4: Transposable Elements
Lecture 3: Mechanisms of Transposition; Overview of Transposons in Bacteria
Lecture 4: Transposons in Maize, Drosophila, and Yeast; Examples and Significance
Lecture 5-6: DNA Replication
Lecture 5: Semi-Conservative Replication; Bidirectional Replication; Replication Origins
Lecture 6: Replication Machinery: Enzymes and Proteins Involved in DNA Replication
Unit II: Mutations and DNA Repair
Lecture 7-8: Mutations
Lecture 7: Types of Mutations; Methods for Isolation of Mutants
Lecture 8: Molecular Basis of Mutations; Examples from Model Organisms
Lecture 9-10: DNA Damage and Repair

Lecture 9: Causes of DNA Damage; Photoreactivation, Excision Repair, and Mismatch Repair Systems
Lecture 10: Post-Replication and Error-Prone Repair Systems; Repair Mechanisms and Their Importance
Lecture 11-12: Fine Structure of Gene
Lecture 11: Cis-Trans Test; rII Locus; Fine Structure Analysis of Bacterial Genes
Lecture 12: Fine Structure Analysis in Eukaryotes; Methods and Applications
Lecture 13-14: Bacterial Genetics
Lecture 13: Bacterial Conjugation; Mechanisms and Significance
Lecture 14: Transduction and Transformation in Bacteria; Methods and Applications
Unit III: Transcription and RNA Processing
Lecture 15-16: Transcription
Lecture 15: Initiation, Elongation, and Termination in Prokaryotes
Lecture 16: Transcription in Eukaryotes: RNA Polymerases and Regulatory Elements
Lecture 17-18: RNA Processing
Lecture 17: Processing of mRNA: Capping, Polyadenylation, and Splicing
Lecture 18: Processing of rRNA and tRNA; Modifications and Functional Implications
Lecture 19-20: Genetic Code and Translation
Lecture 19: Deciphering the Genetic Code; Characteristics and Properties
Lecture 20: Translation: Initiation, Elongation, and Termination in Prokaryotes and Eukaryotes
Unit IV: Regulation of Gene Expression
Lecture 21-22: Regulation in Prokaryotes
Lecture 21: Operon Concept; Lac Operon Regulation by Positive and Negative Mechanisms
Lecture 22: Trp Operon: Regulation by Negative Feedback and Attenuation
Lecture 23-24: Regulation in Eukaryotes
Lecture 23: Transcriptional Regulation: Regulatory Sequences, Nucleosome Positioning, and Chromatin Remodeling
Lecture 24: Post-Transcriptional Regulation: RNA Splicing, RNA Stability, and Its Role in Gene Expression
Lecture 25-26: Review and Case Studies
Lecture 25: Review of Key Concepts in Molecular Genetics
Lecture 26: Case Studies on Gene Regulation and Genetic Disorders
Lecture 27-28: Practical Applications
Lecture 27: Laboratory Techniques: DNA Replication, Mutation Analysis, and RNA Processing
Lecture 28: Data Analysis and Interpretation in Molecular Genetics
Lecture 29-30: Student Presentations
Lecture 29: Student Presentations on Molecular Genetics Topics
Lecture 30: Discussion and Feedback on Presentations
Lecture 31-32: Final Review and Examination Preparation
Lecture 31: Comprehensive Review of Course Material
Lecture 32: Final Exam Preparation and Q&A
Lecture 33-34: Emerging Issues and Innovations
Lecture 33: Recent Advances in Molecular Genetics
Lecture 34: Innovations and Future Directions in Genetic Research

Lecture 35-36: Advanced Topics
Lecture 35: Advanced Techniques in Molecular Genetics Research
Lecture 36: Ethical and Practical Considerations in Genetic Research
Lecture 37-40: Course Wrap-Up and Final Examination
Lecture 37: Integration of Course Knowledge
Lecture 38: Course Summary and Review
Lecture 39: Final Examination
Lecture 40: Course Wrap-Up and Feedback

PAPER – BOT-206 – Plants for Human Welfare

CREDIT -2 MM- 40+10 T: 3hrs

Objective: This course is intended to provide the basic understanding the origin, morphology, cultivation of major crops. It also deals with the traditional knowledge and utility of some common spices, condiments, medicinal plants and horticulture crops.

Outcomes:

1. CO1 Explain the origin of agriculture and centres of origin of various crops
2. CO2 Identify the plant sources of foods, modern and traditional medicines, spices, oil, fibres, dyes, gum and timbers.
3. CO3 Learn about plant sources of psychoactive compounds, ornamental plants and identification of common food adulterants
4. CO4 Evaluate the edible plant components for commercial purposes as well as for humanwelfare.

BOT-206											
PO											
CO		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	2	2	2	3	2	3	2	2
	CO 2	2	2	3	2	3	2	2	2	2	1
	CO 3	1	2	2	2	2	2	1	1	1	2
	CO 4	2	1	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Plants and Civilization
Lecture 1-2: Origin and Importance of Agriculture
Lecture 1: Origin of Agriculture: Historical Perspectives and Developments
Lecture 2: Centers of Origin of Common Crop Plants: Evidence and Theories
Lecture 3-4: Overview of Crop Plants
Lecture 3: Minor Cereals, Major Cereals, Pseudo-Cereals: Characteristics and Uses
Lecture 4: Pulses: Types, Importance, and Nutritional Value
Lecture 5-6: Spices and Condiments
Lecture 5: Introduction to Key Spices: Saffron, Clove, Cardamom, Ginger, Turmeric
Lecture 6: Other Spices and Condiments: Cinnamon, Capsicum, Asafoetida, Coriander, Fennel, Fenugreek
Unit II: Medicinal Plants
Lecture 7-8: Role of Medicinal Plants

Lecture 7: Importance of Medicinal Plants: Historical and Modern Perspectives
Lecture 8: Medicinal Plants and Human Health Care: Overview of Traditional and Modern Uses
Lecture 9-10: Traditional Knowledge and Medicinal Plants
Lecture 9: Common Medicinal Plants: Sarpgandha, Isabgol, Vasaka, Neem, Bhiringraj
Lecture 10: Additional Medicinal Plants: Amla, Harrad, Bahera, Arjun, Punarnava, Brahmi, Kasondi, Ghritkumari, Quinine, Eucalyptus
Unit III: Fruits, Vegetables, and Beverages
Lecture 11-12: Nutritive and Medicinal Value
Lecture 11: Fruits: Guava, Sapota, Orange, Mango, Banana, Lemon, Pomegranate
Lecture 12: Vegetables: Moringa, Cabbage – Nutritional and Medicinal Benefits
Lecture 13-14: Beverages
Lecture 13: Coffee: Origin, Processing, and Health Benefits
Lecture 14: Tea, Chocolate, Cola: Varieties, Production, and Effects on Health
Lecture 15-16: Ornamental Plants and Food Adulterants
Lecture 15: Common Ornamental Plants: Characteristics and Uses
Lecture 16: Food Adulterants: Types, Detection, and Impact on Health
Unit IV: Timber, Fibers, and Plant Products
Lecture 17-18: Timber and Forest Products
Lecture 17: Common Timber Yielding Plants: Types and Uses
Lecture 18: Minor Forest Products: Overview and Importance
Lecture 19-20: Fibers, Dyes, Tannins, Gums, and Resins
Lecture 19: General Account of Fibers: Types, Sources, and Applications
Lecture 20: Dyes, Tannins, Gums, and Resins: Sources and Industrial Uses
Lecture 21-22: Plant-Based Insecticides
Lecture 21: Pyrethrum: Source, Properties, and Applications
Lecture 22: Rotenone: Source, Properties, and Uses in Pest Control
Lecture 23-24: Review and Case Studies
Lecture 23: Review of Key Topics Covered in the Course
Lecture 24: Case Studies on the Use of Plants in Various Industries
Lecture 25-26: Practical Applications
Lecture 25: Laboratory Session: Identification of Medicinal Plants and Their Properties
Lecture 26: Field Trip: Observations of Crop Plants, Medicinal Plants, and Timber Sources
Lecture 27-28: Student Presentations
Lecture 27: Student Presentations on Selected Topics Related to Plants and Civilization
Lecture 28: Discussion and Feedback on Presentations
Lecture 29-30: Final Review and Examination Preparation
Lecture 29: Comprehensive Review of Course Material
Lecture 30: Final Exam Preparation and Q&A
Lecture 31-32: Emerging Issues and Innovations
Lecture 31: Recent Advances in Plant Science and Their Applications
Lecture 32: Innovations in the Use of Plants in Industry and Medicine
Lecture 33-34: Advanced Topics
Lecture 33: Advanced Techniques in Plant Research and Biotechnology
Lecture 34: Ethical Considerations and Future Directions in Plant Utilization

SEMESTER – III

Paper – BOT-301-Plant Physiology and Plant Biochemistry

Credit -4 MM-80+20 T:3 hrs

Objective: The course would deal with the study of plant physiology especially the water transport, absorption, mineral nutrition, photosynthesis, respiration and nitrogen metabolism.

Outcome:

1. CO1 The students will be able to understand the physiology and basic metabolism of plants.
2. CO2 The students will be learning about the concepts of water potential, transpiration and mechanisms of water absorption in plants.
3. CO3 During the course students will gain in depth knowledge about mineral nutrition, photosynthesis and respiration in plants.
4. CO4 The students will be able to increase the understanding about enzymes, lipid metabolism and nitrogen metabolism.

BOT-301											
PO											
		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	3	2	2	3	2	3	2	1
	CO 2	2	2	2	2	3	2	2	2	2	1
	CO 3	1	2	2	2	2	2	1	1	2	2
CO	CO 4	2	1	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Water and Plant Water Relations
Lecture 1-2: Water Absorption
Lecture 1: Passive Absorption of Water: Mechanisms and Processes
Lecture 2: Active Absorption of Water: Role of Energy and Transport Proteins
Lecture 3-4: Plant Water Relations
Lecture 3: Concept and Components of Water Potential: Definitions and Applications
Lecture 4: Soil Water Relationship: Soil Moisture, Availability, and Movement

Lecture 5-6: Transpiration
Lecture 5: Transpiration: Mechanisms, Types, and Significance
Lecture 6: Factors Governing Transpiration: Environmental and Internal Factors
Lecture 7: Antitranspirants
Lecture 7: Antitranspirants: Types, Mechanisms of Action, and Applications
Unit II: Mineral Nutrition and Photosynthesis
Lecture 8-9: Mineral Nutrition
Lecture 8: Role of Macro-Nutrients: Functions, Deficiencies, and Toxicity
Lecture 9: Role of Micro-Nutrients: Functions, Deficiencies, and Toxicity
Lecture 10-11: Photosynthesis
Lecture 10: Photo-Oxidation of Water and Photophosphorylation: Cyclic and Non-Cyclic Pathways
Lecture 11: Photorespiration: Mechanism and Significance
Lecture 12-13: Carbon Assimilation
Lecture 12: The Sequence of Reactions in Photosynthesis: Calvin Cycle Overview
Lecture 13: Pathways of Carbon Assimilation: C3 Cycle, C4 Pathway, and CAM Pathway
Unit III: Respiration and Nitrogen Metabolism
Lecture 14-15: Respiration
Lecture 14: Glycolysis and Krebs Cycle: Pathways and Energetics
Lecture 15: Electron Transport Chain and ATP Synthesis: Mechanisms and Efficiency
Lecture 16-17: Additional Metabolic Pathways
Lecture 16: Pentose Phosphate Pathway: Functions and Importance
Lecture 17: Glyoxylate Cycle: Role in Plant Metabolism
Lecture 18-19: Nitrogen Metabolism
Lecture 18: Biochemistry of Nitrogen Fixation: Nitrogenase and Mechanism
Lecture 19: Nitrogen Fixation in Legumes, Nitrate Assimilation, Ammonium Assimilation, and Amino Acid Biosynthesis
Unit IV: Lipid Metabolism and Enzymes
Lecture 20-21: Lipid Metabolism
Lecture 20: Fatty Acid Biosynthesis: Pathways and Regulation
Lecture 21: Alpha and Beta Oxidation: Processes and Energy Conservation into Carbohydrates
Lecture 22-23: Enzymes
Lecture 22: Structure, Properties, and Functions of Enzymes: Basics and Types
Lecture 23: Factors Affecting Rates of Enzymatic Reactions: Environmental and Chemical Factors
Lecture 24: Isozymes and Allosteric Enzymes
Lecture 24: Isozymes: Definitions, Functions, and Examples
Lecture 24: Allosteric Enzymes: Mechanisms of Regulation and Examples
Lecture 25-26: Review and Case Studies
Lecture 25: Review of Key Concepts in Plant Physiology and Metabolism
Lecture 26: Case Studies on Metabolic Pathways and Plant Responses
Lecture 27-28: Practical Applications
Lecture 27: Laboratory Session: Techniques in Studying Plant Water Relations and Photosynthesis

Lecture 28: Field Trip or Virtual Tour: Observations of Plant Metabolic Processes
Lecture 29-30: Student Presentations
Lecture 29: Student Presentations on Selected Topics Related to Plant Physiology
Lecture 30: Discussion and Feedback on Presentations
Lecture 31-32: Final Review and Examination Preparation
Lecture 31: Comprehensive Review of Course Material
Lecture 32: Final Exam Preparation and Q&A
Lecture 33-34: Emerging Issues and Innovations
Lecture 33: Recent Advances in Plant Physiology and Metabolic Research
Lecture 34: Innovations and Future Directions in Plant Metabolism and Physiology
Lecture 35-36: Advanced Topics
Lecture 35: Advanced Techniques in Metabolic Research
Lecture 36: Ethical and Practical Considerations in Plant Metabolism Studies
Lecture 37-40: Course Wrap-Up and Final Examination
Lecture 37: Integration of Course Knowledge
Lecture 38: Course Summary and Review
Lecture 39: Final Examination
Lecture 40: Course Wrap-Up and Feedback

Paper – BOT-302- Plant Taxonomy and Economic Botany

Credit -4 MM-80+20 T: 3hrs

Objective: The course would deal with the study of the basic concepts of plant taxonomy and botanical nomenclature. The course is also designed to know about the origin of agriculture and economic importance of major crop plants.

Outcomes:

1. CO1 Understand the significance, basic concepts, tools of plant taxonomy
2. CO2 Learn about the different systems of classification of angiosperms and relevance of plant taxonomy to other branches.
3. CO3 Acquire knowledge about the plant sources of foods, modern and traditional medicines, spices, oil, fibres, dyes, gum and timbers.
4. CO4 Apply the knowledge on cultivating hybrids for better yield and economic development of the country.

BOT-302											
PO											
		1	2	3	4	5	6	7	8	9	10
	CO 1	3	2	2	2	2	3	2	3	2	3
	CO 2	2	2	2	2	3	2	2	2	2	1
	CO 3	1	2	2	2	2	2	1	1	2	2
CO	CO 4	2	1	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Taxonomy and Classification
Lecture 1-2: Introduction to Taxonomy
Lecture 1: The Species Concept: Definitions and Importance in Taxonomy
Lecture 2: Taxonomic Hierarchy: Levels from Species to Family
Lecture 3-4: Taxonomic Evidence
Lecture 3: Morphology and Anatomy: Methods and Examples
Lecture 4: Palynology: Importance and Techniques in Plant Taxonomy
Lecture 5-6: Taxonomic Tools
Lecture 5: Herbarium: Purpose, Preparation, and Importance
Lecture 6: Floras: Uses, Examples, and Their Role in Plant Identification
Lecture 7-8: Botanical Institutions in India

Lecture 7: Botanical Gardens and Herbaria in India: Overview and Importance
Lecture 8: Botanical Survey of India (BSI): Organization, Role, and Contributions
Unit II: Systems of Classification
Lecture 9-10: International Code of Nomenclature (ICN)
Lecture 9: Salient Features of ICN: Principles and Rules
Lecture 10: Application of ICN in Plant Nomenclature and Classification
Lecture 11-12: Historical Systems of Classification
Lecture 11: Systems by Bentham and Hooker, Engler and Prantl, Hutchinson
Lecture 12: Systems by Cronquist, Takhtajan, Dahlgren, and Thorne
Lecture 13-14: Comparative Analysis
Lecture 13: Relative Merits and Demerits of Different Classification Systems
Lecture 14: Discussion: How Classification Systems Influence Plant Taxonomy
Unit III: Origin of Agriculture and Crop Plants
Lecture 15-16: Origin of Agriculture
Lecture 15: World Centers of Primary Diversity: Introduction and Importance
Lecture 16: Domestication of Plants: Historical Perspectives and Modern Practices
Lecture 17-18: Major Crop Plants
Lecture 17: Cereals: Wheat and Rice – Origin, Botany, Cultivation, and Uses
Lecture 18: Sugarcane and Potato: Origin, Cultivation, and Economic Importance
Lecture 19-20: Oil-Yielding Plants
Lecture 19: Groundnut, Mustard, and Sunflower: Botany, Cultivation, and Uses
Lecture 20: Overview of Oil Extraction and Applications in Industry
Unit IV: Economic Botany
Lecture 21-22: Important Fibers
Lecture 21: Cotton and Jute: Botany, Cultivation, Uses, and Processing
Lecture 22: Comparison of Fiber Plants and Their Industrial Applications
Lecture 23-24: Spices and Condiments
Lecture 23: Overview of Key Spices: Ginger, Turmeric, Cinnamon, Clove, Cardamom
Lecture 24: Additional Spices: Chilies, Pepper, Fennel, Coriander, Cumin, Asafoetida, Nutmeg, Mace, and Saffron
Lecture 25-26: Medicinal Plants
Lecture 25: Important Medicinal Plants: Aconite, Cinchona, Belladonna, Digitalis, Glycyrrhiza, Rauwolfia, Papaver
Lecture 26: Additional Medicinal Plants: Vasaka, Aloe, Ginseng, and Major Indian Medicinal Plants (Amla, Neem, Arjun, Harad, Bahera, Isabgol, Ashwagandha, Bhringraj, Senna)
Lecture 27-28: Other Economic Plants
Lecture 27: Timber-Yielding Plants: Overview and Uses
Lecture 28: Dye Plants, Gums, and Tannin-Yielding Plants: Botany and Applications
Lecture 29-30: Review and Case Studies
Lecture 29: Review of Key Topics Covered in the Course
Lecture 30: Case Studies: Economic Botany and Its Impact on Society
Lecture 31-32: Practical Applications
Lecture 31: Laboratory Session: Identification of Economic Plants and Analysis of Plant Products
Lecture 32: Field Trip or Virtual Tour: Observations of Cultivation Practices and Economic Uses

Lecture 33-34: Student Presentations
Lecture 33: Student Presentations on Selected Topics Related to Economic Botany
Lecture 34: Discussion and Feedback on Presentations
Lecture 35-36: Final Review and Examination Preparation
Lecture 35: Comprehensive Review of Course Material
Lecture 36: Final Exam Preparation and Q&A
Lecture 37-38: Emerging Issues and Innovations
Lecture 37: Recent Advances in Economic Botany and Plant Research
Lecture 38: Innovations in Crop Production, Processing, and Applications
Lecture 39-40: Course Wrap-Up and Final Examination
Lecture 39: Integration of Course Knowledge
Lecture 40: Final Examination and Course Summary

Paper-BOT-303 Plant Biotechnology and Genetic Engineering

Credit -4 MM-80+20 T: 3hrs

Objective: This course is intended to provide knowledge about Recombinant DNA Technology, DNA cloning, gene amplification, genetic transformation methods and transgenic plants.

Outcome:

1. CO1 The students will have better understanding of various tools and techniques of genetic engineering.
2. CO2 During the course students will gain in depth knowledge about different methods for genetic transformation of plants.
3. CO3 The students will acquire understanding of production of transgenic plants for biotic and abiotic stress resistance, male sterility and edible vaccines.
4. CO4 During the course students will gain in depth knowledge about gene cloning methods, PCR
5. and fermentation technology.

BOT-303											
PO											
		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	2	2	2	3	3	3	2	3
	CO 2	2	2	2	2	3	2	2	2	2	1
	CO 3	1	2	2	2	2	2	1	1	2	2
CO	CO 4	2	1	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Techniques and Methods in DNA Technology
Lecture 1-2: Techniques Used in DNA Technology
Lecture 1: Gel Electrophoresis & PAGE
Principles of gel electrophoresis
Applications in DNA analysis
Differences between agarose gel electrophoresis and polyacrylamide gel electrophoresis (PAGE)
Lecture 2: Blotting Techniques & DNA Chip Technology
Southern, Western, and Dot blotting techniques: Principles and applications
Chemical synthesis of genes: Methods and significance
DNA chip technology: Overview and applications in genomics
Lecture 3-4: Isolation and Sequencing of Genes
Lecture 3: Maxam & Gilbert's Method vs. Sanger's Method

Maxam & Gilbert's sequencing: Principle and procedure
Sanger's sequencing: Principle, methodology, and comparison with Maxam & Gilbert's method
Lecture 4: Next-Generation Sequencing Technologies
Overview of next-generation sequencing (NGS)
Techniques and applications of NGS
Brief introduction to proteomics and genomics
Unit II: Gene Cloning and Amplification
Lecture 5-6: DNA Cloning Methods and Vectors
Lecture 5: Vectors in Gene Cloning
Types of vectors: Plasmids, phages, cosmids, phagemids, transposons
Artificial chromosomes: BAC, YAC, MAC
Advantages and disadvantages of different vectors
Lecture 6: Cloning in Bacteria and Eukaryotes
Cloning methods in bacteria
Cloning methods in eukaryotic cells
Creating genomic and cDNA libraries
Lecture 7-8: Gene Amplification and Molecular Probes
Lecture 7: Polymerase Chain Reaction (PCR)
Types of PCR: Standard, quantitative (qPCR), reverse transcription (RT-PCR)
Applications of PCR in genetic research and diagnostics
DNA fingerprinting: Principles and applications
Lecture 8: Molecular Probes
General features of molecular probes
Applications in gene detection and analysis
Unit III: Gene Transfer and Transgenic Plants
Lecture 9-10: Gene Transfer Methods in Plants
Lecture 9: Gene Transfer Techniques
Plasmid-mediated transformation
Electroporation, cation precipitation, liposomes
Microinjection and particle gun technology
Lecture 10: Expression of Transgenes
Methods to assess gene expression in plants
Applications in functional genomics
Lecture 11-12: Transgenic Plants
Lecture 11: Production of Transgenic Plants
Insect resistance
Herbicide resistance
Resistance to biotic and abiotic factors
Lecture 12: Special Applications of Transgenic Plants
Transgenics for male sterility
Edible vaccines and their potential applications
Unit IV: Applications of Biotechnology
Lecture 13-14: Biomass and Microbial Technology
Lecture 13: Yeast and Algal Biomass

Use of yeast and algae as sources of single cell protein, oils, and vitamins
Methods of biomass production and applications
Lecture 14: Microbial Fermentation Technology
Role of fermentation in the food industry
Applications and examples of microbial fermentation
Lecture 15-16: Biopesticides and Bioremediation
Lecture 15: Plant and Microbial Biopesticides
Types and uses of biopesticides
Applications in agriculture and pest management
Lecture 16: Bioremediation and Phytoremediation
Principles and methods of bioremediation
Phytoremediation techniques and applications
Lecture 17-18: Review and Case Studies
Lecture 17: Review of Key Topics
Summary of techniques and applications
Discussion of key concepts and methods
Lecture 18: Case Studies
Analysis of real-world applications and case studies in biotechnology
Lecture 19-20: Practical Applications and Future Directions
Lecture 19: Laboratory Session
Hands-on practice with DNA technology techniques
Analysis of experimental results
Lecture 20: Future Directions in Biotechnology
Emerging trends and innovations
Ethical considerations and future prospects

Paper – BOT-304 – Biophysical and Biochemical Techniques

Credit -4 MM-80 +20 T: 3hrs

Objective: This paper aims to provide an introduction to various tools and techniques used to gain insight into cell structure and biological processes. The focus is on studying the techniques used for isolation, purification and characterization of biomolecules.

Outcomes:

1. CO1 This course will provide the students in-depth knowledge of microscopic technology.
2. CO2 The students will understand the various methods used in separation, purification
3. and quantification of biomolecules.
4. CO3 It will provide the students a basic understanding of the techniques used for the identification of various macromolecules.
5. CO4 The students will know about the tools used for tracing the metabolic pathways.

BOT-304											
PO											
		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	2	2	2	3	3	2	2	2
	CO 2	2	3	2	2	3	2	2	2	2	1
	CO 3	2	2	2	2	2	2	1	1	2	2
CO	CO 4	1	1	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Microscopic Techniques and Centrifugation
Lecture 1-2: Microscopic Techniques
Lecture 1: Introduction to Microscopy
Basic principles of microscopy
Overview of light microscopy
Phase contrast microscopy: Principles and applications
Lecture 2: Fluorescent Microscopy and Electron Microscopy
Fluorescent microscopy: Principles, types, and applications
Electron microscopy: Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), Scanning Transmission Electron Microscopy (STEM)
Scanning probe microscopy: Techniques and applications
Fixation and staining techniques: Different methods and their purposes
Lecture 3-4: Centrifugation Techniques
Lecture 3: Principles and Types of Centrifugation
Principles of sedimentation

Types of centrifuges and their applications
Care and safety aspects of using centrifuges
Lecture 4: Differential and Density Gradient Centrifugation
Differential centrifugation: Principle and applications
Density gradient centrifugation: Theory, methods, and uses
Unit II: Chromatographic Techniques and Spectrophotometry
Lecture 5-6: Chromatographic Techniques
Lecture 5: Introduction to Chromatography
Basic principles of chromatography
Paper chromatography: Principles and applications
Thin Layer Chromatography (TLC): Techniques and uses
Lecture 6: Advanced Chromatographic Methods
Adsorption, Partition, and Affinity Chromatography
Ion Exchange Chromatography
High-Performance Liquid Chromatography (HPLC)
Size-Exclusion Chromatography
Lecture 7-8: Spectrophotometry
Lecture 7: Colorimetry and UV-Visible Spectrophotometry
Principles of colorimetry
UV and Visible spectrophotometry: Theory, instruments, and applications
Unit III: Electrophoresis and Mass Spectrometry
Lecture 9-10: Electrophoresis Techniques
Lecture 9: Basic Principles and Techniques
Principles of electrophoresis
Agarose gel electrophoresis: Procedure and applications
Polyacrylamide Gel Electrophoresis (PAGE): Techniques and uses
Lecture 10: Advanced Electrophoresis Techniques
2-Dimensional Gel Electrophoresis
Capillary electrophoresis
Microchip electrophoresis
Isoelectric focusing
Lecture 11-12: Mass Spectrometry
Lecture 11: Introduction and Theory
Basic principles of mass spectrometry
Types of mass spectrometers and their components
Ionization methods: MALDI (Matrix-Assisted Laser Desorption/Ionization)
Lecture 12: Applications and Detectors
Mass analyzers: Theory and types
Detection methods and applications in research
Unit IV: Immunotechniques and Radioisotope Techniques
Lecture 13-14: Immunotechniques
Lecture 13: Antibody Generation and Detection
Methods of antibody generation
ELISA (Enzyme-Linked Immunosorbent Assay): Principles and applications

RIA (Radioimmunoassay): Techniques and uses
Lecture 14: Immunoprecipitation and Immunofluorescence
Immunoprecipitation: Procedure and applications
Immunofluorescence microscopy: Techniques and detecting molecules in living cells
Lecture 15-16: Radioisotope Techniques
Lecture 15: Basics of Radioisotopes
Nature of radioactivity
Detection and measurement of radioisotopes
Incorporation of radioisotopes in biological studies
Lecture 16: Molecular Imaging and Safety Guidelines
Molecular imaging techniques for radioactive materials
Disposal of radioactive wastes
Safety guidelines for handling radioisotopes
Lecture 17-18: Review and Practical Applications
Lecture 17: Review of Key Techniques
Summary of microscopy, centrifugation, chromatography, electrophoresis, and spectrometry
Discuss practical applications and relevance in research
Lecture 18: Case Studies and Practical Sessions
Case studies showcasing applications of different techniques
Hands-on sessions or demonstrations in the laboratory
Lecture 19-20: Emerging Technologies and Future Directions
Lecture 19: Emerging Technologies
Overview of emerging techniques in microscopy and analysis
Future trends and advancements in the field
Lecture 20: Future Directions in Biotechnology
Discussion on the impact of new technologies
Ethical considerations and potential future developments

Paper – BOT-306 – Biodiversity and its conservation

Credit -2 MM-40+10 T: 3hrs

Objectives: This paper is meant for students to gain in-depth knowledge of different levels, threats and distribution of Biodiversity and focus on the different approaches for biodiversity conservation.

Outcomes:

1. CO1 Define and appreciate the value of biodiversity
2. CO2 Learn about the distribution patterns and threats to biodiversity
3. CO3 Acquire knowledge about hotspots of biodiversity
4. CO4 Learn about the various methods to conserve biodiversity

BOT-306											
PO											
CO		1	2	3	4	5	6	7	8	9	10
	CO 1	3	2	2	3	3	3	3	2	2	2
	CO 2	2	3	2	2	3	2	2	2	2	1
	CO 3	2	2	2	2	2	2	1	1	2	2
	CO 4	1	1	1	2	2	1	1	2	1	1

Lecture Plan: Biodiversity and Conservation

Unit I: Introduction to Biodiversity and Threats
Lecture 1-2: Understanding Biodiversity
Lecture 1: Importance of Biodiversity
Definition and scope of biodiversity
Levels of biodiversity: species, genetic, and ecosystem diversity
Importance of each level for ecological stability and human well-being
Lecture 2: Threats to Biodiversity
Habitat loss and fragmentation
Impact of exotic species and pollution
Overexploitation and its consequences
IUCN Categories of Threat: Red List and criteria for categorization
Unit II: Biodiversity Hotspots and Conservation Approaches
Lecture 3-4: Biodiversity Hotspots
Lecture 3: Terrestrial and Marine Hotspots
Definition and criteria for hotspots
Major terrestrial biodiversity hotspots globally
Marine biodiversity hotspots: Locations and significance

Lecture 4: Biodiversity Hotspots in India
Overview of hotspots in India
Unique features and importance of Indian hotspots
Conservation status and challenges in these regions
Lecture 5-6: Approaches to Biodiversity Conservation
Lecture 5: Conservation Approaches for Tropical Forests, Wetlands, and Aquatic Ecosystems
Importance and conservation status of tropical forests
Wetlands and their role in biodiversity
Conservation strategies for aquatic ecosystems
Lecture 6: Conservation Strategies
Key strategies and tools for effective conservation
Examples of successful conservation projects
Unit III: Principles and Practices in Conservation Biology
Lecture 7-8: Principles of Conservation Biology
Lecture 7: Principles of Conservation Biology
Core principles and objectives of conservation biology
Importance of biodiversity conservation for ecosystem services and sustainability
Lecture 8: In-Situ Conservation
Sanctuaries, National Parks, and Biosphere Reserves
Case studies of successful in-situ conservation efforts
Lecture 9-10: Ex-Situ Conservation Practices
Lecture 9: Principles of Ex-Situ Conservation
Overview of ex-situ conservation techniques
Field gene banks, seed banks, and cryopreservation methods
Lecture 10: Practical Aspects of Ex-Situ Conservation
Case studies of ex-situ conservation projects
Challenges and future directions in ex-situ conservation
Unit IV: Global Patterns, Ecosystem Services, and Management Approaches
Lecture 11-12: Global Patterns and Ecosystem Services
Lecture 11: Global Distribution and Patterns of Biodiversity
Overview of global biodiversity distribution
Factors influencing global biodiversity patterns
Lecture 12: Biodiversity and Ecosystem Services
Relationship between biodiversity and ecosystem services
Examples of ecosystem services provided by diverse ecosystems
Lecture 13-14: Management and Conservation Strategies
Lecture 13: Major Approaches to Biodiversity Management
Overview of management strategies for biodiversity conservation
Integration of conservation practices with sustainable development
Lecture 14: Indian Case Studies on Conservation Strategies
Detailed case studies of Indian biosphere reserves
Analysis of successful and ongoing conservation projects
Lecture 15-16: Review and Future Directions
Lecture 15: Review of Key Concepts and Techniques

SEMESTER – IV

Paper – BOT-401 Physiology of Plant Growth and Development

Credit-4 MM- 80+20 T: 3hrs

Objective: The course would deal with different aspects of plant growth and development especially germination and dormancy of seeds, plant growth regulators, senescence and abscission, photomorphogenesis and response of plant to different abiotic stresses.

Outcomes:

1. CO1 The students will be able to understand the basic concepts of plant growth and development. CO2 The students will be learning about abiotic stress tolerance/adaptive physiological changes affecting plant productivity.
2. CO3 During the course students will gain in depth knowledge about various plant growth regulators and their role in physiology of growth and development.
3. CO4 Students will be acquainted with the knowledge of physiology of flowering and sensory biology.

BOT-401											
PO											
CO		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	3	3	3	2	3	2	2	2
	CO 2	2	3	2	2	2	2	2	2	2	1
	CO 3	2	2	2	2	2	2	1	1	2	2
	CO 4	1	1	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Plant Growth and Stress Physiology
Lecture 1-2: Growth Concepts and Analysis
Lecture 1: Introduction to Plant Growth
Definition and concepts of plant growth
Types of growth: Primary and secondary
Growth curves: Logistic, exponential, and linear growth
Lecture 2: Growth Analysis and Factors Affecting Growth

Methods of growth analysis: Relative growth rate, net assimilation rate
Factors influencing plant growth: Light, temperature, water, nutrients
Lecture 3-4: Seed Germination and Dormancy
Lecture 3: Seed Germination
Stages of seed germination
Factors affecting seed germination: Water, temperature, light
Lecture 4: Seed Dormancy
Types of seed dormancy: Physical, physiological, morphological
Regulation of dormancy: Role of plant growth regulators and environmental factors
Lecture 5-6: Stress Physiology
Lecture 5: Abiotic Stress Responses
Types of abiotic stresses: Drought, salinity, temperature extremes
Mechanisms of stress adaptation and tolerance
Lecture 6: Crop Improvement under Stress
Basic principles of crop improvement programs
Strategies for enhancing stress tolerance in crops
Unit II: Plant Growth Regulators and Senescence
Lecture 7-8: Plant Growth Regulators (PGRs)
Lecture 7: Auxins and Gibberellins
Discovery, biosynthesis, and transport of auxins
Effects of auxins on growth and development
Discovery and action of gibberellins
Lecture 8: Cytokinins, Ethylene, and Abscisic Acid
Cytokinins: Discovery, biosynthesis, and functions
Ethylene: Role in plant growth and responses
Abscisic Acid (ABA): Biosynthesis, functions, and mechanism of action
Lecture 9-10: Senescence and Abscission
Lecture 9: Physiological and Biochemical Changes
Senescence: Definition, phases, and regulation
Biochemical changes during senescence
Lecture 10: Abscission Process
Mechanism of abscission
Hormonal regulation of abscission
Unit III: Seed Physiology and Fruit Ripening
Lecture 11-12: Seed Physiology
Lecture 11: Seed Viability and Dormancy
Factors affecting seed viability
Mechanisms and types of seed dormancy
Lecture 12: Seed Germination Metabolism
Metabolic processes during seed germination
Environmental and hormonal control of seed dormancy and germination
Lecture 13-14: Fruit Physiology
Lecture 13: Fruit Ripening
Differences between climacteric and non-climacteric fruits

Physiological changes during fruit ripening
Lecture 14: Post-Harvest Storage
Methods and technologies for post-harvest storage
Quality maintenance: Physiological and biochemical aspects
Unit IV: Sensory Photobiology and Flowering
Lecture 15-16: Phytochromes and Tropisms
Lecture 15: Phytochromes and Photomorphogenesis
Mechanism of phytochrome action
Role of phytochromes in plant growth and development
Introduction to cryptochromes
Lecture 16: Tropisms
Types of tropisms: Phototropism, geotropism, and nastism
Nature of receptors and role of hormones
Lecture 17-18: The Flowering Process
Lecture 17: Photoperiodism and Vernalization
Photoperiodism: Types, mechanisms, and significance
Role of dark periods and vernalization in flowering
Lecture 18: Flowering and Chemical Control
Events during flowering
Florigen concept and chemical control of flowering
Lecture 19-20: Review and Discussion
Lecture 19: Review of Key Concepts
Recap of major topics covered in the course
Discussion of key physiological processes and their applications
Lecture 20: Future Directions and Emerging Trends
Emerging research trends in plant physiology
Future directions in crop improvement and plant growth regulation

Paper – BOT-402 Biology of Reproduction and Anatomy

Credit -4 MM-80+20 T: 3hrs

Objective: The course would deal with history of Embryology. It also describe the technique and applications of in vitro culture of reproductive organs.

Outcomes:

1. CO1 Describe the structure and development of reproductive structures and the process of reproduction in angiosperms
2. CO2 Acquire knowledge about in vitro culturing techniques and their applications in human welfare.
3. CO3 Learn laboratory techniques for in-vitro fertilization and culture of plant parts
4. CO4 Learn about the role of anatomy in taxonomy and anomalous secondary structures in plants

BOT-402											
PO											
		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	3	3	2	2	3	2	2	1
	CO 2	2	2	2	2	2	2	2	2	2	1
	CO 3	2	2	2	2	2	2	1	1	2	2
CO	CO 4	1	1	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Plant Embryology and Male Gametophyte
Lecture 1-2: History and Basics of Plant Embryology
Lecture 1: History of Plant Embryology
Evolution of embryological studies in plants
Key milestones and contributions in plant embryology
Lecture 2: Introduction to Male Gametophyte
Overview of male gametophyte development
Significance of male gametophyte in plant reproduction
Lecture 3-4: Structure and Development of Male Gametophyte
Lecture 3: Structure of Anther and Microsporogenesis
Anther structure and its role in pollen development
Process of microsporogenesis and role of tapetum
Lecture 4: Pollen Development and Sterility
Stages of pollen development
Male sterility: Types and implications
Pollen germination, pollen tube growth, and guidance
Pollen allergy: Causes and effects

Unit II: Female Gametophyte and Pollination
Lecture 5-6: Development of Female Gametophyte
Lecture 5: Ovule Development and Megasporogenesis
Ovule structure and development
Megasporogenesis: Process and outcomes
Lecture 6: Organization of the Embryo Sac
Structure of embryo sac cells
Functions and roles of different embryo sac cells
Lecture 7-8: Pollination and Mechanisms
Lecture 7: Pollination
Types of pollination: Self-pollination vs. cross-pollination
Pollination mechanisms and vectors
Lecture 8: Pollination Mechanisms
Role of pollinators and environmental factors in pollination
Adaptations of plants for effective pollination
Unit III: Fertilization, Endosperm Development, and Experimental Embryology
Lecture 9-10: Fertilization and Endosperm Development
Lecture 9: Pollen-Pistil Interaction and Fertilization
Structure of pistils
Mechanisms of pollen-stigma interaction
Sporophytic and gametophytic incompatibility
Double fertilization process
Lecture 10: Endosperm Development and Apomixis
Types and stages of endosperm development
Polyembryony: Definition and examples
Apomixis: Mechanisms and types
Lecture 11-12: Experimental Embryology
Lecture 11: In Vitro Fertilization and Culture Techniques
Principles of in vitro fertilization
Techniques for anther, pollen, and embryo culture
Lecture 12: Applications and Advances
Recent advances in experimental embryology
Applications in plant breeding and research
Unit IV: Anatomy and Secondary Growth
Lecture 13-14: Anatomy in Relation to Taxonomy
Lecture 13: Role of Anatomy in Plant Taxonomy
Importance of anatomical features in plant classification
Examples of anatomical characteristics used in taxonomy
Lecture 14: Anomalous Secondary Structures
Definition and types of anomalous secondary growth
Abnormal behavior of normal cambium
Accessory cambium formation and activity
Lecture 15-16: Advanced Secondary Growth
Lecture 15: Extrastelar Cambium and Abnormal Structures

Concept of extrastelar cambium
Presence and role of medullary bundles, cortical bundles, and exclusive phloem/xylem bundles
Lecture 16: Secondary Growth in Monocots
Differences in secondary growth between dicots and monocots
Examples of secondary growth patterns in monocots
Lecture 17-18: Review and Case Studies
Lecture 17: Review of Key Concepts
Summary of key topics covered in embryology and anatomy
Discussion of important concepts and processes
Lecture 18: Case Studies and Applications
Case studies related to plant embryology and anatomy
Applications in agriculture, horticulture, and biotechnology

Paper – BOT-403 Plant Tissue Culture

Credit -4 MM-80+20 T: 3hrs

Objective: This course seeks to impart detailed knowledge of micropropagation, somatic embryogenesis, haploid production, somatic hybridization, cryopreservation and secondary metabolite production.

Outcomes:

1. CO1 This course will impart knowledge to students for non-conventional multiplication of plants. CO2 Students will learn about regeneration of complete plants from plant organs/cell other than seeds.
2. CO3 Students will be able to apply knowledge regarding in vitro techniques in Agriculture and forestry.
3. CO4 Students will attain practical knowledge of preparing artificial seeds.

BOT-403											
PO											
CO		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	3	3	3	2	3	2	2	1
	CO 2	2	1	2	2	2	2	2	2	1	1
	CO 3	2	2	2	2	2	1	1	1	2	2
	CO 4	1	1	1	2	2	1	1	2	1	1

Lecture Plan:

Unit I: Foundations of Plant Tissue Culture
Lecture 1-2: History and Basic Concepts
Lecture 1: History of Plant Tissue Culture
Development and milestones in plant tissue culture
Key contributions and advancements
Lecture 2: Basic Concepts, Principles, and Scope
Fundamental principles of plant cell and tissue culture
Concepts of cellular differentiation and totipotency
Scope and applications of plant tissue culture
Lecture 3-4: Techniques and Processes
Lecture 3: Basic Techniques in Plant Tissue Culture
Overview of basic techniques: sterilization, media preparation, and culture conditions
Callus formation, organogenesis, and embryogenesis

Lecture 4: Protoplast Isolation and Fusion
Techniques for protoplast isolation and culture
Protoplast fusion, somatic hybridization, and hybrid selection
Applications of cybrids in research and agriculture
Unit II: Advanced Tissue Culture Techniques
Lecture 5-6: Haploid Production and Cultures
Lecture 5: In Vitro Haploid Production
Methods and significance of haploid production
Anther and pollen culture, ovary culture
Lecture 6: Embryo and Ovule Culture
Techniques for embryo and ovule culture
Production of triploids through endosperm culture
Lecture 7-8: Micropropagation and Cryopreservation
Lecture 7: Micropropagation
Meristem culture techniques
Production of virus-free plants
Lecture 8: Cryopreservation
Methods and importance of cryopreservation
Establishment of gene banks
Unit III: Applications and Variations
Lecture 9-10: Somaclonal Variation and Mutant Isolation
Lecture 9: Somaclonal Variation
Definition and mechanisms of somaclonal variation
Applications in genotype improvement
Lecture 10: Bioreactors and Secondary Metabolites
Role of plant cell cultures in bioreactor systems
Types of bioreactors and applications in secondary metabolite production
Unit IV: Specialized Applications and Future Prospects
Lecture 11-12: Somatic Embryogenesis and Synthetic Seeds
Lecture 11: Somatic Embryogenesis
Process and significance of somatic embryogenesis
Production and application of synthetic seeds
Lecture 12: Applications in Forestry and Agriculture
Applications of tissue culture in forestry and agriculture
Status of tissue and cell culture technology in India
Prospects of edible vaccines and their applications
Lecture 13: Review and Case Studies
Lecture 13: Review and Applications
Summary of key concepts and techniques
Case studies highlighting successful applications of tissue culture

Paper – BOT-404 Genomics

Credit -4 MM-80+20 T: 3hrs

Objective: This course seeks to impart detailed knowledge of basic methods involved in genome studies, their organization and function.

Outcomes:

1. CO1 The students get acquainted about the basic principles of DNA sequencing and evolution of DNA sequencing techniques.
2. CO2 Help the students to understand methods/techniques employed in proteome and genome analysis.
3. CO3 This course will enable the students to learn about the various databases utilize for the storage and analysis of proteome/genome information.
4. CO4 The students will learn about the various computational tools used for analysis of genome sequence data.

BOT-404											
PO											
CO		1	2	3	4	5	6	7	8	9	10
	CO 1	3	3	2	2	2	2	3	2	2	1
	CO 2	2	2	2	2	2	2	2	2	2	1
	CO 3	2	2	2	2	1	2	1	1	2	2
	CO 4	1	1	1	2	1	1	1	2	1	1

Lecture Plan:

Unit I: Genome Mapping and Sequencing
Lecture 1-2: Overview of Genome Sequences
Lecture 1: Sequenced Genomes of Prokaryotes and Eukaryotes
Prokaryotic Genomes: T4 and λ phages, E. coli
Eukaryotic Genomes: Saccharomyces cerevisiae, Caenorhabditis elegans, Drosophila melanogaster, Arabidopsis thaliana, Oryza sativa, Mus musculus, and Homo sapiens
Mitochondrial and Chloroplast Genomes: Features and significance
Lecture 2: Genome Mapping Techniques
Genetic Mapping: DNA markers, linkage analysis
Physical Mapping: Restriction mapping, Fluorescent in-situ hybridization (FISH), Sequence Tagged Sites (STSs)
Lecture 3-4: Genome Sequencing Technologies

Lecture 3: Sequencing Methods
Chain Termination and Chemical Degradation: Sanger sequencing
Next Generation Sequencing (NGS): Pyrosequencing, SOLiD sequencing, Bridge amplification sequencing
Assembly Methods: Shotgun sequencing, Clone contig methods
Lecture 4: Human Genome Project
Overview and Goals
Significance and Impact
Understanding a Genome Sequence: ORF scanning, automatic annotation, homology searches, comparative genomics
Unit II: Functional Genomics and Transcriptomics
Lecture 5-6: Gene Function Identification
Lecture 5: Gene Function Analysis
Computer Analysis: Bioinformatics tools for gene function prediction
Experimental Techniques: Gene inactivation, overexpression, directed mutagenesis, reporter genes, immunocytochemistry
Lecture 6: Transcriptome Analysis
Techniques: Expressed Sequence Tags (ESTs), Serial Analysis of Gene Expression (SAGE), Differential Display (DD), Representational Difference Analysis (RDA), DNA Microarrays
Lecture 7-8: Proteome Analysis
Lecture 7: 2-D Gel Electrophoresis
Principles and Techniques
Protein Identification
Lecture 8: Protein Interactions and Biochips
Protein-DNA and Protein-Protein Interactions
Biochips: Applications and technologies
Unit III: Biological Databases
Lecture 9-10: Introduction to Databases
Lecture 9: Types of Biological Databases
Primary and Specialized Databases
Database Scheme and Annotation
Retrieval Systems: Accessing and querying databases
Lecture 10: Databases and Resources
Nucleotide, Protein, and Genomic Databases
Gene, Transcriptome, Mutation, and Mitochondrial Databases
Lecture 11-12: Computational Methods for Sequence Analysis
Lecture 11: Sequence Alignment and Analysis
Dot-Plot Matrix, Pairwise Alignment
Database Searching, Multiple Alignment
Linguistic Analysis of Biosequences
Lecture 12: Advanced Computational Methods
Sequence Assembly
Prediction of RNA Secondary Structures
Protein Sequence Analysis

Evolutionary and Phylogenetic Analysis
Unit IV: Application and Integration
Lecture 13: Review and Case Studies
Lecture 13: Review of Key Concepts
Integration of Genomic and Bioinformatics Tools
Case Studies: Practical applications of genomics and bioinformatics in research and medicine

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)
RAFFELS UNIVERSITY, NEEMRANA

MSc (Chemistry)
(2 Years Degree Program)

SCHOOL OF BASIC & APPLIED SCIENCES (SOBAS)

RAFFELS UNIVERSITY, NEEMRANA

M.Sc. (Chemistry) (2 Years Degree Program)

Programme Educational Objective (PEO)Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)Course Outcomes (COs)

Raffles University Neemrana

RAFFLES
UNIVERSITY

Program outcomes

After completing M.Sc. Chemistry program, students will be able to

PO1	**Domain Knowledge**	understand, analyze and interpret various chemical phenomena and process
PO2	**Creative and Interdisciplinary Thinking**	develop skill in planning and conducting advanced chemical experiments as well asaccurately record and analyze the results of such experiments
PO3	**Communication and Competency**	develop new molecules or innovative techniques with industrial and societal applications
PO4	**Research skills & Ethical practices**	develop a research culture and implementation of the policies to tackle the burning globalissues.
PO5	**Leadership Skills**	engage in independent learning in the broadest context of scientific advancement
PO6	**Career readiness and higher education**	communicate the principles and practice of chemical sciences in a clear and concisemanner to both science community and society
PO7	**Lifelong Learning**	communicate the principles and practice of chemical sciences in a clear and concisemanner to both science community and society

Program objectives

- To impart an advance level theoretical and practical knowledge in the major fields of inorganic, organic, physical, analytical, material and computational chemistry.
- To engaged in research projects for gaining wide spectrum of subject knowledge and research experience.
- To focused on skill enhancement in the core chemistry with practical expert hands which will make students employable in academia and industries.
- To make responsible citizen to serve the nation

CO – PO Mapping of Courses All the courses together must cover all the POs /PSOs. For a course we map the COs to POs and PSOs through the CO-PO-PSO matrix. The various correlation levels in the matrix are as shown below.

"1" – Slight (Low) Correlation,
"2" – Moderate (Medium) Correlation,
"3" – Substantial (High) Correlation,
"-" – Indicates there is no correlation

Course Code: CH -401

Title of the Course: INORGANIC CHEMISTRY-I

Course Objectives: To understand molecular symmetry, chemical bonding, structure of coordination compounds, cluster, ring and chain compounds of main group elements, inorganic reaction mechanism, environmental and bioinorganic chemistry.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	get basic ideas of theories of Bonding in coordination complex
UNIT-II	Understand about lanthanides and Actinides
UNIT – III	learn about cluster, ring and chain compounds of main group elements
UNIT-IV	Address chemistry of non-transition elements chemical perspective and ableto explain the function of various elements in biological systems.
UNIT – V	obtain theoretical understanding of chemistry of non-transition elements ii and non aqueous solvent

CO-PO MAPPING
CHEMISTRY

CH-401								
PO								
		1	**2**	**3**	**4**	**5**	**6**	**7**
CO	**CO 1**	3	1	2	1	3	2	2
	CO 2	2	3	2	2	1	3	1
	CO 3	2	1	1	1	2	2	2
	CO 4	2	2	1	2	2	1	1
	CO 5	3	3	2	1	2	1	3

Lesson Plan for Chemistry - CH-401

Unit 1: Theories of Bonding in Coordination Complexes (8 Lectures)

1. Lecture 1: Introduction to Coordination Complexes: Valence Bond Theory
2. Lecture 2: Limitations of Valence Bond Theory in Coordination Complexes
3. Lecture 3: Crystal Field Theory: d-Orbital Splitting in Octahedral Complexes
4. Lecture 4: Splitting in Tetrahedral and Square Planar Complexes
5. Lecture 5: Jahn-Teller Effect and Its Structural Consequences
6. Lecture 6: Ionic Radii Trends, Lattice Energy, and Heat of Ligation
7. Lecture 7: Structure and Properties of Spinels
8. Lecture 8: Molecular Orbital Theory in Coordination Complexes

Unit 2: Lanthanides and Actinides (8 Lectures)

9. Lecture 9: Lanthanides: Extraction, Applications, and Lanthanide Contraction
10. Lecture 10: Lanthanide Compounds: Spectra, Magnetism, and Oxo Salts
11. Lecture 11: Lanthanide Complexes: Oxygen, Nitrogen, Sulphur Ligands
12. Lecture 12: Actinides: General Properties and Oxidation States
13. Lecture 13: Actinide Compounds: Dioxoions and Cyclopentadienyl Complexes
14. Lecture 14: Transuranic Elements and Later Actinides
15. Lecture 15: Chemistry of Uranium and Thorium
16. Lecture 16: Lanthanides as Shift Reagents in Spectroscopy

Unit 3: Chemistry of Non-Transition Elements – I (7 Lectures)

17. Lecture 17: Overview of Non-Transition Elements: General Properties
18. Lecture 18: Halides and Oxides of Non-Transition Elements
19. Lecture 19: Polymorphism in Carbon, Phosphorus, and Sulphur
20. Lecture 20: Sulphur-Nitrogen Compounds: Structure and Reactivity
21. Lecture 21: Peroxo Compounds of Boron, Carbon, and Sulphur
22. Lecture 22: Oxyacids of Nitrogen, Phosphorus, Sulphur, and Halogens
23. Lecture 23: Review of Non-Transition Element Chemistry

Unit 4: Chemistry of Non-Transition Elements – II and Non-Aqueous Solvents (7 Lectures)

24. Lecture 24: Boranes, Carboranes, and Borazines: Synthesis and Properties
25. Lecture 25: Silicates and Phosphazenes: Structure and Applications
26. Lecture 26: Interhalogens, Pseudohalides, and Noble Gas Compounds
27. Lecture 27: Non-Aqueous Solvents: Solvent Systems and Reactions
28. Lecture 28: Reactions in Liquid H_2SO_4, NH_3, and SO_2
29. Lecture 29: Mechanism of Coordination Reactions in Non-Aqueous Media
30. Lecture 30: Review and Problem-Solving on Non-Transition Elements and Solvents

Course Code: CH -403

Title of the Course: ORGANIC CHEMISTRY – I

Course Objectives: To understand the structure, stereochemistry and reaction pathways of organic molecules.

Course Outcomes (COs)

After completion of this course successfully, the students will be able ……	
UNIT – I	get a basic idea about the nature of bonding in organic molecules and the role of structures in interpreting organic reactions.
UNIT-II	an exposure about the stereochemistry of molecules and different techniques of asymmetric synthesis.
UNIT – III	get an idea about the mechanistic pathway of various substitution reactions.
UNIT-IV	study the Chromatographic techniques
UNIT – V	learn the mechanistic pathways of organic chemistry under the terms of addition and elimination reactions.

CH-403								
PO								
		1	**2**	**3**	**4**	**5**	**6**	**7**
CO	**CO 1**	1	2	2	1	3	2	1
	CO 2	2	3	2	2	1	3	1
	CO 3	3	1	1	1	3	2	2
	CO 4	2	2	1	2	2	1	1
	CO 5	3	3	2	1	2	1	3

Lesson Plan for Chemistry - CH-403

Unit 1: Nature of Bonding in Organic Molecules (8 Lectures)

1. Lecture 1: Introduction to Delocalized Bonding: Conjugation, Resonance
2. Lecture 2: Hyperconjugation, Fullerenes, Tautomerism
3. Lecture 3: Aromaticity: Benzenoid, Non-Benzenoid Compounds
4. Lecture 4: Hückel's Rule, Molecular Orbitals, Annulenes
5. Lecture 5: Anti-Aromaticity, Homoaromaticity: Concepts
6. Lecture 6: Weaker Bonds: Crown Ethers, Phase Transfer Catalysts
7. Lecture 7: Inclusion Compounds: Cyclodextrins, Cryptands
8. Lecture 8: Catenanes, Rotaxanes: Structure and Bonding

Unit 2: Stereochemistry (8 Lectures)

9. Lecture 9: Nomenclature Systems: D&L, R&S, E&Z
10. Lecture 10: Conformational Analysis: Cycloalkanes, Decalins
11. Lecture 11: Chirality: Molecules with Multiple Chiral Centers
12. Lecture 12: Optical Activity without Chiral Carbon: Biphenyls, Allenes
13. Lecture 13: Asymmetric Synthesis: Principles, Methods
14. Lecture 14: Stereospecific and Stereoselective Synthesis
15. Lecture 15: Stereochemistry in Nitrogen, Sulphur, Phosphorus Compounds
16. Lecture 16: Review and Problem-Solving Session on Stereochemistry

Unit 3: Reaction Mechanism: Structure and Reactivity (8 Lectures)

17. Lecture 17: Types of Reactions: Mechanisms, Control
18. Lecture 18: Thermodynamic and Kinetic Requirements
19. Lecture 19: Transition States and Intermediates: Determination Methods
20. Lecture 20: Generation, Structure, Stability: Carbocations, Carbanions
21. Lecture 21: Reactivity: Free Radicals, Carbenes, Nitrenes
22. Lecture 22: Hard and Soft Acids and Bases: Concepts
23. Lecture 23: Hammett Equation, Linear Free Energy Relationships
24. Lecture 24: Review and Problem-Solving Session on Reaction Mechanisms

Unit 4: Chromatographic Techniques (6 Lectures)

25. Lecture 25: Introduction to Chromatography: Principles
26. Lecture 26: Thin Layer and Column Chromatography: Techniques
27. Lecture 27: High Performance Liquid Chromatography (HPLC)
28. Lecture 28: Gas Chromatography: Principles and Applications
29. Lecture 29: Counter Current Distribution: Concepts and Techniques
30. Lecture 30: Electrophoresis: Methods and Applications

Course Code: CH-405

Title of the Course: PHYSICAL CHEMISTRY-I

Course Objectives: To understand the thermodynamics and electrochemistry processes

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	get basic idea about fundamental laws of thermodynamics
UNIT-II	learn applications of thermodynamics II
UNIT – III	be introduced about the ELECTROCHEMISTRY
UNIT-IV	Impart knowledge on the fundamentals of Electrochemistry II chemical
UNIT – V	study the kinetics of different types of reactions and methodologies

CH-405								
PO								
CO		1	2	3	4	5	6	7
	CO 1	1	1	2	1	2	2	3
	CO 2	2	3	2	2	1	3	1
	CO 3	1	1	3	1	2	2	2
	CO 4	2	2	1	2	2	1	1
	CO 5	2	3	2	1	3	1	3

Lesson Plan for Chemistry - CH-405

Unit 1: Thermodynamics-I (11 Lectures)

1. Lecture 1: First and Second Laws of Thermodynamics - Overview
2. Lecture 2: Entropy Changes in Processes - Reversible & Irreversible
3. Lecture 3: Entropy Variation with Temperature, Pressure, Volume
4. Lecture 4: Entropy as Unavailable Energy - Concept & Applications
5. Lecture 5: Free Energy Functions - Definitions and Importance
6. Lecture 6: Criteria for Spontaneity - Free Energy Analysis
7. Lecture 7: Partial Molar Quantities - Free Energy, Volume, Heat
8. Lecture 8: Gibbs-Duhem Equation - Derivation and Applications
9. Lecture 9: Free Energy and Spontaneity - Practical Examples
10. Lecture 10: Entropy in Chemical Reactions - Case Studies
11. Lecture 11: Review and Problem-Solving on Thermodynamics-I

Unit 2: Thermodynamics-II (7 Lectures)

12. Lecture 12: Clausius-Clapeyron Equation - Law of Mass Action
13. Lecture 13: Third Law of Thermodynamics - Nernst Heat Theorem
14. Lecture 14: Absolute Entropy - Determination and Limitations
15. Lecture 15: Phase Diagrams - Two-Component Systems
16. Lecture 16: Eutectic Systems - Calculation of Eutectic Points
17. Lecture 17: Thermodynamic Treatment of Solid Solutions
18. Lecture 18: Review and Discussion on Thermodynamics-II

Unit 3: Electrochemistry I (7 Lectures)

19. Lecture 19: Ion-Ion Interactions - Debye-Huckel Theory

20. Lecture 20: Activity Coefficients - Debye-Huckel Limiting Law
21. Lecture 21: Ion-Size Effects - Theoretical Mean Activity Coefficient
22. Lecture 22: Debye-Huckel-Onsager Treatment - Aqueous Solutions
23. Lecture 23: Limitations of Debye-Huckel-Onsager Theory
24. Lecture 24: Conductivity in Non-Aqueous Solutions - Solvent Effect
25. Lecture 25: Ion Association Effects on Conductivity

Unit 4: Electrochemistry II (5 Lectures)
26. Lecture 26: Ion Transport - Mobility and Drift Velocity
27. Lecture 27: Einstein Relation - Mobility and Diffusion Coefficient
28. Lecture 28: Nernst-Einstein Equation - Ionic Migration
29. Lecture 29: Rate-Process Approach - Ionic Migration
30. Lecture 30: Planck-Henderson Equation - Diffusion Potential

Course Code: CH-407

Title of the Course: Mathematics for Chemist

Course Objectives: To know
Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	get the fundamentals vectors and matric and determinates
UNIT-II	study the differential and integral calculus
UNIT – III	learn the **Graphical Representation of Equations:**
UNIT-IV	impart knowledge on **Partial Differentiation:**
UNIT – V	study the **Elements of Algebraic and Trigonometric Functions**

CH-407								
		PO						
		1	**2**	**3**	**4**	**5**	**6**	**7**
CO	**CO 1**	1	2	3	3	1	2	2
	CO 2	2	3	2	2	1	3	1
	CO 3	1	1	2	1	2	2	2
	CO 4	2	2	2	2	3	1	1
	CO 5	3	3	2	1	3	1	3

Lesson Plan for Chemistry - CH-407

Unit 1: Vectors and Matrices (12 Lectures)

1. Lecture 1: Introduction to Scalars and Vectors
2. Lecture 2: Vector Addition and Subtraction
3. Lecture 3: Rectangular Components of Vectors
4. Lecture 4: Scalar and Vector Products
5. Lecture 5: Introduction to Matrices
6. Lecture 6: Types of Matrices
7. Lecture 7: Matrix Addition and Subtraction
8. Lecture 8: Matrix Multiplication
9. Lecture 9: Transpose and Adjoint of Matrices
10. Lecture 10: Determinants: Definition and Properties
11. Lecture 11: Evaluation of Determinants
12. Lecture 12: Applications to Group Theory in Chemistry

Unit 2: Differential and Integral Calculus (15 Lectures)

13. Lecture 13: Introduction to Differential Calculus
14. Lecture 14: Differentiation Rules and Functions
15. Lecture 15: Logarithmic Differentiation
16. Lecture 16: Parametric Functions and Differentiation
17. Lecture 17: Graphical Significance of Differentiation
18. Lecture 18: Rate of Change and Successive Differentiation
19. Lecture 19: Introduction to Integral Calculus
20. Lecture 20: Basic Rules of Integration
21. Lecture 21: Integration by Parts
22. Lecture 22: Partial Fractions and Substitution in Integration
23. Lecture 23: Exact and Inexact Differentials in Thermodynamics
24. Lecture 24: Chemical Applications of Differentiation
25. Lecture 25: Chemical Applications of Integration

Unit 3: Graphical Representation and Partial Differentiation (9 Lectures)

26. Lecture 26: Rectangular Coordinates and Straight Lines
27. Lecture 27: Slope and Intercept: Straight Line Equations
28. Lecture 28: Points of Intersection and Distance Between Points
29. Lecture 29: Introduction to Partial Differentiation
30. Lecture 30: Geometrical Significance of Partial Differentiation
31. Lecture 31: Successive Partial Differentiation
32. Lecture 32: Integral Transforms: Fourier and Laplace
33. Lecture 33: Chemical Applications of Partial Differentiation

Unit 4: Algebraic and Trigonometric Functions, Differential Equations (9 Lectures)
34. Lecture 34: Binomial Expansion: Examples in Chemistry
35. Lecture 35: Trigonometric Functions: Sines, Cosines, Tangents
36. Lecture 36: Trigonometric Identities and Chemical Applications
37. Lecture 37: Introduction to Differential Equations
38. Lecture 38: Separable Variables and Homogeneous Equations
39. Lecture 39: Exact Equations and Linear Equations
40. Lecture 40: Differential Equations of First and Second Order
41. Lecture 41: Partial Differential Equations: Concepts and Applications
42. Lecture 42: Applications to Physico-Chemical Problems

Course Code: CH -409

Title of the Course: Biology for CHEMIST

Course Objectives: To analyze biological aspect of chemical reaction complexes.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT-I	analyze **Cell Structure and Functions**
UNIT-II	estimate **Lipids**
UNIT-III	gather information about lipids and proteins
UNIT-IV	analyze nucleic and Genetic Code
UNIT-V	Understand proteins and chemistry

CH-409								
		PO						
		1	**2**	**3**	**4**	**5**	**6**	**7**
CO	**CO 1**	2	1	2	1	2	2	3
	CO 2	2	3	2	2	1	3	1
	CO 3	2	1	1	1	2	2	2
	CO 4	2	2	1	2		1	1
	CO 5	3	3	2	1	3	1	2

Lesson Plan for Chemistry - CH-409

Unit 1: Cell Structure and Carbohydrates (15 Lectures)

1. Lecture 1: Introduction to Prokaryotic and Eukaryotic Cells
2. Lecture 2: Intracellular Organelles: Structure and Functions
3. Lecture 3: Comparison of Plant and Animal Cells
4. Lecture 4: Overview of Metabolic Processes: Catabolism and Anabolism
5. Lecture 5: ATP: The Biological Energy Currency
6. Lecture 6: Monosaccharides: Conformation and Functions
7. Lecture 7: Important Derivatives of Monosaccharides
8. Lecture 8: Structural Polysaccharides: Cellulose and Chitin
9. Lecture 9: Storage Polysaccharides: Starch and Glycogen
10. Lecture 10: Glucosaminoglycans: Structure and Functions
11. Lecture 11: Glycoproteins and Glycolipids: Role in Biological Recognition
12. Lecture 12: Blood Group Substances and Ascorbic Acid
13. Lecture 13: Carbohydrate Metabolism: Glycolysis and Kreb's Cycle
14. Lecture 14: Glycogenesis and Glycogenolysis
15. Lecture 15: Gluconeogenesis and Pentose Phosphate Pathway

Unit 2: Lipids and Proteins (15 Lectures)

16. Lecture 16: Fatty Acids: Structure and Functions
17. Lecture 17: Triacylglycerols and Glycerophospholipids
18. Lecture 18: Sphingolipids, Cholesterol, Bile Acids, Prostaglandins
19. Lecture 19: Lipoproteins: Composition and Functions
20. Lecture 20: Lipid Aggregates: Micelles, Bilayers, Liposomes
21. Lecture 21: Biological Membranes: Fluid Mosaic Model
22. Lecture 22: Lipid Metabolism: β-oxidation of Fatty Acids
23. Lecture 23: Protein Structure: Chemical and Enzymatic Hydrolysis
24. Lecture 24: Secondary Structure of Proteins: α-Helix and β-Sheets
25. Lecture 25: Super Secondary Structures and Collagen Triple Helix
26. Lecture 26: Tertiary Structure of Proteins: Folding and Domain Structure
27. Lecture 27: Quaternary Structure of Proteins: Assembly and Function

Unit 3: Nucleic Acids and Genetic Code (15 Lectures)

28. Lecture 28: Nucleotides and Nucleosides: Structure and Function
29. Lecture 29: DNA Structure: Watson-Crick Model
30. Lecture 30: RNA Structure: Types and Conformation
31. Lecture 31: DNA Replication: Mechanism and Fidelity
32. Lecture 32: Transcription: From DNA to RNA
33. Lecture 33: Genetic Code: Universality and Codon-Anticodon Pairing
34. Lecture 34: Translation: Protein Biosynthesis Initiation
35. Lecture 35: Elongation and Termination of Peptide Chain

36. Lecture 36: Post-Translational Modifications and Protein Processing

Course Code: CH -411

Title of the Course: INORGANIC CHEMISTRY-lab-1
Course Objectives: Quantitative Analysis Preparation Inorganic Chemistry Lab-1 is for students to develop the skills and knowledge necessary to perform accurate and precise quantitative analysis of inorganic compounds.

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

Co:1Understand the basic principles of quantitative analysis, including gravimetry, titrimetric, and spectrophotometry.
CO:2 Design and execute quantitative analysis experiments for a variety of inorganic compounds.
CO:3Use a variety of analytical equipment, such as analytical balances, volumetric glassware, and UV-Vis spectrometers.
CO:4Calculate and report the results of quantitative analysis experiments accurately and precisely.

Course Code: CH -413

Title of the Course: ORGANIC CHEMISTRY-lab-1

Course Objective:
The MSC course outcome for Organic Chemistry Lab-: Qualitative Analysis and Organic Synthesis is for students to develop the skills and knowledge necessary to perform qualitative analysis and synthesis of organic compounds.

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

CO1: Identify the functional groups present in organic compounds using a variety of chemical tests.
CO2: Design and execute organic synthesis experiments to produce desired products.
CO3: Use a variety of laboratory techniques, such as crystallization, distillation, and chromatography, to purify and isolate organic compounds.
CO4: Calculate and report the yields of organic synthesis experiments.
CO5: Apply their knowledge of qualitative analysis and organic synthesis to solve problems in a variety of fields, such as medicinal chemistry, materials science, and environmental chemistry.

Course Code: CH -415

Title of the Course: Physical lab CHEMISTRY-lab-1

Course Objective: The MSC course outcome for Conductometry, Potentiometry, and pH Meter is for students to develop the skills and knowledge necessary to use these electrochemical techniques to solve problems in chemistry and related fields.

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

CO1:Understand the basic principles of conductometry, potentiometry, and pH measurement. Design and execute experiments using these techniques to measure the conductivity, potential, or pH of solutions.
CO2:Use a variety of electrochemical instruments, such as conductometers, potentiometers, and pH meters.
CO3:Analyze and interpret the results of electrochemical experiments accurately and precisely.
CO4:Apply their knowledge of electrochemical techniques to solve problems in a variety of fields, such as environmental chemistry, materials science, and analytical chemistry.
CO5:In addition to the general course outcomes listed above, MSC students may also be required to complete a capstone project or research thesis in electrochemical techniques. This will give them the opportunity to apply their knowledge and skills to solve a real-world problem in the field.

Course Learning Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT – I	understand the magnetic properties of coordination compounds
UNIT-II	understand the electronic properties of coordination compounds
UNIT – III	know the chemical properties and applications of lanthanides and actinides
UNIT-IV	understand the structure, bonding, and reactivity of □-acid complexes
UNIT – V	design and develop new bio-inorganic model systems

Course Code: CH -402

Title of the Course: Inorganic Chemistry –II (Coordination Chemistry)
Course Objectives: To analyze the properties of transition metal.

Course Outcomes (COs)

After completion of this course successfully, the students will be able to……	
UNIT-I	**Electronic Spectra of Transition Metal Complexes**
UNIT-II	**Magnetic Properties**
UNIT-III	**Reaction Mechanism**
UNIT-IV	**Reaction Mechanism**
UNIT-V	**Equilibria in Solution**

CH-402								
PO								
CO		**1**	**2**	**3**	**4**	**5**	**6**	**7**
	CO 1	2	3	1	1	3	2	2
	CO 2	1	2	2	3	1	3	2
	CO 3	3	1	3	1	2	2	2
	CO 4	3	1	1	2	2	3	1
	CO 5	3	1	2	1	3	3	1

Lesson Plan for Chemistry - CH-402

UNIT-I: Electronic Spectra of Transition Metal Complexes (10 Lectures)

1. Introduction to Electronic Spectra of Transition Metal Complexes
2. Spectroscopic Ground States in Transition Metals
3. Correlation and Spin-Orbit Coupling in Free Ions (1st Series)
4. Orgel Diagrams for Transition Metal Complexes (d1 – d9 states)
5. Tanabe-Sugano Diagrams for Transition Metal Complexes (d1 – d9 states)
6. Calculation of Dq Parameter in Complexes
7. Calculation of B and ß Parameters in Complexes
8. Charge Transfer Spectra: Metal to Ligand
9. Charge Transfer Spectra: Ligand to Metal
10. Summary and Review of Electronic Spectra

UNIT-II: Magnetic Properties of Transition Metal Complexes (10 Lectures)

1. Introduction to Magneto-Chemistry and Magnetic Properties
2. Guoy's Method for Determining Magnetic Susceptibility
3. Calculation of Magnetic Moments in Complexes
4. Magnetic Properties of Free Ions
5. Orbital Contribution to Magnetic Properties
6. Effect of Ligand Field on Magnetic Properties
7. Structure Determination via Magneto-Chemistry
8. Magnetic Exchange Coupling in Complexes
9. Spin State Crossover Phenomena in Complexes
10. Summary and Review of Magnetic Properties

UNIT-III: Reaction Mechanism of Transition Metal Complexes – I (12 Lectures)

1. Energy Profile of Reactions in Transition Metal Complexes
2. Reactivity of Metal Complexes
3. Inert and Labile Complexes
4. Kinetic Application of Valence Bond Theory
5. Kinetic Application of Crystal Field Theory
6. Kinetics of Octahedral Substitution Reactions
7. Mechanism and Factors Affecting Acid Hydrolysis
8. Base Hydrolysis in Metal Complexes
9. Conjugate Base Mechanism in Complexes
10. Direct and Indirect Evidence for Conjugate Mechanism
11. Anation Reactions in Transition Metal Complexes
12. Summary and Review of Mechanism I

UNIT-IV: Reaction Mechanism of Transition Metal Complexes – II (13 Lectures)

1. Substitution Reactions in Square Planar Complexes
2. Trans Effect in Square Planar Complexes
3. Mechanism of Substitution Reactions in Square Planar Complexes
4. Introduction to Redox Reactions in Metal Complexes
5. Mechanism of One Electron Transfer Reactions
6. Outer Sphere Electron Transfer Reactions
7. Inner Sphere Electron Transfer Reactions
8. Introduction to Metal-Ligand Equilibria in Solution
9. Stepwise and Overall Formation Constants
10. Trends in Stepwise Constants
11. Factors Affecting Stability of Metal Complexes
12. Stability Factors: Nature of Metal Ion
13. Stability Factors: Nature of Ligand

Course Code: CH -404

Title of the Course: ORGANIC CHEMISTRY-II

Course Objectives: To have an exposure in the understanding structure and mechanisms of organicions, reductions in organic reaction chemistry.

Course Learning Outcomes (COs)

After completion of this course successfully, the students will be able ……	
UNIT – I	get the fundamentals of reduction reaction of organic molecules by reducing agent. **Aliphatic Electrophilic Substitution**
UNIT-II	study the different approaches of **Aliphatic and Aromatic NucleophilicSubstitution**
UNIT – III	learn how organic reaction intermediates can be generated and reacted. **FreeRadical Reaction**
UNIT-IV	gain an understanding of photochemical processes in organic synthesis.
UNIT – V	study the fundamentals of Pericyclic Reactions. **Addition to Carbon-HeteroMultiple Bonds**

CH-404								
		PO						
		1	**2**	**3**	**4**	**5**	**6**	**7**
CO	**CO 1**	2	2	3	1	3	2	3
	CO 2	2	3	2	2	1	3	1
	CO 3	1	1	2	1	2	2	2
	CO 4	2	2	1	2	2	1	1
	CO 5	3	3	1	1	3	1	2

Lesson Plan for Chemistry - CH-404

UNIT-I: Aliphatic and Aromatic Electrophilic Substitution (10 Lectures)

1. Lecture 1: Bimolecular mechanisms: SE2 and SEi
2. Lecture 2: The SE1 mechanism
3. Lecture 3: Effect of substrates, leaving group, and solvent polarity on reactivity
4. Lecture 4: Arenium ion mechanism in aromatic substitution
5. Lecture 5: Orientation and reactivity in aromatic substitution
6. Lecture 6: The ortho/para ratio and ipso attack
7. Lecture 7: Orientation in other ring systems
8. Lecture 8: Diazonium coupling reaction
9. Lecture 9: Vilsmeir reaction

10. Lecture 10: Gattermann-Koch reaction

UNIT-II: Aliphatic and Aromatic Nucleophilic Substitution (12 Lectures)

11. Lecture 11: The SN2, SN1, SNi, mixed SN1 and SN2, and SET mechanisms
12. Lecture 12: Neighboring group participation by π and σ bonds
13. Lecture 13: Classical and nonclassical carbocations, phenonium ions, norbornyl system
14. Lecture 14: Nucleophilic substitution at allylic, aliphatic trigonal, and vinylic carbon
15. Lecture 15: Reactivity effects: Substrate structure, nucleophile, leaving group, and reaction medium
16. Lecture 16: Ambident nucleophile and regioselectivity
17. Lecture 17: The SNAr, SN1, benzyne, and SRN1 mechanisms
18. Lecture 18: Reactivity in aromatic nucleophilic substitution
19. Lecture 19: The von Richter rearrangement
20. Lecture 20: The Sommelet-Hauser rearrangement
21. Lecture 21: The Smiles rearrangement
22. Lecture 22: Summary and review of substitution reactions

UNIT-III: Free Radical and Elimination Reactions (11 Lectures)

23. Lecture 23: Types of free radical reactions
24. Lecture 24: Free radical substitution mechanism
25. Lecture 25: Mechanism at an aromatic substrate
26. Lecture 26: Reactivity in attacking radicals
27. Lecture 27: Effect of solvents on reactivity
28. Lecture 28: Allylic halogenation (NBS)
29. Lecture 29: Oxidation of aldehydes to carboxylic acids
30. Lecture 30: Auto-oxidation
31. Lecture 31: Coupling of alkynes and arylation of aromatic compounds by diazonium salts
32. Lecture 32: Sandmeyer reaction
33. Lecture 33: Types of elimination reactions: E1, E2, and Ecb mechanisms

UNIT-IV: Addition to Carbon-Carbon and Carbon-Hetero Multiple Bonds (12 Lectures)

34. Lecture 34: Mechanistic and stereochemical aspects of addition reactions
35. Lecture 35: Addition involving electrophiles, nucleophiles, and free radicals
36. Lecture 36: Hydrogenation of double and triple bonds
37. Lecture 37: Hydrogenation of aromatic rings
38. Lecture 38: Hydroboration
39. Lecture 39: Michael reaction
40. Lecture 40: Sharpless asymmetric epoxidation
41. Lecture 41: Mechanism of metal hydride reduction of carbonyl compounds, acids, and esters
42. Lecture 42: Addition of Grignard reagents, organozinc, and organolithium reagents to carbonyl compounds 43. Lecture 43: Wittig reaction
44. Lecture 44: Mechanism of condensation reactions involving enolates: Aldol, Knoevenagel, Claisen, Mannich, Benzoin, Perkin, and Stobbe reactions
45. Lecture 45: Hydrolysis of esters and amides

Course Code: CH -406

Title of the Course Physical Chemistry –II (Kinetics, Quantum Mechanics and Spectroscopy)

Course Objectives: To learn basic concepts on spectroscopy and quantum dynamics

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to……	
UNIT-I	**Able to understand Quantum Mechanics**.
UNIT-II	**Understand Chemical kinetics**
UNIT-III	**Apply the knowledge of Chemical Dynamics I**
UNIT-IV	**Analyses the Spectroscopical data**
UNIT-V	**Elucidate the data intepation of different spectroscopical data.**

CH-406								
PO								
CO		**1**	**2**	**3**	**4**	**5**	**6**	**7**
	CO 1	2	1	2	1	2	2	2
	CO 2	2	2	3	2	2	3	1
	CO 3	3	1	2	1	2	2	2
	CO 4	2	2	1	2	2	3	1
	CO 5	1	3	2	1	2	3	3

Lesson Plan for Chemistry - CH-406

UNIT-I: Quantum Mechanics (12 Lectures)

1. Lecture 1: Postulates of Quantum Mechanics
2. Lecture 2: Formulation of Schrodinger Wave Equation
3. Lecture 3: Max-Born Interpretation and Heisenberg's Uncertainty Principle
4. Lecture 4: Quantum Mechanical Operators and Their Commutation Relations
5. Lecture 5: Hermitian Operators - Elementary Ideas
6. Lecture 6: Quantum Mechanical Operator for Linear and Angular Momentum as Hermitian Operators
7. Lecture 7: Average Value of the Square of Hermitian Operators
8. Lecture 8: Commuting Operators and Uncertainty Principle (x & p; E & t)
9. Lecture 9: Schrodinger Wave Equation for a Particle in One Dimensional Box
10. Lecture 10: Schrodinger Wave Equation for a Particle in Three Dimensional Box
11. Lecture 11: Evaluation of Average Position, Average Momentum, and Uncertainty in Position

and Momentum

12. Lecture 12: Pictorial Representation of Wave Equation for a Particle in One Dimensional Box and its Influence on Kinetic Energy

UNIT-II: Chemical Dynamics I (10 Lectures)

13. Lecture 13: Effect of Temperature on Reaction Rates
14. Lecture 14: Rate Law for Opposing Reactions of First and Second Order
15. Lecture 15: Rate Law for Consecutive First Order Reactions
16. Lecture 16: Collision Theory of Reaction Rates and Its Limitations
17. Lecture 17: Steric Factor in Reaction Rates
18. Lecture 18: Activated Complex Theory
19. Lecture 19: Ionic Reactions - Single and Double Sphere Models
20. Lecture 20: Influence of Solvent and Ionic Strength on Reaction Rates
21. Lecture 21: Comparison of Collision and Activated Complex Theories
22. Lecture 22: Summary and Review of Chemical Dynamics I

UNIT-III: Chemical Dynamics II (12 Lectures)

23. Lecture 23: Chain Reactions - Hydrogen-Bromine Reaction, Pyrolysis of Acetaldehyde, and Decomposition of Ethane
24. Lecture 24: Photochemical Reactions - Hydrogen-Bromine and Hydrogen-Chlorine Reactions
25. Lecture 25: General Treatment of Chain Reactions
26. Lecture 26: Apparent Activation Energy of Chain Reactions
27. Lecture 27: Chain Length and Rice-Herzfeld Mechanism
28. Lecture 28: Branching Chain Reactions and Explosions (H2-O2 Reaction)
29. Lecture 29: Kinetics of Enzymatic Reactions - Michaelis-Menten Treatment
30. Lecture 30: Evaluation of Michaelis Constant - Lineweaver-Burk Plot
31. Lecture 31: Evaluation of Michaelis Constant - Dixon Method
32. Lecture 32: Evaluation of Michaelis Constant - Eadie-Hofstae Method
33. Lecture 33: Competitive and Non-Competitive Inhibition
34. Lecture 34: Summary and Review of Chemical Dynamics II

UNIT-IV: Spectroscopy (11 Lectures)

35. Lecture 35: Electromagnetic Radiation and Its Interaction with Matter
36. Lecture 36: Regions of the Spectrum, Width, and Intensity of Spectral Transitions
37. Lecture 37: Rotational Spectra of Diatomic Molecules and Non-Rigid Rotators
38. Lecture 38: Rotational Spectra of Linear and Symmetric Top Polyatomic Molecules
39. Lecture 39: Vibrational and Vibrational-Rotational Spectra - Simple Harmonic and Anharmonic Vibrations
40. Lecture 40: Diatomic Vibrating Rotator and Interaction of Rotations and Vibrations
41. Lecture 41: Vibrations of Polyatomic Molecules - Analysis by Infrared Technique
42. Lecture 42: Electronic Spectra of Diatomic Molecules - Vibrational Course Structure
43. Lecture 43: Rotational Fine Structure of Electronic Band and Franck-Condon Principle
44. Lecture 44: Intensity of Vibrational Electronic Band and Dissociation Energy
45. Lecture 45: Organic Charge Transfer Complexes and Fortrat Diagram

Course Code: CH -408

Title of the Course: Computer for Chemists
Course Objectives: To learn the fundamentals of computational chemistry

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to……	
UNIT – I	**Computer Fundamentals**
UNIT-II	Programming fundamental
UNIT – III	**Programming in C**
UNIT-IV	**Application of Computer Application in Chemistry**
UNIT – V	

CH-408								
		PO						
		1	**2**	**3**	**4**	**5**	**6**	**7**
CO	**CO 1**	3	2	2	1	3	2	2
	CO 2	2	3	2	1	1	3	3
	CO 3	2	3		1	2	2	2
	CO 4	2	2	1	2	2	1	1
	CO 5	3	3	2	3	1	1	3

Lesson Plan for Chemistry - CH-408

UNIT-I: Computer Fundamentals and MS Office (10 Lectures)

1. Lecture 1: Functional components of a digital computer
2. Lecture 2: Concepts of hardware and software
3. Lecture 3: Number systems: Binary, octal, and hexadecimal
4. Lecture 4: Binary arithmetic operations
5. Lecture 5: Input/output and storage devices
6. Lecture 6: Overview of operating system functions
7. Lecture 7: Types of operating systems
8. Lecture 8: Features of Windows operating system
9. Lecture 9: MS Office: Word, Excel, PowerPoint
10. Lecture 10: Equation Editor and MathType in MS Office

UNIT-II: Chem Office and Programming Fundamentals (12 Lectures)

11. Lecture 11: Introduction to Chem Office: Structure of proteins, DNA, RNA
12. Lecture 12: Structure of sugars, amino acids, and heterocyclic compounds using ChemDraw
13. Lecture 13: Representation of chemical reactions using ChemDraw (single-step)

14. Lecture 14: Representation of chemical reactions using ChemDraw (two-step)
15. Lecture 15: Representation of chemical reactions using ChemDraw (multistep)
16. Lecture 16: Introduction to programming fundamentals: Algorithms
17. Lecture 17: Flowcharts: Concepts and applications
18. Lecture 18: Linear and binary search algorithms
19. Lecture 19: Bubble sort algorithms
20. Lecture 20: Matrix transposition algorithm
21. Lecture 21: Matrix addition and multiplication algorithms
22. Lecture 22: Applications of matrix operations in chemistry

UNIT-III: Programming in C (13 Lectures)
23. Lecture 23: Introduction to C programming: Character set, constants, and variables
24. Lecture 24: Reserved words and data types in C
25. Lecture 25: Expressions in C programming
26. Lecture 26: Scan and print statements in C
27. Lecture 27: Operators and their hierarchy in C
28. Lecture 28: Conditional control structures in C
29. Lecture 29: Unconditional control structures in C
30. Lecture 30: Loop control structures in C
31. Lecture 31: One-dimensional arrays in C
32. Lecture 32: Two-dimensional arrays in C
33. Lecture 33: Functions in C programming
34. Lecture 34: Applications of C programming in chemistry
35. Lecture 35: Review and practice of C programming concepts

UNIT-IV: Computer Applications in Chemistry (10 Lectures)
36. Lecture 36: Developing programs in C: van der Waals equation
37. Lecture 37: pH titration program in C
38. Lecture 38: Kinetics and radioactive decay programs in C
39. Lecture 39: Evaluation of lattice energy and ionic radii from experimental data using C
40. Lecture 40: Linear simultaneous equations in Huckel theory using C
41. Lecture 41: Extraction of bond lengths and bond angles from the Cambridge database
42. Lecture 42: Extraction of dihedral angles from the Cambridge database
43. Lecture 43: Introduction to molecular databases and their applications
44. Lecture 44: Case studies using molecular databases
45. Lecture 45: Summary and review of computer applications in chemistry

Course Code: CHM -501

Title of the Course: Inorganic Special-I (Spectroscopic Techniques)

Course Objectives: Impart knowledge on organometallic compounds and their catalytic applications, Group Theory and its application in spectroscopy, nuclear radiation and measurement and supramolecular chemistry.

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to……	
UNIT – I	understand the synthesis, structure, bonding, reactivity of various organometallic compounds
UNIT-II	understand homogeneous catalysis relevant to chemical and polymer industries.
UNIT – III	learn the basics of group theory and its application in chemistry. This knowledge may help them to learn other topics in chemistry like spectroscopy and coordination chemistry etc.
UNIT-IV	learn various nuclear radiations and their detection and measurement techniques
UNIT – V	provide insight into the various supramolecular interactions, molecular recognition, transport, translocation, self-assembly and molecular devices

CH-501								
PO								
		1	**2**	**3**	**4**	**5**	**6**	**7**
CO	**CO 1**	2	1	2	1	3	2	2
	CO 2	3	3	2	2	1	3	2
	CO 3	1	1	3	1	3	2	2
	CO 4	2	2	1	2	2	1	1
	CO 5	3	3	2	1	3	2	3

Lesson Plan for Chemistry - CH-501

UNIT – I: Atomic Absorption and Atomic Emission Spectroscopy (15 Lectures)

1. Lecture 1: Introduction to Atomic Absorption Spectroscopy (AAS)
2. Lecture 2: Principle of Atomic Absorption Spectroscopy
3. Lecture 3: Instrumentation of Atomic Absorption Spectroscopy
4. Lecture 4: Applications of Atomic Absorption Spectroscopy
5. Lecture 5: Sensitivity and Detection Limits in AAS
6. Lecture 6: Interferences in AAS and Their Elimination
7. Lecture 7: Introduction to Atomic Emission Spectroscopy (AES)
8. Lecture 8: Principle of Atomic Emission Spectroscopy
9. Lecture 9: Instrumentation of Atomic Emission Spectroscopy
10. Lecture 10: Applications of Atomic Emission Spectroscopy

11. Lecture 11: Introduction to Inductively Coupled Plasma (ICP)
12. Lecture 12: ICP Instrumentation and Operation
13. Lecture 13: Advantages of ICP over AES with respect to Detection Limits
14. Lecture 14: Review and Comparison of AAS and AES
15. Lecture 15: Summary and Discussion of UNIT-I Topics

UNIT – II: Electron Spin Resonance Spectroscopy (15 Lectures)

16. Lecture 16: Introduction to Electron Spin Resonance (ESR) Spectroscopy
17. Lecture 17: Principle of Electron Spin Resonance Spectroscopy
18. Lecture 18: Presentation of ESR Spectrum
19. Lecture 19: Hyperfine Coupling in ESR
20. Lecture 20: Hyperfine Splitting in Various Structures
21. Lecture 21: Factors Affecting the Magnitude of g Value
22. Lecture 22: Zero Field Splitting and Kramer's Degeneracy
23. Lecture 23: Applications to Transition Metal Complexes (One Unpaired Electron)
24. Lecture 24: Applications to Transition Metal Complexes (More Than One Unpaired Electron)
25. Lecture 25: Applications to Inorganic Free Radicals
26. Lecture 26: Study of Electron Exchange Reactions Using ESR
27. Lecture 27: Advanced Applications of ESR in Inorganic Chemistry
28. Lecture 28: Practical Considerations in ESR Spectroscopy
29. Lecture 29: Summary and Review of UNIT-II Topics
30. Lecture 30: Discussion and Problem Solving on ESR Spectroscopy

UNIT-III: Mossbauer Spectroscopy and Mass Spectrometry (15 Lectures)

31. Lecture 31: Introduction to Mossbauer Spectroscopy
32. Lecture 32: Basic Principles of Mossbauer Spectroscopy
33. Lecture 33: Spectral Display in Mossbauer Spectroscopy
34. Lecture 34: Isomer Shift and Its Factors
35. Lecture 35: Quadrupole and Magnetic Hyperfine Interaction
36. Lecture 36: Applications to Fe^{2+} and Fe^{3+} Compounds
37. Lecture 37: Applications to Sn^{2+} and Sn^{4+} Compounds
38. Lecture 38: Detection of Oxidation States and M-L Bond Nature
39. Lecture 39: Introduction to Mass Spectrometry
40. Lecture 40: Principles and Representation in Mass Spectrometry
41. Lecture 41: Ionization Techniques (EI, CI, MALDI, FAB)
42. Lecture 42: Detection Techniques (Magnet Sector, Quadrupole, TOF)
43. Lecture 43: Interpretation of Mass Spectra
44. Lecture 44: Applications of Mass Spectrometry (Fingerprinting, Molecular Weight, Heat of Sublimation)
45. Lecture 45: Summary and Review of UNIT-III Topics

UNIT- IV: Electronic Spectroscopy (15 Lectures)

46. Lecture 46: Introduction to UV-Visible Molecular Absorption Spectrometry
47. Lecture 47: Principle of UV-Visible Molecular Absorption Spectrometry
48. Lecture 48: Instrumentation of UV-Visible Spectrometry
49. Lecture 49: Applications of UV-Visible Spectrometry
50. Lecture 50: Frank-Condon Principle
51. Lecture 51: Molecular Luminescence Spectroscopy
52. Lecture 52: Fluorescence Spectroscopy: Principle and Applications
53. Lecture 53: Phosphorescence Spectroscopy: Principle and Applications
54. Lecture 54: Chemiluminescence Spectroscopy: Principle and Applications

55. Lecture 55: Comparative Study of Luminescence Techniques
56. Lecture 56: Summary and Review of UNIT-IV

Course Code: CH -513

Title of the Course: Organic Chemistry Special –I (Organic Spectroscopy)

Course Objectives: To bridge the fundamental ideas of chemistry to modern research and industry-related topics

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to……	
UNIT – I	be introduced to UV
UNIT-II	understand the IR
UNIT – III	study NMR
UNIT-IV	learn MASS Spectroscopy
UNIT – V	know ORD and CD

CH-513								
PO								
		1	**2**	**3**	**4**	**5**	**6**	**7**
CO	**CO 1**	1	1	2	1	3	2	3
	CO 2	2	3	2	2	1	3	1
	CO 3	2	3	2	1	3	2	2
	CO 4	2	2	1	2	2	1	1
	CO 5	3	3	2	1	3	2	2

Lesson Plan for Chemistry - CH-513

UNIT-I: Ultraviolet and Visible Spectroscopy (11 Lectures)

1. Lecture 1: Introduction to UV-Vis Spectroscopy and Electronic Energy Levels
2. Lecture 2: Electronic Transitions and Selection Rules
3. Lecture 3: Origin, General Appearance, and Designation of UV Bands
4. Lecture 4: Absorption Laws and Measurement of Absorption Intensity
5. Lecture 5: Chromophores and Auxochromes
6. Lecture 6: Bathochromic Shift, Hypsochromic Shift, Hypochromic Effect, Hyperchromic Effect
7. Lecture 7: The Ultraviolet Spectrometer
8. Lecture 8: Woodward and Fieser's Rules for Substituted Dienes and Conjugated Dienes

9. Lecture 9: UV Absorption Maxima for Unsaturated Carbonyl and Aromatic Carbonyl Compounds
10. Lecture 10: Application of UV Spectroscopy in Organic Chemistry
11. Lecture 11: Summary and Review of UV-Vis Spectroscopy

UNIT-II: Infrared Spectroscopy (11 Lectures)
12. Lecture 12: Introduction to IR Spectroscopy, Basic Theory, and Instrumentation
13. Lecture 13: FT-IR Spectroscopy and Infrared Spectrum Overview
14. Lecture 14: Functional Group and Fingerprint Regions
15. Lecture 15: Absorption of IR Radiation and Molecular Vibrations
16. Lecture 16: Fundamental Vibrations, Overtones, and Fermi Resonance
17. Lecture 17: Frequency of Vibrations of a Diatomic Molecule
18. Lecture 18: Spectral Features of Major Functional Groups
19. Lecture 19: Effect of Hydrogen Bonding on Vibrational Frequencies
20. Lecture 20: Solvent Effect on Vibrational Frequencies, Overtones, and Combination Bands 21. Lecture 21: Fermi Resonance and Its Applications in IR Spectroscopy
22. Lecture 22: Summary and Review of IR Spectroscopy

UNIT-III: Nuclear Magnetic Resonance Spectroscopy (12 Lectures)

23. Lecture 23: Introduction to NMR Spectroscopy and Spin Active Nuclei
24. Lecture 24: Energy Description of NMR Phenomenon
25. Lecture 25: Continuous Wave (CW) NMR and Fourier Transform (FT) NMR Spectrometers 26. Lecture 26: Chemical Shift, Parameters, and Internal Standards
27. Lecture 27: Shielding, Deshielding, and Factors Affecting Chemical Shift
28. Lecture 28: Empirical Correlations for Proton Chemical Shifts
29. Lecture 29: Anisotropic Effects and Solvent Influences on Chemical Shifts
30. Lecture 30: Spin-Spin Coupling and Multiplicity of Splitting
31. Lecture 31: Techniques for Simplification of Complex Spectra
32. Lecture 32: Comparison of 13C NMR and 1H NMR
33. Lecture 33: Simplification of 13C Spectra by Decoupling Techniques
34. Lecture 34: Summary and Review of NMR Spectroscopy

UNIT-IV: Mass Spectroscopy, ORD, and CD (11 Lectures)
35. Lecture 35: Introduction to Mass Spectroscopy, Basic Theory, and Instrumentation
36. Lecture 36: Methods of Generation of Positively Charged Ions
37. Lecture 37: Mass Spectrum: Base Peak, Molecular and Parent Ions
38. Lecture 38: Fragment Ions, Even Electron Rule, and Nitrogen Rule
39. Lecture 39: Metastable Ions and McLafferty Rearrangement
40. Lecture 40: Determination of Molecular Weight and Formula Using Mass Spectrometry
41. Lecture 41: Introduction to Optical Rotatory Dispersion (ORD) and Circular Dichroism (CD)
42. Lecture 42: Halo-Keto Rule and Octant Rule for Ketones
43. Lecture 43: Cotton Effect and Cotton Curves
44. Lecture 44: Deduction of Absolute Configuration Using ORD and CD
45. Lecture 45: Summary and Review of Mass Spectroscopy, ORD, and CD

Course Code: CH -515

Title of the Course: Organic Chemistry Special –II (Natural Products-I)
Course Objectives: To study Natural product and enzymes in chemistry. Application of enzymes.

Course Learning Outcomes (CLOs)

After completion of this course successfully, the students will be able to……	
UNIT – I	**Study of Carotenoids**
UNIT-II	understand the basics **Plant pigments**
UNIT – III	**Understanding of Enzymes**
UNIT-IV	**Understanding and application of Co-Enzymes**
UNIT – V	Understand **Biotechnological Applications of Enzymes**

CH-515								
		PO						
		1	**2**	**3**	**4**	**5**	**6**	**7**
CO	**CO 1**	2	1	2	1	3	2	2
	CO 2	1	3	2	2	1	2	2
	CO 3	2	1	2	1	3	2	2
	CO 4	3	2	1	2	2	1	1
	CO 5	3	3	2	1	3	3	3

Lesson Plan for Chemistry - CH-515

UNIT-I: Carotenoids and Vitamins (11 Lectures)

1. Lecture 1: Introduction to Carotenoids and General Method of Structure Elucidation
2. Lecture 2: Structure and Synthesis of β-Carotene
3. Lecture 3: Structure and Synthesis of α-Carotene
4. Lecture 4: Structure and Synthesis of Lycopene
5. Lecture 5: Structure and Synthesis of γ-Carotene
6. Lecture 6: Biosynthesis of Carotenoids
7. Lecture 7: Structure and Synthesis of Vitamin A
8. Lecture 8: Structure and Synthesis of Vitamins B1 and B2
9. Lecture 9: Structure and Synthesis of Vitamins B6 and C
10. Lecture 10: Structure and Synthesis of Nicotinic Acid and Pantothenic Acid
11. Lecture 11: Structure and Synthesis of Biotin

UNIT-II: Plant Pigments and Porphyrins (11 Lectures)
12. Lecture 12: Occurrence and General Chemical Methods for Structure Determination of Plant Pigments
13. Lecture 13: Spectroscopic Methods for Structure Determination of Plant Pigments
14. Lecture 14: Structure Elucidation and Synthesis of Flavone and Chrysin
15. Lecture 15: Structure Elucidation and Synthesis of Flavonol and Quercetin
16. Lecture 16: Structure Elucidation and Synthesis of Diadazin and Xanthone
17. Lecture 17: Structure Elucidation and Synthesis of Euxanthone and Cyanidin Chloride
18. Lecture 18: Structure Elucidation and Synthesis of Malvidin Chloride and Hirsudin Chloride
19. Lecture 19: Biosynthesis of Flavonoids: Acetate Pathway
20. Lecture 20: Biosynthesis of Flavonoids: Shikimic Acid Pathway
21. Lecture 21: Structural and Spectral Properties of Porphyrins and Haemin
22. Lecture 22: Structure of Chlorophyll and Hemoglobin

UNIT-III: Enzymes and Co-enzymes (12 Lectures)
23. Lecture 23: Introduction to Enzymes: Historical Perspective, Chemical, and Biological Catalysis
24. Lecture 24: Catalytic Power and Specificity of Enzymes
25. Lecture 25: Nomenclature and Classification of Enzymes with Examples
26. Lecture 26: Fischer's Lock & Key and Koshland's Induced Fit Hypothesis
27. Lecture 27: Concept and Identification of Active Sites: Use of Inhibitors and Affinity Labeling
28. Lecture 28: Enzyme Reversible and Irreversible Inhibition
29. Lecture 29: Transition-State Theory and Orientation Effects in Catalysis
30. Lecture 30: Steric Effect, Acid-Base Catalysis, and Covalent Catalysis
31. Lecture 31: Strain or Distortion in Catalysis
32. Lecture 32: Chemistry of Co-enzymes: Co-I and Co-II
33. Lecture 33: Chemistry of Co-enzymes: Co-A, Co-carboxylase
34. Lecture 34: Chemistry of Co-enzymes: FMN and FAD

UNIT-IV: Biotechnological Applications of Enzymes (11 Lectures)
35. Lecture 35: Large-scale Production and Purification of Enzymes
36. Lecture 36: Techniques and Methods of Immobilization of Enzymes
37. Lecture 37: Effect of Immobilization on Enzyme Activity
38. Lecture 38: Application of Immobilized Enzymes
39. Lecture 39: Oxidation-Reduction Reactions Catalyzed by Enzymes
40. Lecture 40: Hydrolytic Reactions Catalyzed by Enzymes
41. Lecture 41: Addition and Elimination Reactions Catalyzed by Enzymes
42. Lecture 42: Formation of C-C Bond (Aldol Reactions)
43. Lecture 43: Elementary Discussion on Enzyme Mechanisms
44. Lecture 44: Role of Enzymes in Biotechnological Processes
45. Lecture 45: Summary and Review of Biotechnological Applications of Enzymes

Course Code: CH -517

ORGANIC CHEMISTRY –(Heterocyclic chemistry)

Title of the Course: Organic Chemistry Special –III (Heterocyclic Chemistry)

Course Objectives: To get idea about the various applications of organic chemistry in thelight of strategies and control.

After completion of this course successfully, the students will be able ……	
UNIT – I	gain exposure to the applications of heterocyclic chemistry
UNIT-II	get an idea about six membered heterocyclic with 2 heteroatoms
UNIT – III	acquire knowledge of the mechanistic yields.
UNIT-IV	develop the concept of protecting group chemistry
UNIT – V	gain an understanding of nucleoside and nucleotides .

CH-517								
PO								
		1	**2**	**3**	**4**	**5**	**6**	**7**
CO	**CO 1**	3	2	2	1	3	2	2
	CO 2	2	3	2	2	1	1	1
	CO 3	2	1	2	3	3	2	2
	CO 4	2	2	1	2	2	1	3
	CO 5	3	2	2	1	3	3	3

Lesson Plan for Chemistry - CH-408

UNIT – I: Heterocyclic Compounds (11 Lectures)

1. Lecture 1: General Behaviour of Heterocyclic Compounds
2. Lecture 2: Classification & Nomenclature of Heterocyclic Compounds
3. Lecture 3: Criteria of Aromaticity in Heterocycles
4. Lecture 4: Synthesis of 1,3-Azoles: Imidazole
5. Lecture 5: Reactions of Imidazole
6. Lecture 6: Synthesis of 1,3-Azoles: Thiazole
7. Lecture 7: Reactions of Thiazole
8. Lecture 8: Synthesis of 1,3-Azoles: Oxazole

9. Lecture 9: Reactions of Oxazole
10. Lecture 10: Comparative Study of Imidazole, Thiazole, and Oxazole
11. Lecture 11: Summary and Review of Five-Membered Heterocycles

UNIT - II: Six-Membered Heterocycles with Two Heteroatoms (11 Lectures)

12. Lecture 12: Introduction to Six-Membered Heterocycles with Two Heteroatoms
13. Lecture 13: Detailed Study of Pyrimidines
14. Lecture 14: Detailed Study of Purines
15. Lecture 15: Structural Elucidation of Uric Acid
16. Lecture 16: Structural Elucidation of Caffeine
17. Lecture 17: Structure of Nucleosides
18. Lecture 18: Structure of Nucleotides
19. Lecture 19: General Synthesis of Nucleotides
20. Lecture 20: General Synthesis of Polynucleotides
21. Lecture 21: Applications of Pyrimidines and Purines
22. Lecture 22: Summary and Review of Six-Membered Heterocycles

UNIT - III: Ylides (12 Lectures)

23. Lecture 23: Introduction to Ylides and General Methods of Formation
24. Lecture 24: Study of Nitrogen Ylides: Ammonium
25. Lecture 25: Reactions and Mechanisms of Ammonium Ylides
26. Lecture 26: Study of Nitrogen Ylides: Immonium
27. Lecture 27: Reactions and Mechanisms of Immonium Ylides
28. Lecture 28: Study of Nitrogen Ylides: Diazonium
29. Lecture 29: Reactions and Mechanisms of Diazonium Ylides
30. Lecture 30: Study of Nitrogen Ylides: Nitrile
31. Lecture 31: Reactions and Mechanisms of Nitrile Ylides
32. Lecture 32: Study of Phosphorous and Sulphur Ylides
33. Lecture 33: Applications of Phosphorous and Sulphur Ylides
34. Lecture 34: Summary and Review of Ylides

UNIT - IV: Protecting Group Chemistry (11 Lectures)

35. Lecture 35: Introduction to Protecting Group Chemistry
36. Lecture 36: Role of Protective Groups in Organic Synthesis
37. Lecture 37: Protection of Hydroxy Groups (1,2 Diols)
38. Lecture 38: Protection of Hydroxy Groups (1,3 Diols)
39. Lecture 39: Protection of Phenols: Esters
40. Lecture 40: Protection of Phenols: Ethers
41. Lecture 41: Protection of Amino Groups: Carbamates
42. Lecture 42: Protection of Carbonyl Groups: Acetals
43. Lecture 43: Protection of Carbonyl Groups: Ketals
44. Lecture 44: Applications of Protecting Group Chemistry
45. Lecture 45: Summary and Review of Protecting Group Chemistry

M.Sc. (Mathematics) Semester I

Contact hours 32 **Credits: = 24** **Marks: 700**

Paper Code	Course Name	Course type	Contact Hours per week	Credits	Examination Scheme					
					Inter. Assessment	Theory	Practical	Seminar/ viva voce	Assignment	Total
MS- 101	Advanced Abstract Algebra	core	4+2	4	40	60				**100**
MS- 102	Real Analysis	core	4+2	4	40	60				**100**
MS-103	Mechanics	core	4+2	4	40	60				**100**
MS- 104	Differential Equations and Dynamical System	core	4+2	4	40	60				**100**
MS- 105	Discrete Mathematical Structures	core	4+2	4	40	60				**100**
MS-106	Seminar /Assignment	Core	2	2				**50**	50	**100**
	Sub-total		32	22	200	300		**50**	**50**	**600**
MS -107	Comprehensive viva-voce			2				**100**		**100**
	Total		**32**	**24**	**200**	**300**		**150**	**50**	**700**

M.Sc. (Mathematics) Semester II

Contact hours 32 **Credits: = 24** **Marks: 700**

Paper Code	Course Name	Course type	Contact Hours per week	Credits	Examination Scheme					
					Inter. Assessment	Theory	Practical	Seminar/ viva voce	Assignment	Total
MS-201	Topology	core	4+2	4	40	60				**100**
MS- 202	Complex Analysis	core	4+2	4	40	60				**100**
MS- 203	Partial Differential Equation	core	4+2	4	40	60				**100**
MS- 204	Numerical Analysis	core	4+2	4	40	60				100
MS 205	Number Theory	core	4+2	4	40	60				**100**
MS-206	Seminar /Assignment	Core	2	2				**50**	50	**100**
	Sub-total		32	22	200	300		**50**	**50**	**600**
MS -207	Comprehensive viva-voce			2				**100**		**100**
	Total		**32**	**24**	**200**	**300**		**150**	**50**	**700**

M.Sc. (Mathematics) Semester III

Contact hours 32 **Credits: = 24** **Marks: 700**

	Course Name	Course type	Contact Hours per week	Credits	Examination Scheme					
					Inter. Assessment	Theory	Practical	Seminar/ viva voce	Assign Ment	Total
MS-301	Functional Analysis	core	4+2	4	40	60				**100**
MS- 302	Measure Theory	core	4+2	4	40	60				**100**
Ms-303	Bio Mechanics	EL	4+2	4	40	60				**100**
	Elective	EL	4+2	4	40	60				**100**
	Choice	CB	4+2	4	40	60				**100**
MS- 308	Practical/Assignment	Core lab	2	2			50		50	**100**
	Sub-total		32	22	200	300	50		**50**	**600**
MS- 309	Comprehensive viva-voce			2				**100**		**100**
	Total		**32**	**24**	**200**	**300**	**50**	**100**	**50**	**700**

Elective papers (Choice Any Two)

1. MS-304 Operation Research

2. MS-305 Fluid Dynamics

Choice Base paper for MS-305 (Any one)

1. MS-306 Object Oriented Programming using C++
2. MS-307 Data Stature

.

M.Sc. (Mathematics) Semester IV

Contact hours 32 **Credits: = 24** **Marks: 700**

Paper Code	Course Name	Course type	Contact Hours per week	Credits	Examination Scheme					
					Inter. Assessment	Theory	Practical	Seminar/ viva voce	Assignment	Total
MS-401	Special Functions	core	4+2	4	40	60				**100**
MS-402	Integral Equations and Calculus of Variations	Core	4+2	4	40	60				**100**
Ms-403	Tensor and Differential Geometry .	EL	4+2	4	40	60				**100**
	Elective	EL	4+2	4	40	60				**100**
	Choice Base	CB	4+2	4	40	60				**100**
MS- 409	Practical/ Assignment	core lab	2	2			50		50	**100**
	Sub-total		32	22	200	300	50		50	**600**
MS- 410	Comprehensive viva-voce			2				**100**		**100**
	Total		**32**	**24**	**200**	**300**	**50**	**100**	**50**	**700**

Elective paper (Choice Any Two)

1. MS-404 Fluid Mechanics
2. MS-405 Fuzzy set and Their Application
3. MS-406 Wavelets

Choice Base paper (Any one)

1. MS-407 Mat Lab
2. MS-408 Neural Network

CO-PSO Matrix for the Course MS-101: Advanced Abstract Algebra

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3
CO2	3	2	2	3
CO3	3	3	3	3
CO4	3	3	3	3

CO-PO Matrix for the Course MS-101: Advanced Abstract Algebra

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	2	3	3	2	3	2	2	2
CO2	3	3	3	2	3	3	2	3	2	3
CO3	3	3	3	2	3	2	2	2	3	3
CO4	3	3	2	3	3	3	3	2	2	2

Paper Title **ADVANCED ABSTRACT ALGEBRA**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-101**

Unit-I

Sylows First, Second and Third theorems, p-sylow Subgroups, Double cosets conjugate groups, Normal and Subnormal series, Composition series, Jordan Holder theorem, Solvable groups, and commutator subgroups.

Unit-II

Modules, Cyclic modules, Simple modules, finitely generated modules, Fundamental structure theorem for finitely generated modules,

Unit-III

Field theory, Extension fields, Algebraic Extensions, Roots of polynomials, Simple extension, Splitting fields.

Unit-IV

Elements of Galois Theory, Fixed Fields, Normal extensions, Group of automorphisms, Galois group, Fundamental theorem of Galois theory.

Text Books :

1. Topics in Algebra by I.N. Herstein, Wiley Eastern Ltd., New Delhi, 1975.
2. Basic Abstract Algebra (2^{nd} Edition), Cambridge University Press, Indian Edition, 1997.
3. Algebra by M. Artin, Prentice-Hall of India1991.

Reference Books:

1. Algebra by P.M. Cohn, Vols. I, II & III, John Wiley & Sons, 1982,1989,1991.
2. Basic Algebra, Vols. I & II by N. Jacobson, W.H. Freeman, 1980 (also published by Hindustan Publishing Company).
3. Galois theory by J.P. Escofier, GTM, Vol. 204, Springer, 2001.
4. Lectures on Modules and Rings by T.Y. Lam, GTM Vol. 189, Springer-Verlag, 1999.

CO-PSO Matrix for the Course MS-102: Real Analysis

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	3	3	2
CO3	3	3	3	2
CO4	3	3	3	2

CO-PO Matrix for the Course MS 102: Real Analysis

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	2	2	3	2	3	2
CO2	3	3	3	3	2	2	3	2	3	2
CO3	3	3	3	3	3	3	2	2	3	3
CO4	3	2	3	3	3	3	2	2	3	3

Paper Title **REAL ANALYSIS**
Lectures : (4+2)Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-102**

Unit-I

Metric spaces: compact sets, perfect sets, connected sets, compactness and completeness, limit and continuity of function defined on metric spaces, limits of functions, continuous functions. Continuity and Compactness, continuity and connectedness, monotonic functions.

Unit-II

Definition and existence of Riemann – Stieltjes integral, properties of the integral, integration and differentiation, the fundamental theorem of calculus, integration of vector-valued functions. Sequence & Series of function point wise & uniform Convergence, Cauchy Criterion for uniform Convergence, Weierstrass M-Test for uniform Convergence of Series, Uniform Convergence & Continuity

Unit–III

Uniform Convergence & R-S integral Uniform Convergence & differentiation, Weierstrass approximation Theorem. Lebesgue outer measure, Measurable sets & its properties, Borel set & their measurability, Non-measurable set, measurable functions, characteristic function & simple function, Littlewood's three Principles.

Unit-IV

Lebesgue integral of bounded function over a set of finite measure, Integration of Non-negative function,The general Lebesgue integral, Monotonic Convergence Theorem, Lebesgue convergence Theorem, Fatou's Lemma.

Text Books:

1. Principles of Mathematical Analysis by Walter Rudin.
2. Real Analysis (UNIT IV & V) by H. L. Roydon.

Reference Books:

1. Mathematical Analysis by Mullick & Arora, New Age International Publisher.
2. Lebsegue Measure & Integration by Jain & Gupta, New Age International Publisher

CO-PSO Matrix for the Course MS-103: Mechanics

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3

CO-PO Matrix for the Course MS-103: Mechanics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	2	2	3	2	3	2
CO2	3	2	3	3	3	3	3	3	3	3
CO3	3	3	3	3	2	3	2	2	3	2
CO4	3	2	3	3	2	2	3	2	3	2

Paper Title **MECHANICS**
Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-103**

Unit-I

Hamilton's variables, Donkin's theorem, Hamilton canonical equations, Generalized coordinates, Holonomic and Non–holonomic systems, Scleronomic and Rheonomic systems, Generalized potential. Lagrange's equations of first kind. Lagrange's equations of second Kind, Uniqueness of solution, Energy, equation for conservative fields.

Unit-II

Fundamental lemma of calculus of variation, Euler's equation for one dependent function, Generalization of Euler's equations to (i) 'n' dependent functions, (ii) higher order derivatives.

Cyclic coordinates, Routh's equations, Poisson's Bracket, Poisson's identity, Jacobi-Poisson Theorem, Motivating Problems of calculus of variations, Shortest distance, Minimum surface of revolution, Brachistochorone Problems, Isoperimetric problems, Geodesic.

Unit-III

Conditional extremum under geometric constraints and under integral constraints, Hamilton's Principle, Principle of least action. Poincare Cartan integral invariant, Whittaker's equations, Jacobi''s equations, Statement of Lee Hwa chung's theorem.

Unit-IV

Method of separation of Variables, Hamilton-Jacobi equation, Jacobi theorem, , Lagrange Brackets, Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets, Invariance of Lagrange brackets and Poisson brackets under canonical transformations.

Text Books:

1. Calculus of Variation by I.M. Gelfand and S.V. Fomin, Prentice Hall.
2. Analytical Mechanics by Louis N. Hand and Janet D. Finch, Cambridge University, Press, 1998.

CO-PSO Matrix for the Course MS-104: Differential Equations and Dynamical System

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3
CO2	3	3	2	3
CO3	3	3	3	3
CO4	2	3	3	3

CO-PO Matrix for the Course MS-104: Differential Equations and Dynamical System

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	3	3	2	3	3
CO2	3	2	3	2	3	2	3	3	2	3
CO3	2	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	2	3	3	3	3

Paper Title **DIFFERENTIAL EQUATIONS AND DYNAMICAL SYSTEM**
Lectures : (4+2) Hrs Maximum Marks: 100(40+60)
Examination Time : 3 Hrs Paper Code : MS-104

Unit-I

Differential Inequalities and integral inequalities –Gronwall's inequality, Maximal and Minimal solutions, differential inequalities, Lower and upper function. Preliminaries-Initial value problem and the equivalent integral equation, System of first order ordinary differential equations, concepts of local existence, Existence and uniqueness of solutions of scalar differential Equations, Peano's existence theorem and corollary for scalar case, system of differential Equations

Unit- II

Ascoli-Arzela theorem (Statement only) , Picard-Lindelof theorem, Peano's existence theorem and corollary for vector case. Linear systems of differential equation, characteristic polynomials eigen values, eigen vectors, linear homogenous systems and their properties, wronskian, fundamental matrix, Abel-Liouville formula, periodic linear system and Floquet's theorem, Inhomogeous linear systems and variation of constants formula

Unit- III

Poincare- Bendixson Theory –Autonomous systems, Poincare-Bendixson theorem (statement only), Stability of periodic solutions, foci, nodes and saddle points. Automomous system of ordinary differential equations, Phase Plane, critical points, Stability, Critical Points and Stability of linear systems, Stability by
Liapunov's direct method, Lyapunov functions.

Unit- IV

The Pitchfork Bifurcation,A Pure Imaginary Pair of eigenvalues.The Poincare- Andronov –Hopf Bifurcation, Bifurcation of Fixed Points of Ordinary differential Equation, A Zero Eigenvalue; Examples, What is a "Bifurcation of a Fixed Point",The saddle –Node Bifurcation, The Transcritical Bifurcation.

Text Books:

1. Ordinary Differential Equations by M.Rama Mohan Rao, East-West Press.
2. Introduction to Applied Nonlinear Dynamical Systems and chaos by Stephen Wiggins, Springer, New York.

Reference Books:

1. Ordinary Differential Equations by P. Hartman, John wiley.
2. Theory of Ordinary Differential Equations by E.A.Coddington and DSN, Levinson, McGraw Hill, NY.
3. Differential Equations with Applications and Historical note by G.F.Simmons, Tata McGraw Hill.
4. Ordinary Differentions by W.T. Reid, John Wiley & Sons, NY.
5. Differential Equations and Dynamical Systems, by Lawrence Perko, Springer, Newyork.

CO-PSO Matrix for the Course MS-105: Discrete Mathematical Structures

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3

CO-PO Matrix for the Course MS-105: Discrete Mathematical Structures

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	2	3	2	3	3
CO2	3	3	3	3	3	2	3	2	3	3
CO3	3	3	3	3	3	2	3	2	3	3
CO4	3	3	3	3	3	2	3	2	3	3

Paper Title DISCRETE MATHEMATICAL STRUCTURES
Lectures : (4+2) Hrs Maximum Marks: 100(40+60)
Examination Time : 3 Hrs Paper Code : MS-105

Unit-I

Relation, Equivalence relation, Partitioning, Fundamental theorem on equivalence relation, ordered sets, First and last elements, maximal and minimal elements, upper and lower bounds, similar sets, Totally ordered sets, well ordered sets, Axioms of choice, Zorn's lemma, Well ordering theorem (Statements only), Inclusion exclusion principle & Pigeon Hole principle.

Unit-II

Mathematical logic: Propositions and logical operators, Contradictions and Tautologies, Equivalence & Implication, Duality NAND and NOR connections, Functionally complete sets, Two-state devices and statement logic, Normal forms, Predicate calculus, Free and bound variables.

Unit-III

Lattice-Definition & examples, Distributive lattice, modular lattice. Bounded lattice, complemented lattice, Boolean lattice, Sublattice, Boolean algebra- Definition & examples, Basic Boolean algebra laws Principle of duality, Applications of Boolean algebra, Boolean functions, Disjunctive & Conjunctive normal forms.

Unit-IV

Mathematical Induction, Recursion, Recursion and iteration, closed form expression, sequence of integers, Recurrence relation, linear recurrence relation, Homogeneous recurrence, Recurrence relations obtained from solutions, Solving linear homogeneous recurrence relation, solving linear non-homogeneous recurrence relations, Generating functions, solution of recurrence relation using generating functions.

Text Books:

1. Discrete Mathematics by N Ch. S N Iyengar, V M Chandra Sekharan, K A Venkatesh, P.S. Arunachalam- Vikas Publishing House Pvt. Ltd.
2. Set Theory-Schaum outline series.

Reference Books:

1. Discrete Mathematics and its applications by Kenneth H. Rosen Tata McGraw Hill Pub. Ltd.
2. Discrete Mathematics for Computer Scientists by J K Truss, Pearson Education Asia Ltd.
3. Discrete Mathematical Structures with Applications by J P Tremblay, R. Manohar Data McGraw Hill Pub. Company Ltd.

Lesson plans 1st semester

Paper: MS-101: Advanced Abstract Algebra

1. Introduction to Groups and Subgroups
2. Cyclic Groups and Order of Elements
3. Permutation Groups and Symmetric Groups
4. Cosets and Lagrange's Theorem
5. Normal Subgroups and Factor Groups
6. Group Homomorphisms
7. Isomorphism Theorems
8. Automorphisms and Inner Automorphisms
9. Direct Product of Groups
10. Fundamental Theorem of Finite Abelian Groups
11. Sylow Theorems
12. Applications of Sylow Theorems
13. Classification of Finite Groups
14. Simple Groups
15. Solvable Groups
16. Commutator Subgroups
17. Jordan-Hölder Theorem
18. Introduction to Modules
19. Cyclic Modules
20. Simple and Semisimple Modules
21. Finitely Generated Modules
22. Structure Theorem for Modules over a PID
23. Field Extensions
24. Algebraic Extensions
25. Splitting Fields

26. Separable and Inseparable Extensions
27. Normal Extensions
28. Galois Theory Basics
29. Fundamental Theorem of Galois Theory
30. Applications of Galois Theory
31. Solvability by Radicals
32. Introduction to Noetherian Rings
33. Chain Conditions in Rings
34. Integral Domains and Fields
35. Principal Ideal Domains (PID)
36. Euclidean Domains
37. Introduction to Polynomial Rings
38. Divisibility in Polynomial Rings
39. Applications of Polynomial Rings
40. Review and Problem Solving

Paper: MS-102: Real Analysis

1. Introduction to Metric Spaces
2. Open and Closed Sets
3. Compactness in Metric Spaces
4. Continuity and Uniform Continuity
5. Connectedness and Path-Connectedness
6. Convergence in Metric Spaces
7. Completeness and Baire Category Theorem
8. The Riemann-Stieltjes Integral
9. Properties of the Riemann-Stieltjes Integral
10. Integration and Differentiation
11. Sequence of Functions and Uniform Convergence
12. Series of Functions and Uniform Convergence
13. Weierstrass M-Test
14. Uniform Convergence and Riemann-Stieltjes Integral
15. Uniform Convergence and Differentiation
16. Weierstrass Approximation Theorem
17. Lebesgue Outer Measure
18. Measurable Sets
19. Borel Sets and Measurability
20. Non-Measurable Sets
21. Measurable Functions
22. Lebesgue Integral for Bounded Functions
23. Integration of Non-Negative Functions
24. The General Lebesgue Integral
25. Fatou’s Lemma
26. Monotone Convergence Theorem
27. Dominated Convergence Theorem
28. Comparison between Riemann and Lebesgue Integrals
29. Functions of Bounded Variation
30. Absolute Continuity
31. Differentiation of the Integral
32. Functions of Several Variables
33. Implicit and Inverse Function Theorems

34. Change of Variable Formula
35. Convergence of Measure
36. Differentiability and Integrability
37. Fubini's Theorem
38. Lebesgue Measure in R^n
39. Product Measures
40. Review and Problem Solving

Paper: MS-103: Mechanics

1. Introduction to Newtonian Mechanics
2. Principle of Least Action
3. Generalized Coordinates
4. Lagrange's Equations of the First Kind
5. Lagrange's Equations of the Second Kind
6. Conservation Laws and Symmetry
7. Hamilton's Equations
8. Phase Space and Phase Portraits
9. Canonical Transformations
10. Poisson Brackets
11. Liouville's Theorem
12. Hamilton-Jacobi Theory
13. Action-Angle Variables
14. Rigid Body Dynamics
15. Euler's Equations of Motion
16. Stability of Rotational Motion
17. Small Oscillations and Normal Modes
18. The Variational Principles
19. Calculus of Variations
20. Applications of Calculus of Variations
21. Central Force Problems
22. Kepler's Laws
23. Scattering in a Central Force Field
24. Motion in a Non-Inertial Reference Frame
25. Coriolis and Centrifugal Forces
26. Rigid Body Motion: Kinematics
27. Moment of Inertia Tensor
28. Nonholonomic Constraints
29. Applications of Hamilton's Principle
30. The Two-Body Problem
31. The n-Body Problem
32. Chaos in Dynamical Systems
33. Introduction to Continuum Mechanics
34. Stress and Strain Tensors
35. Conservation of Mass, Momentum, and Energy
36. Fluid Mechanics: Euler and Navier-Stokes Equations
37. Introduction to Special Relativity
38. Relativistic Mechanics
39. Energy-Momentum Tensor
40. Review and Problem Solving

Paper: MS-104: Differential Equations and Dynamical System

1. Introduction to Differential Equations
2. First Order Differential Equations
3. Existence and Uniqueness Theorems
4. Second Order Linear Differential Equations
5. Variation of Parameters
6. Series Solutions of Differential Equations
7. Bessel and Legendre Functions
8. Systems of First Order Linear Equations
9. Eigenvalue Methods for Systems
10. Stability of Linear Systems
11. Nonlinear Systems and Phase Plane Analysis
12. Introduction to Dynamical Systems
13. Stability of Equilibrium Points
14. Lyapunov's Direct Method
15. Poincaré-Bendixson Theorem
16. Limit Cycles and Bifurcations
17. Autonomous Systems
18. Introduction to Chaos Theory
19. The Lorenz System
20. Strange Attractors
21. Discrete Dynamical Systems
22. Stability of Fixed Points
23. Cobweb Diagrams
24. The Logistic Map
25. Period-Doubling Route to Chaos
26. Introduction to Partial Differential Equations (PDEs)
27. First Order PDEs and Characteristics
28. Classification of Second Order PDEs
29. The Wave Equation
30. The Heat Equation
31. The Laplace Equation
32. Separation of Variables
33. Fourier Series and Transform Methods
34. Green's Functions
35. Boundary Value Problems
36. Sturm-Liouville Theory
37. Nonlinear PDEs and Shock Waves
38. Introduction to Solitons
39. Numerical Methods for PDEs
40. Review and Problem Solving

Paper: MS-105: Discrete Mathematical Structures

1. Introduction to Logic and Propositional Calculus
2. Logical Connectives and Truth Tables
3. Predicate Calculus
4. Methods of Proof and Mathematical Induction
5. Sets, Relations, and Functions

6. Properties of Binary Relations
7. Equivalence Relations and Partitions
8. Partial Orders and Lattices
9. Boolean Algebra
10. Applications of Boolean Algebra
11. Graph Theory: Basic Definitions
12. Types of Graphs and Graph Isomorphisms
13. Connectivity and Paths in Graphs
14. Eulerian and Hamiltonian Graphs
15. Planar Graphs and Graph Coloring
16. Trees and Their Applications
17. Spanning Trees and Minimum Spanning Trees
18. Algorithms on Trees
19. Algebraic Structures: Groups, Rings, and Fields
20. Properties of Groups and Subgroups
21. Applications of Group Theory in Cryptography
22. Introduction to Semigroups and Monoids
23. Languages and Grammars
24. Finite Automata and Regular Languages
25. Context-Free Grammars and Pushdown Automata
26. Turing Machines and Computability
27. Introduction to Recurrence Relations
28. Solving Linear Recurrence Relations
29. Generating Functions
30. Applications of Recurrence Relations
31. Introduction to Combinatorics
32. Permutations and Combinations
33. Binomial Theorem and Pascal's Triangle
34. Inclusion-Exclusion Principle
35. Pigeonhole Principle and Applications
36. Graph Algorithms: Dijkstra and Floyd-Warshall
37. Introduction to Complexity Theory
38. NP-Completeness and Approximation Algorithms
39. Advanced Topics in Discrete Mathematics
40. Review and Problem Solving

Semester - II

CO-PSO Matrix for the Course MS-201: Topology

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3
CO2	3	3	3	2
CO3	3	2	3	3
CO4	3	3	3	3

CO-PO Matrix for the Course MS-201: Topology

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	3	3	2	3	2	3
CO2	3	3	3	3	2	3	3	2	3	3
CO3	3	2	3	2	3	3	3	3	2	3
CO4	3	3	3	3	3	3	2	2	3	2

Paper Title **TOPOLOGY**
Lectures **: (4+2) Hrs** **Maximum Marks: 100(40+60)**
Examination Time **: 3 Hrs** **Paper Code** **: MS-201**

Unit-I

Topological Spaces: Definition and examples, Open Sets, Closed Sets, Closure neighborhoods, Interior, exterior and boundary, Limit points and derived sets, Basis and Sub basis, Alternate method of defining a topology in terms of Kuratowski Closure operator and Neighbourhood systems.

Unit-II

First and Second countable Spaces, Lindelof theorem, Separable Spaces, Second countability and Separability, The product and box topology, Continuous functions and homeomorphism, Countability.

Unit-III

Compact Spaces, Lebesgue number lemma, Uniform continuity theorem, Limit point compactness, Local compactness and sequential compactness, One point compactification.

Connected Spaces, Connected Sets in the real line, Components, Path components, local connectedness, Path connectedness, Local Path connectedness.

Unit-IV

Separation axioms, Hausdroff, Regular and Normal Spaces, The Urysohn lemma, Tietze extension theorem, The Uryshon metrization theorem, Completely regular spaces.

Text Books:

1. Topology A first course by James R Munkres, Prentice Hall of India, Pvt. Ltd. New Delhi 2000.
2. Introduction to Topology and Modern Analysis by G.F. Simonons McGraw Hill Book Co.

Reference Book :

1. General Topology by J.L. Kelley, Van Nostrand, Reinhold Co. New York.

CO-PSO Matrix for the Course MS-202: Complex Analysis

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	3	3	2
CO3	3	3	3	2
CO4	3	3	3	2

CO-PO Matrix for the Course MS-202: Complex Analysis

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	2	2	2	2	3	2
CO2	3	3	3	3	2	2	2	2	3	2
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	2	3	3	3	3	3	2	3	3

Paper Title **COMPLEX ANALYSIS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**

Examination Time : 3 Hrs **Paper Code : MS-202**

Unit-I

Limit and Continuity Differentiability, Functions of Complex Variables, Power Series as an Analytic Function, Exponential and Trigonometric Functions, Complex Logarithms, Zeros of Analytic Functions.

Unit-II

Complex Integration, Curves in the Complex Plane , Basic Properties of Complex Integral, Winding Number of a Curve, Cauchy – Goursat Theorem, Cauchy's Integral formula, Morera's Theorem, Laurent's Series. Maximum Modulus Principle, Schwarz Lemma, Bilinear Transformations, Mobius Transformation, Cross Ratio, Fixed Point, Conformal Mapping Liouville's theorem.

Unit-III

Removable Singularty, Poles, Singularty at Infinity, Isolated and Non-isolated Singularities, Calculus of Residues, Residue at Finite Point, Residue at the Point at Infinity, Residue Theorem, Number of Zeros and Poles, Rouche's Theorem, Hurwitz's Theorem.

Unit-IV

Evaluation of certain Integrals, Integrals of Type $\int_a^{2\pi} R(\cos\theta, \sin\theta)d\theta$, Integrals of Type $\int_{-\infty}^{\infty} f(x)dx$ Integrals of Type $\int_{-\infty}^{\infty} g(x)\cos mx \; dx$ Singularities on Real Axis.

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Text Book:

1. Foundation of Complex Analysis by S. Ponnusamy, Narosa Publishing House, 1997.

Reference Books:

1. Introduction to Complex Analysis by H.A. Priestly, Clarendon Press, Oxford, 1990.
2. Function of one Complex Variable by J.B. Conway, Springer-Verlag. International student-Edition, Narosa Publishing House, 1980.
3. Complex Analysis by L.V. Ahlfors, McGraw-Hill, 1979.
4. Real and Complex Analysis by Walter Rudin, McGraw-Hill Book Co., 1966

CO-PSO Matrix for the Course MS-203: Partial Differential Equation

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3

CO-PO Matrix for the Course MS-203: Partial Differential Equation

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	2	2	3	2	2	3
CO2	3	2	3	3	2	2	3	2	2	3
CO3	3	2	3	3	2	2	3	2	2	3
CO4	3	2	2	3	2	2	3	2	2	3

Paper Title **PARTIAL DIFFERENTIAL EQUATIONS**
Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-203**

Unit-I

Methods of solution of dx/P=dy/Q=dz/R Where P, Q, R, are given functions of x, y, and z, Pfaffian Differential Equations and solution of Pfaffian differential equation in three variables. Partial Differential Equations of the First order, Linear Equations of the First-Order, Integral Surfaces passing through a given curve,Surfaces Orthogonal to a given system of Surfaces, Lagrange's equation, nonlinear partial Differential Equations of the first order, cauchy's Method of characteristics, compatible systems of first-order Equations, Charpit's Method,Special Types of first-order Equations.

Unit-II

Introduction,Classification of Second Order Partial Differential Equations (PDE), Canonical Forms, Boundary Value Problems (BVPs),Propeties of Harmonic functions, Separation of Variables method. Elliptic Differential Equations, Laplace Equation, Poisson Equation, Dirichlet Problem for a Rectangle, Neumann problem for a rectangle, Interior Dirichlet Problem for a Circle, Exterior Dirichlet, Problem for a Circle, Interior.

Unit-III

Neumann Problem for a Circle, Solution of Laplace Equation in Cylindrical Coordinates, Solution of Laplace Equation in Spherical coordinates. Parabolic Differential Equations, Diffusion Equations, Heat Equation, Occurrence of Diffusion Equation, Boundary Conditions, Elementry Solution of the Diffusion Equation,Dirac Delta Function, Separation of Variables Method, Solution of Diffusion Equation in Cylindrical Coordinates, Solution of Diffusion Equation in Spherical Coordinates

Unit-IV

Hyperbolic Differential Equations,Wave Equation,Occurrence of the Wave Equation, Solution of One-Dimensional Wave Equation by Canonical Reduction, The Initial Value Problem, D'Alemberts Solution, Vibrating String-Variables Separable Solution, Forced Vibrations-Solution of Nonhomogeneous Equation.

Books Recommended:

1. Introduction to Partial Differential Equations by K.Sankara Rao, PHI
2. Elements of Partial Differential Equations by IAN N. SNEDDON Mc GRAW-HILL Book Company.

CO-PSO Matrix for the Course MS-204: Numerical Analysis

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	3	3	3
CO3	3	3	3	2
CO4	3	3	3	2

CO-PO Matrix for the Course MS-204: Numerical Analysis

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	2	3	2	3	3
CO2	3	3	3	3	3	2	3	2	3	3
CO3	3	3	3	3	3	2	3	2	3	3
CO4	3	3	3	3	3	2	3	2	3	3

Paper Title **NUMERICAL ANALYSIS**
Lectures **: (4+2) Hrs** **Maximum Marks: 100(40+60)**
Examination Time **: 3 Hrs** **Paper Code** **: MS-204**

Unit-I

Solution of Algebraic Transcendental & Polynomial equations: Bisection method, Iteration method based on first-degree equation: Secant method, Regula-Falsi method, Newton-Raphson method, rate of convergence of Newton-Raphson method & Secant method.

Unit-II

System of linear algebraic equations: Gauss Elimination method, Gauss-Jordan Elimination method, Cholesky method. Iteration methods: Jacobi Iteration method, Gauss-Seidel method.

Unit-III

Interpolation & approximation finite difference operators, Newton's forward and backward interpolation, Central difference interpolation, Lagrange's interpolation, Newton Divided Difference interpolation, Hermite interpolation, Spline interpolation.

Unit-IV

Differentiation and integration: Numerical differentiation, Numerical integration, Newton-cotes formula, Trapezoidal rule, Simpson's one-third rule, Gauss-Legendre integration method.

Ordinary differential equations- Euler method, Backward Euler method, Midpoint method, Taylor Series method, Runge-Kutta methods, Predictor-Corrector methods.

Text Books:

1. Numerical method for Scientific & Engineering Computation by M.K. Jain & R. K. Iyengar & R.K. Jain-Wiley Eastern Ltd.
2. Numerical Method by S S Sastry.

Reference Book:

1. Numerical Methods by V.RajaRaman, PHI.

CO-PSO Matrix for the Course MS-205: Number Theory

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3

CO-PO Matrix for the Course MS-205: Number Theory

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	2	3	2	3	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	2	3	2	3	3

Paper Title NUMBER THEORY
Lectures : (4+2) Hrs Maximum Marks: 100(40+60)
Examination Time : 3 Hrs Paper Code : MS-205

Unit- I

Divisibility, Euclidean algorithm, Linear Diophantine equations, Prime numbers, Fundamental theorem of arithmetic, Prime number theorem (statement only). Congruences, solutions of linear congruences, Chinese Remainder.

Unit-II

Theorem, Euler's totient function, Euler-Fermat theorem, Wilson's theorem, non-linear congruences, Hensel's lemma, primitive roots and power residues.

Unit-III

Quadratic residues, quadratic reciprocity, the Jacobi symbols. The greatest integer function, Arithmetic functions, Mobius function and Mobius inversion formula.

Unit-IV

Finite continued fractions, infinite continued fractions, approximation to irrational numbers. Introduction to cryptography, public key cryptography, RSA.

Text Books:

1. Niven I., Zuckerman H. S., and Montgomery H. L., "An Introduction to the Theory of Numbers", John Wiley & Sons (5th Ed.) 1991
2. Hardy, G., H. and Wright, E. M, "An Introduction to the Theory of Numbers ", Oxford University Press (6th Ed.) 2008
3. Burton D., M., "Elementary Number Theory", McGraw Hill (7th Ed.) 2010.

Reference Books:

1. Andrews G. E., "Number Theory", Dover Publications 1994
2. Koblitz N., A Course in Number Theory and Cryptography, Springer (2nd Ed.) 1994

Lesson plans 2nd semester:

Paper: MS-201: Topology

1. Introduction to Topological Spaces
2. Open and Closed Sets in Topology
3. Basis and Subbasis for a Topology
4. Continuity and Homeomorphisms
5. Compactness in Topological Spaces
6. Compactness in Metric Spaces
7. Connected and Disconnected Sets
8. Path Connectedness
9. Tychonoff Theorem
10. Product Topology
11. Quotient Topology
12. Separation Axioms: T0, T1, and T2
13. Regular and Normal Spaces
14. Urysohn's Lemma
15. Tietze Extension Theorem
16. Metrization Theorems
17. Baire Category Theorem
18. Paracompactness
19. Stone-Čech Compactification
20. Nets and Filters
21. Convergence of Nets
22. Compactness via Nets and Filters
23. Local Compactness
24. One-Point Compactification
25. Stone-Weierstrass Theorem
26. Countability Axioms
27. Lindelöf Spaces

28. Completely Regular Spaces
29. Embedding Theorems
30. Urysohn Metrization Theorem
31. Inverse and Direct Limits
32. Fundamental Group Basics
33. Covering Spaces
34. Introduction to Homotopy
35. Introduction to Simplicial Complexes
36. Cech Cohomology
37. Homology Theory Introduction
38. Applications of Topology
39. Advanced Topics in Topology
40. Review and Problem Solving

Paper: MS-202: Complex Analysis

1. Introduction to Complex Numbers and Functions
2. Limits and Continuity in Complex Plane
3. Analytic Functions and Cauchy-Riemann Equations
4. Complex Integration Basics
5. Cauchy's Theorem and Its Applications
6. Cauchy's Integral Formula
7. Taylor and Laurent Series
8. Residue Theorem and Applications
9. Evaluation of Improper Integrals
10. Conformal Mappings
11. Mobius Transformations
12. Bilinear Transformations
13. Zeros and Singularities of Functions
14. Classification of Singularities
15. The Argument Principle
16. Rouche's Theorem
17. Maximum Modulus Principle
18. Schwarz Lemma
19. Analytic Continuation
20. Harmonic Functions and Their Properties
21. Poisson's Integral Formula
22. The Dirichlet Problem
23. Elliptic Functions Basics
24. Weierstrass Elliptic Functions
25. Modular Functions and Forms
26. Introduction to Riemann Surfaces
27. Monodromy Theorem
28. The Riemann Mapping Theorem
29. Picard's Theorems
30. Introduction to Meromorphic Functions
31. Entire Functions
32. Liouville's Theorem
33. Jensen's Formula
34. Hadamard's Theorem
35. Schwarz-Christoffel Transformation

36. Applications of Conformal Mappings
37. Boundary Behavior of Analytic Functions
38. Advanced Topics in Complex Analysis
39. Problem Solving and Applications
40. Review and Recap

Paper: MS-203: Partial Differential Equations

1. Introduction to Partial Differential Equations (PDEs)
2. First Order PDEs and Method of Characteristics
3. Classification of Second Order PDEs
4. Canonical Forms of PDEs
5. Boundary and Initial Value Problems
6. The Cauchy Problem for PDEs
7. Well-Posed Problems
8. Wave Equation and Its Solutions
9. Heat Equation and Its Solutions
10. Laplace Equation and Its Solutions
11. Separation of Variables Method
12. Fourier Series Solutions
13. Fourier Transform Methods
14. Green's Functions for PDEs
15. Sturm-Liouville Theory
16. Eigenfunction Expansions
17. Energy Methods for PDEs
18. Maximum Principle for Elliptic Equations
19. Weak Solutions and Distributions
20. Sobolev Spaces
21. Method of Integral Transforms
22. Nonlinear First Order PDEs
23. Conservation Laws and Shock Waves
24. Characteristics and Wavefronts
25. Hamilton-Jacobi Equations
26. Introduction to Variational Methods
27. Nonlinear Elliptic Equations
28. Parabolic Equations and Heat Conduction
29. Hyperbolic Equations and Wave Propagation
30. Numerical Methods for PDEs
31. Finite Difference Method
32. Finite Element Method
33. Finite Volume Method
34. Spectral Methods for PDEs
35. Bifurcation Theory
36. Stability Analysis of Solutions
37. Applications in Physics and Engineering
38. Advanced Topics in PDEs
39. Problem Solving and Applications
40. Review and Recap

Paper: MS-204: Numerical Analysis

1. Introduction to Numerical Methods
2. Solution of Nonlinear Equations: Bisection Method
3. Newton-Raphson Method
4. Secant Method and Convergence Analysis
5. Fixed Point Iteration Method
6. Numerical Solution of Linear Systems: Gaussian Elimination
7. LU Decomposition Method
8. Jacobi and Gauss-Seidel Methods
9. Eigenvalue Problems: Power Method
10. QR Algorithm for Eigenvalues
11. Polynomial Interpolation: Lagrange Interpolation
12. Newton's Divided Difference Interpolation
13. Spline Interpolation Methods
14. Numerical Differentiation and Error Analysis
15. Numerical Integration: Trapezoidal Rule
16. Simpson's Rule and Gaussian Quadrature
17. Romberg Integration
18. Adaptive Quadrature Methods
19. Numerical Solutions to ODEs: Euler's Method
20. Runge-Kutta Methods
21. Multi-Step Methods: Adams-Bashforth
22. Stability and Convergence of ODE Methods
23. Numerical Solutions to PDEs: Finite Difference Method
24. Crank-Nicolson Method for Heat Equation
25. Method of Lines for PDEs
26. Introduction to Finite Element Method
27. Boundary Value Problems: Shooting Method
28. Finite Volume Method
29. Iterative Methods for Sparse Linear Systems
30. Monte Carlo Methods and Applications
31. Numerical Linear Algebra: Singular Value Decomposition
32. Fast Fourier Transform (FFT)
33. Numerical Optimization: Gradient Descent
34. Conjugate Gradient Method
35. Numerical Solutions for Nonlinear PDEs
36. Introduction to Stability Analysis
37. Error Analysis in Numerical Computations
38. High-Performance Computing for Numerical Methods
39. Applications in Science and Engineering
40. Review and Problem Solving

Paper: MS-205: Number Theory

1. Introduction to Number Theory
2. Divisibility and the Euclidean Algorithm
3. Prime Numbers and Fundamental Theorem of Arithmetic
4. Congruences and Modular Arithmetic
5. Chinese Remainder Theorem

6. Fermat’s Little Theorem
7. Euler’s Theorem and Its Applications
8. Wilson’s Theorem
9. Linear Diophantine Equations
10. Quadratic Residues and the Legendre Symbol
11. The Law of Quadratic Reciprocity
12. The Jacobi Symbol and Its Properties
13. Continued Fractions and Their Convergents
14. Pell’s Equation and Its Solutions
15. Primitive Roots and Indices
16. Applications of Primitive Roots
17. Cryptography: RSA Algorithm
18. Introduction to Elliptic Curves
19. Elliptic Curves Over Finite Fields
20. The Mordell-Weil Theorem
21. The Riemann Zeta Function
22. Dirichlet’s Theorem on Primes in Arithmetic Progressions
23. Distribution of Primes: The Prime Number Theorem
24. Introduction to Algebraic Number Theory
25. Quadratic Fields and Their Properties
26. Unique Factorization in Quadratic Fields
27. Cyclotomic Fields and Their Applications
28. Introduction to Modular Forms
29. Modular Arithmetic and Elliptic Curves
30. Hasse’s Theorem and Applications
31. Lattice-Based Cryptography
32. Introduction to Sieve Methods
33. The Brun-Titchmarsh Theorem
34. Introduction to Analytic Number Theory
35. The Circle Method and Its Applications
36. Representation of Numbers as Sums of Squares
37. Integer Partitions and the Partition Function
38. Introduction to Additive Number Theory
39. Advanced Topics in Number Theory
40. Review and Problem Solving

CO-PSO Matrix for the Course MS-301: Functional Analysis

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	2	3	3
CO3	3	3	2	3
CO4	2	3	3	3

CO-PO Matrix for the Course MS-301: Functional Analysis

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	3	2	2	3	3	2
CO2	2	3	3	3	3	2	3	3	2	3
CO3	3	2	3	3	2	3	2	2	2	2
CO4	3	3	2	3	3	2	3	3	3	3

Paper Title **FUNCTIONAL ANALYSIS**
Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-301**

Unit-I

Normed linear spaces, Banach spaces and examples, quotient space of normed linear spaces and its completeness, convex sets and convex functional, lower semi-continuous and upper semi-continuous functions.

Unit-II

Equivalent norms, Riesz lemma, basic properties of finite dimensional normed linear spaces and compactness.Normed linear spaces of bounded linear transformations, dual spaces with examples. Uniform boundedness theorem and some of its consequences, Open mapping and closed graph theorems, Hahn-Banach theorem for real linear spaces and complex linear spaces.

Unit-III

Reflexivity of Hilbert spaces, Reflexive spaces, Inner product spaces, Hilbert spaces, Orthonormal sets, Bessel's inequality, Complete orthonormal sets and Parseval's identity, Structure of Hilbert Spaces, Projection theorem.

Unit-IV

Adjoint of an operator on a Hilbert space, Self- adjoint operators, Riesz representation theorem, Positive, Projection, normal and unitary operators, Introduction to Sobolev spaces, Fundamental theorem of variational calculus, bilinear forms.

Text Books:

1. Functional Analysis with Applications by A. H. Siddique, Tata McGraw Hill Publishing Company Ltd. New Delhi.
2. Introductory Functional analysis with Applications by Kreyszig, John Wiley and Sons, New York.

Reference Books:

1. Real Analysis by H.L. Royden, Macmillan Publishing Co. Inc., New York, 4^{th} Edition, 1993.
2. Functional Analysis by B.V. Limaye, Wiley Eastern Ltd.

CO-PSO Matrix for the Course MS-302: Measure Theory

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	2	3	3
CO3	3	3	2	3
CO4	2	3	3	3

CO-PO Matrix for the MS-302: Measure Theory

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	3	3	3	3	2	2	3
CO2	3	3	3	2	3	3	2	2	3	3
CO3	2	3	2	3	3	2	3	3	2	3
CO4	3	2	3	3	2	3	3	3	3	2

Paper Title **MEASURE THEORY**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-302**

Unit- I

Basic Concept of sets, Measure, Measurable Sets, Lebesgue measure of a set, Outer, Exterior & Interior Measure, Measurable Space. Measurable functions, Equivalent functions.

Unit- II

Simple functions, Characteristic functions, Lebesgue measurable functions. Lebesgue Integral of a function, Lebesgue integral of an unbounded function, first mean value theorem. Convergence in Measure, Uniform Convergence.

Unit- III

F. Reisz's theorem, D.F. Egor's theorem, Dominated Convergence Theorem, Beppo Levi's Theorem, Fatou's Lemma, Extension of a Measure. Continuous & absolute continuous function.

Unit- IV

Indefinite Integral, Differentiable, Increasing & decreasing functions, Function of bounded variation.

Text Books:

1. Measure theory – P.R. Halmos
2. Measure Theory-K P. Gupta

CO-PSO Matrix for the Course MS-303: Bio Mechanics

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	3	3	2
CO3	3	3	3	2
CO4	3	3	3	2

CO-PO Matrix for the Course MS-303: Bio Mechanics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	2	3	2	3	3
CO2	3	3	3	3	3	2	3	2	3	3
CO3	3	3	3	3	3	2	3	2	3	3
CO4	3	3	3	3	3	2	3	2	3	3

Paper Title **BIO-MECHANICS**
Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-303**

Unit-I

Bio-physics of Human Cardio-vascular system: Types of Blood Vessels, Properties of Blood. Flow in Tubes, Poiseuibles law, Erythrocyte sedimentation Rate I stoke's low, pulsatile flow, Flow in elastic vessels.

Unit-II

Bio-physics of Human Thermo-regulation Heat flow in Human Dermal and sub-dermal ports; Derivation of Governing partial differential Equations Incorporating Micro-circulation and Perspiration.

Unit-III

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Diffusion processes in biology: diffusion in Tissue, Fick's principle, One, two and three Dimensionals diffusion Problems and their solution, Water Transport, Diffusion Through Membranes.Solution of steady stale and Unsteady –state flow problems in one dimension, application of finite element method and exact solutions.

Unit-IV

Respiratory Gas flows, flow in Airways, Interaction Between convection and diffusion, Exchange between Alveolar Gas and Erythrocytes, Pulmonary function Test, Dynamics of Ventilation system.

Text Books:

1. Introduction to Mathematical Biology by S.I. Rubinow, J.Wiley & Sons.
2. Biomechanics by Y.C. Fung, Springer-verlag.
3. Introduction to Biomathematics by V.P. Saxena, Vishwa Prakashan (Wiley-Eastern)

Reference Book:

1. Biofluid Dynamics by Mazumdar.

CO-PSO Matrix for the Course MS-401: Special Function

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	2	3	3	3
CO3	3	2	2	3
CO4	3	3	3	3

CO-PO Matrix for the Course MS-401: Special Function

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	2	3	3	2	3	2
CO2	3	2	3	3	2	2	2	3	2	3
CO3	3	3	2	3	3	2	2	3	3	2
CO4	2	2	3	3	3	3	3	2	2	3

Lesson plans 3rd semester:

Paper: MS-301: Functional Analysis

1. Introduction to Normed Linear Spaces
2. Banach Spaces and Examples
3. Hahn-Banach Theorem
4. Open Mapping Theorem
5. Closed Graph Theorem
6. Uniform Boundedness Principle
7. Baire Category Theorem
8. Dual Spaces and Examples
9. Reflexivity of Banach Spaces
10. Weak and Weak* Topologies
11. Compact Operators on Banach Spaces
12. Spectrum of a Bounded Operator
13. Riesz-Schauder Theory
14. Hilbert Spaces and Examples
15. Orthonormal Sets in Hilbert Spaces
16. Projection Theorem
17. Riesz Representation Theorem
18. Adjoint of an Operator
19. Self-Adjoint, Normal, and Unitary Operators
20. Spectral Theorem for Bounded Operators
21. Compact Operators on Hilbert Spaces
22. Fredholm Theory
23. The Spectral Theorem for Compact Operators
24. Applications of the Spectral Theorem
25. Introduction to Sobolev Spaces
26. Embedding Theorems in Sobolev Spaces
27. Sobolev Inequalities
28. Applications to PDEs
29. Distributions and Fourier Transform
30. Weak Convergence in Banach Spaces
31. Strong and Weak* Convergence
32. Applications of Functional Analysis to Quantum Mechanics
33. Fixed Point Theorems: Banach and Schauder
34. Applications of Fixed Point Theorems
35. Introduction to Nonlinear Functional Analysis
36. The Contraction Mapping Principle
37. Applications in Optimization
38. Introduction to Spectral Decomposition
39. Advanced Topics in Functional Analysis
40. Review and Problem Solving

Paper: MS-302: Measure Theory

1. Introduction to Measure Theory
2. Sigma-Algebras and Measures

3. Construction of Lebesgue Measure
4. Measurable Functions
5. Integration with Respect to a Measure
6. Convergence Theorems: Monotone and Dominated
7. Product Measures and Fubini’s Theorem
8. Signed Measures and the Hahn Decomposition
9. The Radon-Nikodym Theorem
10. The Riesz Representation Theorem
11. Outer Measure and Carathéodory's Extension Theorem
12. The Lebesgue Differentiation Theorem
13. Absolute Continuity and Singularity
14. Vitali Covering Theorem
15. Functions of Bounded Variation
16. The Lebesgue-Stieltjes Integral
17. Lp Spaces and Their Properties
18. The Hölder and Minkowski Inequalities
19. The Riesz Representation Theorem for Lp Spaces
20. Duality in Lp Spaces
21. Introduction to Sobolev Spaces
22. Embedding Theorems for Sobolev Spaces
23. Applications to PDEs
24. Measure and Integration in Product Spaces
25. Introduction to Hausdorff Measure
26. Measure on Metric Spaces
27. Applications to Fractals and Geometry
28. Fourier Transform on Lp Spaces
29. Convolution and Approximate Identities
30. Plancherel Theorem and Applications
31. Introduction to Ergodic Theory
32. Measure-Preserving Transformations
33. Recurrence Theorems in Ergodic Theory
34. Introduction to Probability Measures
35. The Kolmogorov Extension Theorem
36. Conditional Expectation
37. Radon Measures
38. Introduction to Non-Standard Analysis
39. Advanced Topics in Measure Theory
40. Review and Problem Solving

Paper: MS-303: Bio-Mechanics

1. Introduction to Bio-Mechanics
2. Biomechanical Properties of Biological Tissues
3. Mechanics of Bone
4. Mechanics of Soft Tissues
5. Viscoelasticity in Biological Tissues
6. Cardiovascular System Mechanics
7. Blood Flow in Arteries
8. Fluid Mechanics of Circulatory System
9. Mechanics of Respiration
10. Mechanics of Skeletal Muscles

11. Biomechanics of Joints
12. Gait Analysis and Locomotion
13. Mechanics of Spine and Posture
14. Mechanical Properties of Cartilage
15. Biomechanics of Injury and Rehabilitation
16. Computational Models in Bio-Mechanics
17. Finite Element Analysis in Bio-Mechanics
18. Mechanics of Microcirculation
19. Cellular Biomechanics
20. Mechanics of Cell Membrane and Cytoskeleton
21. Mechanical Signaling in Cells
22. Biomechanics of Growth and Remodeling
23. Mechanics of Tissue Engineering
24. Biomaterials and Prosthetics
25. Mechanics of Implantable Devices
26. Orthopedic Biomechanics
27. Biomechanics in Sports
28. Biofluid Mechanics
29. Applications of Biomechanics in Surgery
30. Mechanics of Hearing and Vision
31. Introduction to Mechanobiology
32. Experimental Techniques in Bio-Mechanics
33. Data Analysis in Biomechanics
34. Current Trends in Bio-Mechanics
35. Ethical Issues in Bio-Mechanics Research
36. Computational Simulations in Bio-Mechanics
37. Advanced Imaging Techniques in Bio-Mechanics
38. Integrative Approaches in Bio-Mechanics
39. Applications of Bio-Mechanics in Clinical Settings
40. Review and Problem Solving

Paper: MS-304: Operations Research (Elective)

1. Introduction to Operations Research
2. Linear Programming Problems (LPP) Formulation
3. Graphical Method for LPP
4. Simplex Method Basics
5. Duality in Linear Programming
6. Sensitivity Analysis
7. Transportation Problem
8. Assignment Problem
9. Integer Programming
10. Goal Programming
11. Dynamic Programming
12. Network Models: PERT/CPM
13. Inventory Models
14. Queuing Theory Introduction
15. M/M/1 Queuing System
16. Decision Theory and Analysis
17. Game Theory Introduction
18. Two-Person Zero-Sum Games

19. Nonlinear Programming
20. Kuhn-Tucker Conditions
21. Quadratic Programming
22. Markov Chains and Their Applications
23. Steady-State Analysis in Markov Chains
24. Reliability and Maintainability
25. Replacement and Maintenance Models
26. Simulation Techniques
27. Monte Carlo Simulation
28. Applications of Simulation in Operations Research
29. Forecasting Models
30. Time Series Analysis
31. Regression Models
32. Multi-Criteria Decision Making
33. Introduction to Metaheuristics
34. Genetic Algorithms
35. Simulated Annealing
36. Particle Swarm Optimization
37. Applications of Metaheuristics
38. Case Studies in Operations Research
39. Advanced Topics in Operations Research
40. Review and Problem Solving

Paper: MS-305: Fluid Dynamics (Elective)

1. Introduction to Fluid Dynamics
2. Fluid Properties and Flow Classification
3. Kinematics of Fluids
4. Conservation Laws in Fluid Mechanics
5. Bernoulli's Equation
6. Potential Flow Theory
7. Stream Function and Velocity Potential
8. Vorticity and Circulation
9. Navier-Stokes Equations
10. Exact Solutions of Navier-Stokes Equations
11. Boundary Layer Theory
12. Prandtl's Boundary Layer Equations
13. Laminar and Turbulent Flows
14. Stability of Fluid Flow
15. Hydrodynamic Stability Theory
16. Instabilities in Fluid Flow
17. Turbulence: Concepts and Models
18. Reynolds-Averaged Navier-Stokes Equations
19. Introduction to Computational Fluid Dynamics (CFD)
20. Finite Difference Methods in CFD
21. Finite Volume Methods in CFD
22. Finite Element Methods in CFD
23. Incompressible Flow Problems
24. Compressible Flow Problems
25. Shock Waves in Compressible Flows
26. Supersonic and Hypersonic Flows

27. Flow Around Airfoils
28. Lift and Drag on Airfoils
29. Aerodynamics of Wings
30. Introduction to Magnetohydrodynamics (MHD)
31. Flow in Porous Media
32. Multiphase Flow Problems
33. Biofluid Dynamics
34. Applications of Fluid Dynamics in Engineering
35. Fluid-Structure Interaction
36. Flow Measurement Techniques
37. Experimental Fluid Dynamics
38. Non-Newtonian Fluids
39. Advanced Topics in Fluid Dynamics
40. Review and Problem Solving

Title

SPECIAL FUNCTION

Paper
Lectures : (4+2) Hrs Maximum Marks: 100(40+60)
Examination Time : 3 Hrs Paper Code : MS-401

Unit -I

Gamma and Beta Functions Gamma Function, A series for Γ' (z) / Γ (z) , Difference equation Γ(z+1) = zΓ(z), Euler's integral for Γ (z) , Beta function, value of Γ(z) Γ(1-z), Factorial Function, Legendre's duplication formula, Gauss multiplication theorem, The behaviour of log Γ(z) for large l z l

Unit-II

Bessel function and Legendre polynomials Definition of J_n (z), Bessel's differential equation, Generating function, Recurrence relations, Generating function for Legendre polynomials, Rodrigues formula, Bateman's generating function, Additional generating funtions, Hypergeometric forms of P_n (X) , Special properties of P_n, Some more generating functions, Laplace's first integral form, Orthogonality.

Unit-III

Hypergoemetric and Generalized Hypergeometric functions: Gauss hypergeometric Function ${}_2F_1$ and its convergence A simple integral form evaluation of ${}_2F_1$ (a,b;c;1), Contiguous function relations, Hyper geometric differential equation Elementary series manipulations, Simple transformation, Generalized hypergeometric function ${}_pF_q$ and its convergence, Whipple's theorem, Dixon's theorem.

Unit-IV

Hermite and Laguerre polynomials Definition of Hermite and Laguerre polynomials, Pure recurrence relations, Differential recurrence relations, Rodrigue's formula, Other generating functions, Othogonality for Laguerre and Hermite polynomials

1. Rainville, E.D ; Special Functions, The Macmillan co., New york 1971.
2. Mathai and Saxena: Generalized Hypergeometric function with Application in Statistics and physical Sciences, Springer Verlag, Heidelberg and New York, Lecture Notes No 348,1973
3. Saran, N., Sharma S.D. and Trivedi, - Special Functions with application, Pragati prakashan, 1986.

Reference Books:

1. Lebdev, N.N, Special Functions and Their Applications, Prentice Hall, Englewood Cliffs, New Jersey, USA 1995.
2. Whittaker, E.T. and Watson, G.N., A Course of Modern Analysis Cambridge University Press, London, 1963.

CO-PSO Matrix for the Course MS-402: Integral Equation and Calculus of Variations

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	2	2	3
CO4	3	3	2	3

CO-PO Matrix for the Course MS-402: Integral Equation and Calculus of Variations

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	2	3	2	3	3	3
CO2	3	3	3	3	2	3	2	3	3	2
CO3	3	2	3	3	3	2	3	3	3	3
CO4	3	3	2	3	2	3	2	3	2	2

Paper Title **INTEGRAL EQUATION AND CALCULUS OF VARIATIONS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-402**

Unit - I

Linear integral equations, Some basic identities, Initial value problems reduced to Volterra integral equations, Methods of successive substitution and successive approximation to solve Volterra integral equations of second kind, Iterated kernels and Neumann series for Volterra equations. Resolvent kernel as a series in ≒, Laplace transform method for a difference kernel, Solution of a Volterra integral equation of the first kind.

Unit - II

Boundary value problems reduced to Fredholm integral equations, Methods of successive approximation and successive substitution to solve Fredholm equations of second kind, Iterated kernels and Neumann series for Fredholm equations. Resolvent kernel as a sum of series. Fredholm resolvent kernel as a ratio of two series. Fredholm equations with separable kernels, Approximation of a kernel by a separable kernel, Fredholm Alternative, Non homogenous Fredholm equations with degenerate kernels.

Unit - III

Green's function, Use of method of variation of parameters to construct the Green's function for a nonhomogeneous linear second order boundary value problem, Basic four properties of the Green's function, Orthogonal series representation of Green's function, Alternate procedure for construction of the Green's function by using its basic four properties. Reduction of a boundary value problem to a Fredholm integral equation with kernel as Green's function. Hilbert-Schmidt theory for symmetric kernels.

Unit - IV

Motivating problems of calculus of variations, Shortest distance, Minimum surface of revolution, Branchistochrone problem, Isoperimetric problem, Geodesic. Fundamental lemma of calculus of variations, Euler's equation for one dependant function and its generalization to 'n' dependant functions and to higher order derivatives, Conditional extremum under geometric constraints and under integral constraints.

Books Recommended :

1. Jerri, A.J., Introduction to Integral Equations with Applications, A Wiley-Interscience Pub.
2. Kanwal, R.P., Linear Integral Equations, Theory and Techniques, Academic Press, New York.
3. Gelfand, J.M. and Fomin, S.V., Calculus of Variations, Prentice Hall, New Jersy, 1963.
4. Weinstock , Calculus of Variations, McGraw Hall.
5. Abdul-Majid wazwaz, A first course in Integral Equations, World Scientific Pub.
6. David, P. and David, S.G. Stirling, Integral Equations, Cambridge University Press.
7. Tricomi, F.G., Integral Equations, Dover Pub., New York

CO-PSO Matrix for the Course MS-403: Tensor and Differential Geometry

COs	PSO1	PSO2	PSO3	PSO4

CO1	3	3	3	2
CO2	3	3	3	2
CO3	3	3	3	2
CO4	3	3	3	2

CO-PO Matrix for the Course MS-403: Tensor and Differential Geometry

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	3	3
CO2	3	3	3	3	3	3	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	3	3	3	2	3	3

Paper Title **TENSOR AND DIFFERENTIAL GEOMETRY**

Lectures : (4+2) Hrs Maximum Marks: 100(40+60)
Examination Time : 3 Hrs Paper Code : MS-403

Unit- I

Theory of Space Curves: Space curves, Planer curves, Curvature, Torsion and Serret-Frenet formulae. Osculating circles, Osculating circles and spheres. Existence of space curves. Evolutes and involutes of curves.

Unit- II

Theory of Surfaces: Parametric curves on surfaces. Direction coefficients. First and second Fundamental forms. Principal and Gaussian curvatures. Lines of curvature, Euler's theorem. Rodrigue's formula, Conjugate and Asymptotic lines.

Developables: Developable associated with space curves and curves on surfaces, Minimal surfaces.

Unit- III

Geodesics: Canonical geodesic equations. Nature of geodesics on a surface of revolution. Clairaut's theorem. Normal property of geodesics. Torsion of a geodesic. Geodesic curvature. Gauss - Bonnet theorem. Surfaces of constant curvature Conformal mapping Geodesic mapping. Tissot's theorem.

Unit- IV

Tensors: Summation convention and indicial notation, Coordinate transformation and Jacobian, Contra-variant and Covariant vectors, Tensors of different type, Algebra of tensors and contraction, Metric tensor and 3-index Christoffel symbols, Parallel propagation of vectors, Covariant and intrinsic derivatives, Curvature tensor and its properties, Curl, Divergence and Laplacian operators in tensor form, Physical components.

Text Books:

1. Willmore, T. J., "An Introduction to Differential Geometry", Dover publications. 2012.
2. O'Neill B., Elementary Differential Geometry, Academic press, 2nd Ed. 2006
3. Weatherburn, C.E. Differential Geometry of Three Dimensions, Cambridge University Press (digital pub) 2003
4. Spain, B., "Tensor Calculus: A concise Course", Dover Publications2003.

Refenence Book:

1. Struik, D., J., "Lectures on Classical Differential Geometry", Dover Publications. 1988.
2. Lang, S., Fundamentals of Differential Geometry, Springer. 1999.

CO-PSO Matrix for the Course MS-304: Operation Research

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3
CO2	3	2	3	3
CO3	2	3	3	2
CO4	3	3	3	3

CO-PO Matrix for the Course MS-304: Operation Research

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	2	2	3	2	3
CO2	3	3	2	3	3	3	2	2	3	2
CO3	3	3	3	2	2	3	3	3	2	3
CO4	2	3	3	3	3	2	3	2	3	2

Elective Paper

Paper Title **OPERATIONS RESEARCH**
Lectures **: (4+2) Hrs** **Maximum Marks: 100(40+60)**
Examination Time **: 3 Hrs** **Paper Code : MS-304**

Unit-I

Introduction, Nature and Meaning of O.R. Modelling in operations Research, Features of Operation research, scope of operations research Linear Programming Problem: formulation of L.P.P. solution of L.P.P. Graphical Method, Simplex Methods in Duality, Integer Programming.

Unit-II

Mathematical formulation, Transportation problem formulation, basic feasible solution – North-West-corner method, Least cost method, Vogel's Approximation method, Optimum solution: MODI method, Job sequencing: Processing n jobs through 2 machines, Processing n jobs through 3 machines, Processing 2 Jobs through m machines.

Unit-III

Replacement problems: Replacement policy for items whose maintenance cost increase with time and money value is constant, Money value changes with constant rate. Project management: Introduction, network diagram representation, time estimates and critical path with saddle point, rectangular game without saddle point, Principle of dominance.

Unit-IV

Queuing Theory: Introduction, queuing system Transient and steady traffic inlets, Distribution of arrival distribution of departure, M/M/I: ∞/ FCFS model nonlinear programming: Kuhn-Tucker conditions. D composition Method. Gole Progrmming.

Text Books:

1. Linear Programming by G. Hadley, Narosa Publishing House, 1995.
2. Operations Research by R.K. Gupta.

Reference Books:

1. Introduction to Operations Research (Sixth Edition) by F.S. Hillier and G.J. Lieberman Mc Graw Hill International Edition, Industrial Engineering Series, 1995.
2. Operations Research by S.D. Sharma.

CO-PSO Matrix for the Course MS-305: Fluid Dynamics

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	2
CO3	3	3	3	2
CO4	2	3	3	3

CO-PO Matrix for the Course MS-305: Fluid Dynamics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	3	3	2	2	3
CO2	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	3	3	3	2	3	2	2	3	3

Paper Title **FLUID DYNAMICS**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-305**

Unit-I

Lagrangian and Eulerian descriptions, Continuity of mass flow, circulation, rotational and irrotational flows, boundary surface, streamlines, path lines, streak lines, vorticity General equations of motion: inviscid case, Bernoulli's theorem, compressible and incompressible flows, Kelvin's theorem, constancy of circulation.

Unit-II

Stream function, Complex-potential, source, sink and doublets, circle theorem, method of images, Theorem of Blasius, Strokes stream function, Motion of a sphere. Helmholtz's vorticity equation, vortex filaments, vortex pair.

Unit-III

Navier-Stokes equations, dissipation of energy, diffusion of vorticity, Steady flow between two infinite parallel plates through a circular pipe (Hagen-Poiseuille flow), Flow between two co- axial cylinders, Energy equation, Dynamical similarity Mathematical formulation of the stability problem of incompressible flow, Stability of flows under different cases, Prandtl's momentum transfer theory. Introduction to Complex fluids.

Unit-IV

Dimensional analysis, large Reynold's numbers; Laminar boundary layer equations, Similar solutions; Flow past a flat plate, Momentum integral equations, Solution by Karman- Pohlhausen methods, impulsive flow Reyleigh problem, dynamical similarity

Thermal boundary layer equation for incompressible flow; Temperature distribution in Coutte flow and in flow past a flat plate.

Text Books:

1. Batechelor, G.K., "An Introduction to Fluid Dynamics", Cambridge Press 2002
2. Schliting, H. , Gersten K., "Boundary Layer Theory", Springer, 8th edition. 2004
3. Drazin, P.G., Reid W. H., "Hydrodynamic Stability", Cambridge Press 2004

CO-PSO Matrix for the Course MS-404: Fluid Mechanics

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3

CO-PO Matrix for the Course MS-404: Fluid Mechanics

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	2	3	2	3	3	3
CO2	3	3	3	3	2	3	2	3	3	3
CO3	3	3	3	3	2	3	2	3	3	3
CO4	3	3	3	3	2	3	2	3	3	3

Paper Title **FLUID MECHANICS**
Lectures **: (4+2) Hrs** **Maximum Marks: 100(40+60)**
Examination Time **: 3 Hrs** **Paper Code : MS-404**

Unit-I

Lagrangian and Eulerian methods, equation of continuity, types of flow lines, velocity potential, stream function irrotationel and rotational motions, vortex lines. Lagrange's and Euler's equation of motion, Burnoulli's theorem, irrotational motion in two dimensions

Unit-II

complex velocity potential, sources, sinks conformal mapping, theorem of Blasius. Motion of a sphere through a liquid at rest as infinity, equation of motion of a sphere, stress components in a real fluid.

Unit-III

Relations between rectangular components of stress convection between stresses and gradients of velocity, Plane Poiceuille and Coquette flows between two parallel plate, flow through tubes of uniform, cross-section in the former of circle, Annulus under constant pressure gradient.

Unit-IV

Dynamical similarity, Reynolds number, Prandt's boundary layer, boundary layer equations in two dimension, Blasius solution, boundary layer thickness, displacement thickness, Karman integral conditions, separation of boundary layer flow.

Text Books:

1. A Text book of fluid mechanics in SI Units by R.K Rajput.

2. An Introduction to fluid Dynamics by R.K. Rathy Oxford and IBH Published Co.

Reference Books:

1. Fluid Mechanics (Springer) by Joseph H. Spurk.
2. Fluid Mechanics by Irfan A. Khan (H.R.W.).
3. An introduction to Fluid Mechanics by G.K. Batchelor, Foundation Books, New Delhi, 1994.

CO-PSO Matrix for the Course MS-405: Fuzzy Set and Their Application

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3
CO2	3	3	3	2
CO3	2	3	3	3
CO4	3	3	3	3

CO-PO Matrix for the Course MS-405: Fuzzy Set and Their Application

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	2	3	3	3	2	3
CO2	2	3	3	3	2	3	2	3	3	2
CO3	3	2	3	3	3	3	2	3	3	2
CO4	3	3	2	3	2	2	2	2	3	3

Paper Title FUZZY SETS AND THEIR APPLICATIONS
Lectures : (4+2) Hrs Maximum Marks: 100(40+60)
Examination Time : 3 Hrs Paper Code : MS-405

Unit- I

Fuzzy Sets-Basic definitions, A-level sets, convex fuzzy sets, Basic operations on fuzzy sets Types of fuzzy sets, Cartesian products, Algebraic products, Bounded sum and difference, t-Norms and t- co norms.

Unit-II

The Extension Principle – The Zadeh's extension principle, Image and inverse image of fuzzy sets, Fuzzy numbers, Elements of fuzzy arithmetic, Fuzzy Relation and Fuzzy Graphs-Fuzzy relation on fuzzy sets, Composition of fuzzy relations, Min-Max composition and its properties.

Unit-III

Fuzzy equivalence relation, Fuzzy compatibility relations, Fuzzy relation equations, Fuzzy graphs, Similarity relation. Possibility Theory-Fuzzy measures, Evidence theory, Necessity measure, Possibility measure, Possibility distribution, Possibility theory and fuzzy sets, Possibility theory versus probability theory.

Unit-IV

Fuzzy Logic-An overview of classical logic, Multivalued logics, Fuzzy propositions, Fuzzy quantifiers, Linguistic variables and hedges, Inference from conditional fuzzy propositions, the compositional rule of inference.

Text Books:

1. Fuzzy set theory and its Applications by H.J. Zimmermann, Allied Publishers Ltd., New Delhi, 1991.
2. Fuzzy sets and Fuzzy logic by G.J. Klir and B. Yuan Prentice-Hall of India, New Delhi, 1995.

Refenence Book:

1. Fuzzy Sets, Uncertainty and Information by G.J.Klir, Tina A. Folger Prentice-Hall of India.

CO-PSO Matrix for the Course MS-406: Wavelets

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	3
CO2	3	3	3	3
CO3	2	3	3	3
CO4	3	3	3	2

CO-PO Matrix for the Course MS-406: Wavelets

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	2	3	3	3	3	2	3	3
CO2	2	3	3	3	2	3	3	3	2	3
CO3	3	3	3	2	3	3	3	3	3	3
CO4	3	2	3	3	2	3	2	2	3	2

Paper Title

Paper Title **WAVE LETS**

Lectures : (4+2) Hrs Maximum Marks: 100(40+60)

Examination Time : 3 Hrs Paper Code : MS-406

Unit-I

Haar's simple wavelets, Haar wavelet transforms, Inverse Haar wavelet transforms, Multi dimensional wavelets, Two-dimensional Haar wavelets.

Unit-II

Application of wavelets, Noise reduction data compression, Edge detection, Daubechies wavelet (DW), approximation of samples with D' wavelets, Fast DW transform and its inverse.

Unit-III

Inner products and orthogonal projection, Applications of orthogonal projection computer graphics, Computation of functions and wavelets, Discrete and fast Fourier transform with inverse and applications.

Unit-IV

Fourier series for periodic functions, its convergence and inversion, uniform convergence of Fourier series, Bessens inequality, Parsevals inequality.

The Fourier Transform, Convolution and inversion of Fourier transform, weight function, approximate identities.

Text Books:

1. Wavelets Made Easy by Y. Nievergelt.
2. A first Course on Wavelets by E. Hernandez and G. Weiss.

Reference Book:

1. An Introduction to Wavelets by Chui, Academic Press

CO-PSO Matrix for the Course MS-306: Object Oriented Programming using C++

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	2	3	2	3
CO3	3	3	3	3
CO4	3	2	3	3

CO-PO Matrix for the Course MS-306: Object Oriented Programming using C++

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	2	2	2	3	3	3	2
CO2	3	2	3	3	3	3	2	2	2	2
CO3	2	3	3	3	3	2	3	3	2	3
CO4	3	3	2	3	2	3	2	3	3	3

CHOICE BASE PAPER

Paper Title **OBJECT ORIENTED PROGRAMMING USING C++**
Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-308**

Unit-I

Object Oriented Programming using C++ Differences between C and C++.A look at procedure Oriented programming, object oriented programming paradigm, basic concepts of OOP, Benefits of OOP, OO languages, A sample program, structure of C++ program. Introduction to OOPS :The origins of C++, What is Object Oriented Programming?, Some C++ fundamentals, Headers & Name Spaces, Introducing C++ Classes, Function overloading, Operator overloading, Inheritance, Constructors & Destructors, Function & Operator Overloading:

Unit-II

Overloading constructor functions, Localizing variables, Function overloading & Ambiguity, Finding the address of an overloaded function, this Pointer, Operator overloading, References, Using reference to overload a unary operator, Overloading, overriding, Applying operator overloading.

Unit-III

Inheritance, Virtual Functions and polymorphism Inheritance and the access specifies, Constructors and Destructors in derived classes, Multiple Inheritance, Passing parameters to a basic class, Pointers and references to derived types, Virtual Functions, Why virtual functions?, Pure virtual functions and abstract types, Early Vs Late binding.

Unit-IV

Templates Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters,

Text Books:

1. Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia publications
2. The Complete Reference C++, Herbert Schildt, 4th Edition, TMH

Reference Book:

1. Let's C++ by Y. Kanetkar, BPB publications
2. Object oriented programming with C++, E Balagurusamy, 4th edition, TMH
3. Object-Oriented Programming with C++, Sourav Sahay, Oxford University Press, 2006.

CO-PSO Matrix for the Course MS-307: Data Structure

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3
CO2	3	3	3	3
CO3	3	3	3	3
CO4	3	3	3	3

CO-PO Matrix for the Course MS-307: Data Structure

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	2	3	2	3	3
CO2	3	3	3	3	3	2	3	2	3	3
CO3	3	3	3	3	3	2	3	2	3	3
CO4	3	3	3	3	3	2	3	2	3	3

Paper Title **DATA STRUCTURE**
Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-309**

Unit I

Arrays, Records and Pointers Introduction, Linear Arrays, Arrays as ADT, Representation of Linear in Memory, Traversing Linear Arrays, Inserting and deleting, Sorting; Bubble Sort, Searching; Linear Search, Binary Search, Multidimensional Arrays, Representation of Polynomials Using Arrays, Pointers; Pointer Arrays, Dynamic Memory Management, Records; Record Structures, Representation of Records in Memory; Parallel Arrays, Matrices, Sparse Matrices

Unit II

Linked List Introduction, Linked Lists ,Representation of Linked Lists in Memory, Traversing a Linked List, Searching a Linked List ,Memory Allocation; Garbage Collection ,Insertion into a Linked List ,Deletion from a Linked List , Header Linked List, Circularly Linked Lists ,Two-Way Lists (or Doubly Linked Lists), Josephus Problem and its Solution, Buddy Systems.

Unit III

Stacks, Queue and Recursion Introduction, Stacks ,Array Representation of Stacks ,Linked Representation of Stacks, Stack as ADT ,Arithmetic Expression; Polish Notation ,Application of Stacks ,Recursion, Towers of Hanoi , Implementation of Recursive Procedures by Stacks ,Queue, Linked Representation of Queues ,Queues as ADT , Circular of Queues, Deques, Priority Queues ,Applications of Queues.

Unit IV

Trees Introduction, Binary Trees ,Representing Binary Tree in Memory ,Traversing Binary Trees, Traversal Algorithms Using Stacks, Header Nodes; Threads ,Threaded Binary Trees ,Binary Search Trees ,Searching and Inserting in Binary Search Trees ,Deleting in a Binary Search Tree ,Balanced Binary Trees, AVL Search Trees, Insertion in an AVL Search Tree ,Deletion in an AVL Search Tree, mway Search Trees ,Searching, Insertion and Deletion in an m-way Search tree,B-Trees ,Searching, Insertion and Deletion in a B-tree, B+-Trees.

Sorting and Searching Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Shell Sort ,Radix Sort, Searching and Data Modification, Hashing , Advanced topic on Data Structure

Text Books:-

1. Seymour Lipschutz, Schaums Outlines, 'Data Structures with C',Tata Mc Graw Hill
2. S. Sahani, 'Data Structures in C'

CO-PSO Matrix for the Course MS-407: Mat Lab

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	3	3	2
CO3	3	3	3	2
CO4	3	3	3	2

CO-PO Matrix for the Course MS-407: Mat Lab

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	3	2	3	2	3	3
CO2	3	3	3	3	3	2	3	2	3	3
CO3	3	3	3	3	3	2	3	2	3	3
CO4	3	3	3	3	3	2	3	2	3	3

Paper Title **MAT LAB**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-408**

Unit- I

MATLAB: Introduction - What is MATLAB? – Does MATLAB Do symbolic calculations? – Will MATLAB Run on My Computer? – Where do I get MATLAB? – Basis of MATLAB:

Unit- II

MATLAB windows – on line help – Input output, File types. Tutorial Lessons: A minimum MATLAB session – creating and working with arrays of numbers – creating and printing simple plots – creating , saving and executing a script file .

Unit- III

Interactive Mathematical software system : Graphic user inference, Programming styles and Tools. Mat Lab features and commands, character string, Trigonometric and matrix Function, Special function, control commands, Graphic Commands.

Unit- IV

Applications: Linear Algebra – curve fitting interpolation – Numerical Integration – Ordinary differential equation, Animation Symbolic Computation programming example.

Text Books:

1. Rudra Pratap, Getting Started with MATLAB 7, Oxford University Press, 2006.

CO-PSO Matrix for the Course MS-408: Neural Network

COs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2
CO2	3	3	3	2
CO3	3	3	3	2
CO4	3	3	3	2

CO-PO Matrix for the Course MS-408: Neural Network

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	3	3	3	2	2	2	2	3	2
CO2	3	3	3	3	2	2	2	2	3	2
CO3	3	3	3	3	3	3	3	2	3	3
CO4	3	2	3	3	3	3	3	2	3	3

Paper Title **NEURAL NETWORK**

Lectures : (4+2) Hrs **Maximum Marks: 100(40+60)**
Examination Time : 3 Hrs **Paper Code : MS-409**

Unit- I

Introduction of Artificial Neural Networks, Basic concepts in neural computing, Biological and cognitive Aspects, Artificial Neural Networks Application. Characteristics of Artificial Networks overview of ANN learning Methods. Neural Network Texonomies.

Unit-II

Early Neural Networks Architectures; Simple Perceptions, Basic Perception, Learning Algorithms Perceptions Convergence Theorem ADALINE, Neural units, Widrow –Hoff Learning Algorithms ADALINE Applications.

Unit-III

MADALINE Networks. Training Algorithms for MADALINE, MADLINE Application. Associative Memory networks; Learning Algorithms for Associative Memories, Feedforward Heteroassociative Memory Networks, Feedforward Auto associative memory networks.

Unit-IV

Hopfield Networks, Energy function characterization, Cohen-Grossberg Theorem, Brain state in Box. Bidirectional Associative Memory, Multilayer Feedforward neural network and Back propagation.

Text Books:

1. James A. Anderson “An introduction to Neural Network” Prentice-Hall of India (P) Ltd

Lesson plans 4th semester:

Paper: MS-401: Special Functions

1. Introduction to Gamma and Beta Functions
2. Properties of Gamma Function
3. Properties of Beta Function
4. Legendre Polynomials: Introduction
5. Recurrence Relations for Legendre Polynomials
6. Orthogonality of Legendre Polynomials
7. Generating Functions for Legendre Polynomials
8. Bessel Functions: Introduction
9. Recurrence Relations for Bessel Functions
10. Orthogonality of Bessel Functions
11. Asymptotic Expansions of Bessel Functions
12. Hermite Polynomials: Introduction
13. Recurrence Relations for Hermite Polynomials
14. Orthogonality of Hermite Polynomials
15. Generating Functions for Hermite Polynomials
16. Laguerre Polynomials: Introduction
17. Recurrence Relations for Laguerre Polynomials
18. Orthogonality of Laguerre Polynomials
19. Generating Functions for Laguerre Polynomials
20. Chebyshev Polynomials: Introduction
21. Recurrence Relations for Chebyshev Polynomials
22. Orthogonality of Chebyshev Polynomials
23. Generating Functions for Chebyshev Polynomials
24. Hypergeometric Functions: Introduction
25. Gauss' Hypergeometric Function
26. Series Solutions of Hypergeometric Equations
27. Confluent Hypergeometric Functions
28. Applications of Hypergeometric Functions
29. Meijer G-Functions
30. Introduction to Elliptic Integrals
31. Jacobi Elliptic Functions
32. Applications of Elliptic Functions
33. Heun's Equation and Functions
34. Mathieu Functions
35. Spheroidal Wave Functions
36. Applications of Special Functions in Physics
37. Applications of Special Functions in Engineering
38. Advanced Topics in Special Functions
39. Problem Solving and Applications
40. Review and Recap

Paper: MS-402: Integral Equations and Calculus of Variations

1. Introduction to Integral Equations

2. Classification of Integral Equations
3. Fredholm Integral Equations of the First Kind
4. Fredholm Integral Equations of the Second Kind
5. Volterra Integral Equations
6. Conversion of Differential Equations to Integral Equations
7. Resolvent Kernel and Neumann Series
8. Fredholm Alternative Theorem
9. Green's Functions for Boundary Value Problems
10. Applications of Green's Functions
11. Symmetric Kernels and Hilbert-Schmidt Theorem
12. Eigenvalue Problems in Integral Equations
13. Iterative Methods for Solving Integral Equations
14. Singular Integral Equations
15. Abel's Integral Equation
16. Introduction to Calculus of Variations
17. Euler-Lagrange Equation
18. Necessary and Sufficient Conditions for Extremum
19. Applications of Calculus of Variations
20. Variational Methods for Boundary Value Problems
21. Hamilton's Principle in Mechanics
22. Variational Methods in Quantum Mechanics
23. Rayleigh-Ritz Method
24. Direct Methods in Calculus of Variations
25. Noether's Theorem
26. Isoperimetric Problems
27. Calculus of Variations with Constraints
28. Applications to Geodesics and Optimal Control
29. Introduction to Functionals and Their Properties
30. Variational Methods for Eigenvalue Problems
31. Transversality Condition
32. Jacobi's Necessary Condition
33. Applications of Variational Methods in Engineering
34. Pontryagin's Maximum Principle
35. Dynamic Programming and Variational Methods
36. Introduction to Optimization Theory
37. Lagrange Multipliers in Optimization
38. Advanced Topics in Integral Equations
39. Advanced Topics in Calculus of Variations
40. Review and Problem Solving

Paper: MS-403: Tensor and Differential Geometry

1. Introduction to Tensors
2. Covariant and Contravariant Tensors
3. Tensor Algebra: Basic Operations
4. The Metric Tensor and Its Properties
5. Christoffel Symbols and Covariant Differentiation
6. Riemannian Geometry: Curvature Tensor
7. Ricci Tensor and Scalar Curvature
8. Bianchi Identities and Applications

9. Geodesics and Geodesic Equations
10. Parallel Transport and Geodesic Deviation
11. Differential Forms and Exterior Algebra
12. Stokes' Theorem and Applications
13. Introduction to Lie Groups and Lie Algebras
14. Killing Vectors and Symmetries
15. Einstein Field Equations in General Relativity
16. Applications of Tensors in Physics
17. Introduction to Differential Geometry
18. Curvature of Curves in Euclidean Space
19. Frenet-Serret Formulas
20. Surfaces in Euclidean Space
21. First and Second Fundamental Forms
22. Gaussian and Mean Curvatures
23. Gauss-Bonnet Theorem
24. Minimal Surfaces and Applications
25. The Geometry of Hypersurfaces
26. Differential Geometry of Submanifolds
27. Applications of Differential Geometry in General Relativity
28. Introduction to Fibre Bundles
29. Connections on Fibre Bundles
30. The Geometry of Gauge Fields
31. Applications of Differential Geometry in Mathematical Physics
32. Introduction to Complex Manifolds
33. Kähler Manifolds and Their Properties
34. Riemannian Geometry and Topology
35. Holonomy Groups and Applications
36. Advanced Topics in Tensor Calculus
37. Advanced Topics in Differential Geometry
38. Applications in Modern Theoretical Physics
39. Problem Solving and Applications
40. Review and Recap

Paper: MS-404: Fluid Mechanics (Elective)

1. Introduction to Fluid Mechanics
2. Kinematics of Fluids in Motion
3. Streamlines, Pathlines, and Streaklines
4. Conservation of Mass: Continuity Equation
5. Euler’s Equation of Motion
6. Bernoulli’s Equation and Applications
7. Navier-Stokes Equations
8. Exact Solutions of Navier-Stokes Equations
9. Potential Flow Theory
10. Vortex Motion and Circulation
11. Boundary Layer Theory
12. Prandtl’s Boundary Layer Equations
13. Laminar Flow and Turbulent Flow
14. Stability of Fluid Flows
15. Flow in a Circular Pipe: Hagen-Poiseuille Law

16. Introduction to Compressible Flow
17. Shock Waves and Expansion Waves
18. Subsonic and Supersonic Flows
19. Introduction to Computational Fluid Dynamics (CFD)
20. Finite Difference Methods for CFD
21. Finite Volume Methods for CFD
22. Finite Element Methods for CFD
23. Flow Past Objects: Lift and Drag
24. Blasius Boundary Layer Solution
25. Flow Through Porous Media
26. Magnetohydrodynamics (MHD)
27. Non-Newtonian Fluid Mechanics
28. Applications of Fluid Mechanics in Engineering
29. Fluid-Structure Interaction
30. Introduction to Aerodynamics
31. Flow in Open Channels
32. Hydraulic Jumps and Waves
33. Introduction to Turbulence Modeling
34. Applications of CFD in Industry
35. Two-Phase Flow Problems
36. Compressible Aerodynamics
37. Biofluid Mechanics
38. Experimental Methods in Fluid Mechanics
39. Advanced Topics in Fluid Mechanics
40. Review and Problem Solving

Paper: MS-405: Fuzzy Set and Their Applications (Elective)

1. Introduction to Fuzzy Sets
2. Basic Concepts of Fuzzy Logic
3. Fuzzy Sets vs. Crisp Sets
4. Operations on Fuzzy Sets
5. Fuzzy Relations and Their Properties
6. Fuzzy If-Then Rules
7. Fuzzy Inference Systems
8. Fuzzy Arithmetic and Fuzzy Numbers
9. Extension Principle and Applications
10. Fuzzy Decision Making
11. Fuzzy Clustering Methods
12. Fuzzy Pattern Recognition
13. Fuzzy Logic Control Systems
14. Mamdani and Sugeno Fuzzy Models
15. Defuzzification Techniques
16. Fuzzy Optimization Methods
17. Applications of Fuzzy Logic in Engineering
18. Fuzzy Logic in Artificial Intelligence
19. Fuzzy Systems in Robotics
20. Fuzzy Databases and Information Retrieval
21. Fuzzy Set Theory in Economics
22. Fuzzy Set Theory in Medicine

23. Fuzzy Set Theory in Environmental Science
24. Fuzzy Logic in Image Processing
25. Fuzzy Set Applications in Decision Support Systems
26. Introduction to Rough Sets
27. Fuzzy-Rough Hybrid Models
28. Type-2 Fuzzy Sets and Systems
29. Interval-Valued Fuzzy Sets
30. Fuzzy Logic in Neural Networks
31. Neuro-Fuzzy Systems
32. Genetic Fuzzy Systems
33. Applications in Control Engineering
34. Fuzzy Logic in Data Mining
35. Fuzzy Logic in Natural Language Processing
36. Fuzzy Systems in Machine Learning
37. Applications of Fuzzy Logic in Real-Life Scenarios
38. Advanced Topics in Fuzzy Set Theory
39. Problem Solving and Case Studies
40. Review and Recap

Paper: MS-406: Wavelets (Elective)

1. Introduction to Wavelets
2. The Haar Wavelet and Its Properties
3. Multiresolution Analysis (MRA)
4. Construction of Wavelets from MRA
5. The Daubechies Wavelets
6. The Scaling Function and Wavelet Function
7. Discrete Wavelet Transform (DWT)
8. Continuous Wavelet Transform (CWT)
9. Fast Wavelet Transform Algorithm
10. Wavelet Packets and Their Applications
11. Time-Frequency Analysis Using Wavelets
12. Applications of Wavelets in Signal Processing
13. Image Compression Using Wavelets
14. Edge Detection Using Wavelets
15. Wavelets in Audio Compression
16. Applications in Data Compression
17. Wavelets in Numerical Analysis
18. Wavelet Galerkin Methods
19. Wavelets in Solving Differential Equations
20. Wavelets in Pattern Recognition
21. Applications in Finance and Economics
22. Wavelets in Geophysics
23. Wavelets in Biomedical Engineering
24. Wavelet-Based Denoising Techniques
25. Introduction to Frame Theory
26. Wavelet Frames and Their Properties
27. Applications of Wavelet Frames
28. Introduction to Multiwavelets
29. Applications of Multiwavelets

30. B-Spline Wavelets
31. Construction of Orthogonal Wavelets
32. Wavelets on the Interval
33. Boundary Effects in Wavelets
34. Applications in Image Restoration
35. Advanced Topics in Wavelet Theory
36. Wavelets in Machine Learning
37. Wavelets in Deep Learning
38. Applications in Quantum Mechanics
39. Problem Solving and Case Studies
40. Review and Recap

DEPARTMENT OF ZOOLOGY

RAFFLES
UNIVERSITY

Syllabus for M.Sc. ZOOLOGY

Choice Based Credit System
(With effect from the Session 2022 – 2024)

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF BASIC AND APPLIED SCIENCES
DEPARTMENT OF ZOOLOGY
Choice Based Credit System (CBCS)
Scheme of Examination (MSc Zoology) w.e.f. session 2022-2024

SEMESTER I						
Course Code	**Paper Nomenclature**	**Credit**	**Hours**	**MM (Max. Marks)**	**MM (Internal Assessment)**	**Total**
CORE COURSES						
Z00 – 401C	Invertebrate Zoology	4	4	60	40	100
Z00 – 403C	Biosystematics & Taxonomy	4	4	60	40	100
Z00 – 405C	Biochemistry and metabolism	4	4	60	40	100
Z00 – 407C	Animal Cell Biology	4	4	60	40	100
Z00 – 409C	Genetics	4	4	60	40	100
LAB COURSES						
Z00 – 111LC1	Lab Course – I (Z00 401,403, 405 C)	4	8	100	-	100
Z00 – 113LC2	Lab Course – II (Z00 407- 409 C)	4	8	100	-	100
	Total	**28**	**36**			
SEMESTER II						
Course Code	**Paper Nomenclature**	**Credit**	**Hours**	**MM (Max. Marks)**	**Internal Assessment**	**Total**
CORE COURSES						
Z00 – 402C	Animal Physiology	4	4	60	40	100
Z00 – 404C	Immunology	4	4	60	40	100
Z00 – 406C	Tools and Techniques	4	4	60	40	100
DISCIPLINE SPECIFIC ELECTIVE (ANY ONE)						
Z00 – 408DA1	Evolutionary Biology	4	4	60	40	100
Z00 – 410DA2	Applied Zoology	4	4	60	40	100
OPEN ELECTIVE						
Z00 – 412OE	Open Elective*	3	3			
FOUNDATION ELECTIVE						
Z00 – 207FE	Foundation Elective**	2	2			
LAB COURSES						
Z00 – 416LC3	Lab Course (Z00 402C,404C)	4	8	100		100
Z00 – 418LC4	Lab Course (406C , Z00 408DA1/ 410DA2)	4	8	100		100

	Total	**29**	**37**			
SEMESTER III						
Course Code	**Paper Nomenclature**	**Credit**	**Hours**	**MM (Max. Marks)**	**Internal Assessment**	**Total**
CORE COURSES						
Z00 – 501C	Vertebrate Zoology	4	4	60	40	100
Z00 – 503C	Developmental Biology	4	4	60	40	100
DISCIPLINE SPECIFIC ELECTIVE						
Group A (any one)						
Z00 –505DA1	Endocrinology	4	4	60	40	100
Z00 – 507DA2	Cancer and Radiation Biology	4	4	60	40	100
Group B (any one)						
Z00 – 509DB1	Parasitology and Zoonosis	4	4	60	40	100
Z00 – 511DB2	Ecology and Wildlife Conservation	4	4	60	40	100
OPEN ELECTIVE						
Z00 – 513OE	Open Elective*	3	3			
LAB COURSES						
Z00 – 515LC5	Lab Course (Z00 301-302 C)	4	8	100		100
Z00 – 517LC6	Lab Course (Z00 303DA1/304 DA2 & 305 DB1/306DB2)	4	8	100		100
	Total	**27**	**40**			
SEMESTER IV						
Course Code	**Paper Nomenclature**	**Credit**	**Hours**	**MM (Max. Marks)**	**Internal Assessment**	**Total**
CORE COURSES						
Z00 – 502C	Biostatistics and Bioinformatics	4	4	60	40	100
Z00 – 504C	Advances in Apiculture	4	4	60	40	100
DISSERTATION AND SEMINAR						
Z00 – 506D	MS Dissertation and seminar	20	40	180	120	300
	Total	**28**	**48**			

* Exchange programme between schools
** To be selected from pool of foundation elective courses

M. Sc. I Year (I Semester)

ZOO – 401 C
INVERTEBRATE ZOOLOGY

Max. Marks: 60
Credit: 4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Evolutionary origin of Eukaryotic cells (including Protozoa)
Origin of Metazoa
Origin of complexity in metazoan
Evolution of sex
Reproduction and development in invertebrates; asexual (including parthenogenesis) and sexual; larval forms
Diversity and economic importance of invertebrates

UNIT – II

Locomotion: Amoeboid, Flagellar, Ciliary movements in Protozoa. Hydrostatic movement in Cnidaria, Annelida and Echinodermata. flight mechanism of insects; modifications of foot organelles in mollusca.
Nutrition: Amoeboid feeding, ciliary feeding in lower Metazoans, Filter feeding in Polychaetes, Mollascans and Echinoderms, Feeding mechanisms in Insects, Parasitic mode of feeding.

UNIT – III

Respiration: Respiration in lower invertebrates (up to helminthes), organs of respiration; gills, trachea and lungs in invertebrates, Respiratory pigments, Mechanism of Respiration.
Circulation: Patterns of Circulation and functions of body fluids.
Excretion: Excretory Organs, Coelomoducts, Nephridia, Coxal Glands and Malpighian tubules, excretory products.

UNIT – IV

Nervous System: Primitive Nervous system in Coelenterates and Echinodermata. Advanced Nervous System: Nematoda, Annelida, Arthropoda and Mollusca. Sense organs and their importance.
Endocrine system: role of neurosecretions and hormones in developmental events, survey of endocrinal structures and their hormones

Suggested readings

1. Barnes, RD. Invertebrate zoology. WG Saunders, Philadelphia.
2. Edward E Ruppert, Richard S Fox and Barnes. Invertebrates zoology: a functional evolutionary approach. CengageLearning India Private Ltd., New Delhi.
3. P S Verma, E L Jordan. Invertebrate Zoology 25th Edition, 2001. S. Chand Publications, New Delhi.
4. D. T. Anderson. Invertebrate Zoology. Second Edition, 1999 Oxford University Press
5. Janet Moore. An Introduction to the Invertebrates.2006. Cambridge University Press
6. Hunter, 1979. Life of Invertebrates, Collier Macmillan.
7. Biology of the Invertebrates: JA Pechenik
8. Invertebrate: Brusca and Brusca
9. Barrington, E.J.W. 1967. Invertebrate's structure and Function, Nelson, London.

ZOO – 403 C

BIOSYSTEMATICS & TAXONOMY

Max. Marks: 60
Credit:4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT - I

Biosystematics and taxonomy, importance and applications of Biosystematics.
Trends in Biosystematics: conventional and current approaches (chemotaxonomy, cytotaxonomy and molecular taxonomy). Biosystematics as a profession

UNIT - II

Species Concepts: Historical perspectives of species concepts (Typological, Nominalistic, Evolutionary, Biological, Phylogenetic). Concepts of Subspecies; Intraspecific groups (Deme, Form/Morphotype, cline, Variety)
Concepts of species and hierarchical taxa, biological nomenclature, classical and quantititative methods of taxonomy of plants, animals and microorganisms

UNIT – III

Reconstruction of phylogeny; cladistic method, apomorphies, synapomorphy, autapomorphy, symplesiomorphy, Maximum parsimony and Maximum likelihood
Reconstruction of invertebrate and vertebrate phylogeny, Phylogenetic interrelationship among various taxa

UNIT - I

Taxonomic procedures; taxonomic collections, preservation, curating, process of identification.
Typification; details of different zoological types
Taxonomic keys; different kinds of taxonomic keys, their merits and demerits, Important criteria used for classification in animals
ICZN; principles, interpretation and application of important rules, formation of scientific names of various taxa

Suggested readings

1. Principles of animal taxonomy, GG Simpson. Oxford IBH publishing company.
2. Ernest Mayr, 1997. Principles of Systematic Zoology, Tata-McGraw-Hill, New Delhi.
3. Minelli A, 1993. Biological Systematics. Chapman and Hall.
4. The diversity of life, EO Wilson, 2010. WW Northern and Co. Harvard University press.
5. Theory and practice of animal taxonomy. VC Kapoor. Oxford IBH publishing company private limited.
6. Kapoor, V.C. 1998. Theory of Animal Taxonomy, Oxford IBH Co. Pvt. Ltd., New Delhi.
7. Collection, preservation and identificataion of animals. JRB Alfred and Ramakrishna, 2004. ZSI publications.
8. Forey, P. L. *et al.* (1992) *Cladistics – A practical course in systematics*. Clarendron Press.
9. Sebuh, R.T. 2000. Biological systematics: Principles & Application, Cornell University Press.
10. Ruppert, Fox and Barnes, Invertebrate zoology: a functional evolutionary approach, Cengage India.

ZOO – 405 C
BIOCHEMISTRY AND METABOLISM

Max. Marks: 60
Credit:4
Examination Time: 3 hours

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT - I

Atoms, molecules and stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction), Water: biological importance, pH and acid - base balance. Buffers - biological importance. Redox potential and electron transport system, structure of soluble biomolecular pool of cells – aminoacids and peptides, monosaccharides, oligosaccharides and polysaccharides, nucleotides, vitamins and lipids.

UNIT - II

Covalent properties of proteins, proteins structure – primary, secondary, tertiary and quaternary, Enzymes, coenzymes, isoenzymes, allosteric enzymes, ribozyme and abzyme
Hormones – types, structure and properties
Nucleic acids – types, structure and conformation of nucleic acids

UNIT - III

Metabolic pathways of protein; transamination, decarcoxylation, oxidative and non-oxidative deamination of amino acids, Glycolyis and TCA cycle, glycogen breakdown and synthesis, interconversion of hexoses and pentoses, Cori cycle.
Metabolic pathways of lipids and nucleic acids; Biosynthesis of triglycerides, urea, aspartic acid, uridylic acid, adenylic acid.

UNIT - IV

Inborn errors of metabolism; glycogen storage disease, G-6-PD deficiency, lipid metabolism – metabolic disorders of cerebrosides, protein metabolism – PKU, Albinism, cysteinurea, purine metabolism – primary gout, mineral metabolism and desease – hypocalcimia, hypercalcimia, osteoporosis

Suggested readings

1. David, L, Nelson and Michael M Cox. Lehninger's principles of Biochemistry.
2. Bell JN and Davidson GH, Textbook of physiology and Biochemistry, ELBS.
3. Sastry, KV. Animal physiology & biochemistry. Rastogi publications, Meerut.
4. Wilson and Walker. Principles and techniques of practical biochemistry. Cambridge University Press.
5. IH Segal. Biochemical calculations, Johan Wiley & sons.
6. D. Voet and JG Voet. Biochemistry, Johan Wiley & sons

ZOO – 407 C

ANIMAL CELL BIOLOGY

Max. Marks: 60
Credit:4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Introduction of cell biology and the scope of modern cell biology,
Universal features of cells on Earth,
Levels of cell organization (Structure of pro- and eukaryotic cells),
Cell membrane; Molecular organization and functions
Cytosol; Molecular organization and functions of cytoskeleton structures: Microfilaments, Microtubules and their role in cell architecture.
Signal transduction mechanisms; electrical and synaptic signaling in neurons, messengers and receptors.

UNIT - II

Molecular structure and function of Mitochondrion (oxidation events)
Nucleus: Molecular structure of chromosomes, Euchromatin and Heterochromatin, Role of Histone in packing DNA, Non-histone proteins, Organization and functions of Nucleolus.
Ribosomes; polypeptide synthesis
Molecular organization and functions of Cell Organelles: the endomembrane system (Endoplasmic reticulum, Golgi complex, Lysosomes, protein trafficking) and peroxisomes

UNIT - III

The Cell Cycle: Molecular events during cell cycle (DNA replication, Nuclear division and Cell division), Regulation of the cell cycle; cyclins and cyclin dependent protein kinases (CDK's), checkpoints, Cell Aging: characteristics and causes of aging; telomeres and aging; Apoptosis: Uncontrolled cell proliferation; the origin of cancer

UNIT – IV

Beyond the cell; cell adhesions; cell-cell adhesion proteins, cell junctions; adhesive junctions, tight junction, gap junctions, and extracellular structures; extracellular matrix (ECM), collagens and elastins. Agents that invade cells (viruses, viroids, and prions)

Suggested readings

.

1. E. D. De Robertis, 1987. Cell and Molecular Biology 8th Edition. Lippincott Williams & Wilkins
2. Jonathan, Slack. Genes. Oxford University Press, New Delhi.
3. Cell and molecular biology. Phillip Sheeler, Donal E Bianchi, 1987.Wiley.
4. Molecular biology of the cell, B Alberts, D Bray, J Lewis, M Raff, K Roberts and JD Watson. Garland publishing Inc. New York.
5. The Cell – A Molecular Approach. Cooper, Geoffrey M.Sunderland (MA): Sinauer Associates, Inc. 2007
6. Lodish, H., Berk, A Zipuosky, L.S. Matsudaira, P. Baltimore and Darnell, J. Molecular Cell Biology IV Ed. W.H. Freeman and Co., 2001.
7. Jeff Hardin, Gregory Bertoni, Lewis J Kleinsmith, 2016. Becker's world of the cell: technology update, 8th edition. Pearson publication, USA.

ZOO – 409 C
GENETICS

Max. Marks: 60
Credit:4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Basic features of heredity; early conceptions of heredity, Mendelian genetics (discovery and rediscovery of Mendel's Laws, universality of Mendel's Laws,Allelic interactions, gene interactions), heredity and environment (Preformism and epigenesis, Heritability)

UNIT – II

Physical basis of heredity; chromosomes and genes (the behavior of chromosomes during cell division, linkage of traits – simple and sex linkage, chromosomal aberrations)

UNIT – III

Molecular genetics; heredity and nucleic acids, structure of nucleic acids, DNA replication, DNA as an information carrier: transcription and translation of the genetic code, mutations in the code, regulation of genes, cytoplasmic, or extracellular DNA, the biochemical products of gene expression, somatic cell genetics, recombinant DNA technology, DNA cloning, DNA sequencing

UNIT – IV

Human genetics
The human chromosomes, Fertilization, sex determination, and differentiation, Immunogenetics,

the genetics of human blood, Influence of the environment
Genetics and human diseases; Classes of genetic disease, Genetics of cancer, Cognitive and behavioral genetics, Genetic damage from environmental agents, Management of genetic disease

Suggested readings

1. Atherly et.al.The science of genetics, Saunders college pub, NY
2. Fairbanks and Anderson, Genetics-the continuity of life, Brooks/cole publishing company, NY
3. Gardner et.al. principles of genetics, John Wiley and sons, NY
4. Watson et.al. molecular biology of genes, the Benjamin Cummings publ, Tokyo.
5. Britannica 2010. The new encyclopaedia Britannica, Volume X, USA.
6. Strachan T and Read A, 2003. Human molecular genetics. Garland science.
7. Vogel F and Motulsky A. 1997. Human genetics: problems and approaches, springer Verlof.
8. Gardner EJ, Simmons MJ and Snustad DP. 2008. Principles of genetics, 8^{th} edition, Wiley India.

ZOO – 411 LC - I

LABORATORY COURSE – I

(ZOO 401C, 403C, 405 C)

Paper Name: Laboratory course - I
Max. Marks: 150
Paper Code: ZOO – 108 LC
Examination Time: 6 hrs

INVERTEBRATE ZOOLOGY LAB COURSE LIST

1. Salient characteristics, identification and classification of representative types of invertebrate groups including Protozoa, Porifera, Cnidaria, Platyhelminthes, Nematodes, Annelida, Mollusca, Echinodermata, Hemichordata
2. Collection and identification of invertebrates in pond water
3. Demonstration of internal organs of earthworm/cockroach/Prawn/Pila
4. Collection and demonstration of spiders, ticks, mites
5. Study of Minor phyla with the help of specimens/CD/Video
6. Preparation of permanent slides (mouth parts of house fly, mosquitoes etc.)
7. Study Larval forms – any 10 larvae from different taxa

ANIMAL PHYSIOLOGY LAB COURSE LIST

1. Study of blood pressure
2. Detection of blood groups and Rh factor in man
3. Estimation of hemoglobin in human blood
4. Determination of blood clotting time
5. Quantitative estimation of blood glucose by Folin-Wu/Anthrone /DNS/O-Toluidine/Enzymatic method
6. Urine analysis in human urine sample: Test for urea, blood cells, bile salts, albumin, ketone bodies and sugar in human urine sample/visit to the pathology lab
7. Water and ionic Animal physiology regulation of freshwater animal in different osmotic media
8. Kymographic recordings of twitch, tetanus and fatigue
9. Blood parasite smear preparation.
10. Test of anemia in human beings

BIOCHEMISTRY LAB COURSE LIST

1. Detection of carbohydrates, proteins and lipids in the given sample
2. Estimation of a sugar, an amino acid, a vitamin, a nucleotide/nucleic acid by appropriate chemical and biological methods
3. Separation of Serum and tissue protein with the help of electrophoresis
4. Test for presence of Salivary Amylase in human saliva
5. Estimation of protein by Biuret and Lowry methods
6. Estimation of amino acid by Ninhydrin method
7. The effect of concentration of enzyme (trypsin) activity
8. Identify unknown organic/inorganic compounds from a mixture with the help of chromatography
9. Quantitative estimation of blood urea/ creatine/ uric acid
10. Quantitative estimation of cholesterol in the blood
11. To adjust the pH of given buffer by pH meter
12. To prepare casein from milk
13. Estimation of creatinine in blood.
14. To test the urine for urea, proteins, ketones and sugar.
15. To investigate the effect of temperature on enzyme catalysed reaction
16. To investigate the effect of varying pH on enzyme catalysed reaction

ZOO – 413 LC - II

LABORATORY COURSE – II

(ZOO - 407C, ZOO - 409 C)

Max. Marks: 150
Credit:
Examination Time: 6 hrs

ANIMAL CELL BIOLOGY LAB COURSE LIST

1. To study the principle and working of various Microscope.
2. Study of meiosis from onion root tip
3. Extraction of DNA from tissues
4. Observation of a Eukaryotic cell under higher microscope
5. Extraction of membrane lipids and observation of lipid bilayer formation
6. To study different stages of mitosis in onion root tips
7. To prepare a temporary mount of Buccal epithelial cells.
8. To prepare polytene chromosomes from salivary glands of *Drosophila* larva.
9. Identification of mitotic and meiotic stages from permanent slides.

GENETICS LAB COURSE LIST

1. Study of mutant phenotypes of Drosophila
2. Study of law of independent assortment.
3. Chromosome banding (C, G, H banding)
4. Study of monohybird and dihybrid crosses/sex linkage in Drosophila
5. Salivary gland squash preparation for the study of polytene chromosomes of Chironomus / Drosophila
6. To observe barr body in the Buccal Epithelial cells of human females.
7. Collection of Drosophila for the study of morphological characters of males and females
8. Preparation of human karyotype and study of chromosomal aberrations with respect to number, translocation, deletion etc. from the pictures provided/ visit to Jaipur Science Park
9. Study of Hardy– Weinberg equilibrium in human population by taking the example of blood group system (ABO).
10. Pedigree Analysis

II Semester

ZOO – 402 C

ANIMAL PHYSIOLOGY

Max. Marks: 100 (60+40)
Credits: 04
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Digestion and absorption of food in gastrointestinal tract and regulation, BMR
Patterns of nitrogen excretion among different animal groups,
Physiology of excretion
Osmoregulation in aquatic and terrestrial environments
Ionic and osmotic balance

UNIT – II

Internal fluid environment
Composition of blood; plasma, formed elements, prevention of blood loss
Circulation; cardiovascular system and lymphatic system
Regulation of heart beat and blood pressure
Transport and exchange of gases
Acid –base balance, Regulation of body pH

UNIT – III

Thermoregulation - Heat balance in animals, Adaptations to temperature extremes, torpor, Aestivation and hibernation, Counter current heat exchangers. Adaptations to Stress- basic concept of environmental stress, acclimation, acclimatization, avoidance and tolerance, stress and hormones

UNIT – IV

Muscles and receptor physiology: mechanoreception, photoreception, chemoreception,
Origin and propagation of nerve impulse through axon
Neurotransmitters and Neuromodulators
Animal movement, neuromuscular transmission

Suggested readings

1. Eckert, R. Animal physiology: mechanisms and adaptation, WH Freeman and Company, New York.
2. Hoar WS. General and comparative animal physiology, prentice hall.
3. Schiemdt Nielson. Animal physiology: adaptation and environment, Cambridge University Press.
4. Sastry KV and shukla V. Text book of physiology and biochemistry, Rastogi publications, Meerut.
5. General and Comparative Animal Physiology, Hoar W. S. (ed), Prentice Hall, India
6. Animal Physiology: Adaptation and Environmental, Nelson K. S. (ed) Cambridge University Press, Cambridge, UK

ZOO – 404 C
IMMUNOLOGY

Max. Marks: 100
Credit Hrs: 4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT- I

Historical perspective and early theries of Immunology
cells and molecules involved in innate and adaptive immunity (Activation and differentiation of B and T cells, B and T cells receptors, Humoral and cell-mediated immune responses, primary and secondary immune modulation, the complement system, Toll-like receptors, cell-mediated effector functions
Majorhistocompatibility complexes, organs of the immune system (primary and secondary lymphoid organs), lymphatic system, Haematopoesis

UNIT- II

Antigens, Antigenicity and immunogenicity. Properties of antigens, Haptens, Determinants, Adjuvants
Generation of antibody diversity, monoclonal antibodies, antibody engineering, antigen-antibody interactions, Antigen – Antibody Interactions; precipitation, agglutination, immunoelectrophoresis, neutralizing reactions, complementation (classical, alternative and Lectin pathway)

UNIT – III

Mechanism of cell mediated and humoral immunity
MHC Structure and types
Endogenous pathway and exogenous pathway of antigen presentation
Vaccine: Immunization schedule types, attenuated and inactivated, DNA Vaccine, Recombinant Vaccine

UNIT – IV

Immunodeficiencies; Phagocytic deficiencies (neutrophil deficiencies, defective phagocytic functions), Humoral deficiencies (hyper IgM syndrome, X linked Agammaglobulinemia, Common variable hypogammaglobuli nemia), Cell-mediated diseases (DiGeorge syndrome, Nude mice)
Hypersensitivity; Type I, II, III and IV
Tolerance; general features of immunologic tolerance, T and B Cell tolerance, induction of tolerance
Inflammation, hypersensitivity, autoimmunity, immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections, congenital acquired immunodeficiencies, vaccines.

Suggested readings

1. Kuby et.al, 2006, Immunology, WH Freeman and company, USA
2. W Paul. Fundamentals of immunology.
3. Delves PJ, Martin SJ, Burton DR and Roitt IM. 2006. Roitt's Essential immunology, Blackwell publishing.
4. http://raredieseases.org
5. Murray et. al 2009. Harper's illustrated biochemistry. Lange medical book, McGraw Hill.
6. Nelson, DL, Cox, MM and Lehninger AL. 2009. Principles of biochemistry, WH Freeman and Co.

ZOO – 406 C
TOOLS AND TECHNIQUES

Max. Marks: 60
Credits: 4
Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Microscopy: Visulization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes,
The electron microscope; principles and applications of transmission electron microscope (TEM), scanning electron microscope (SEM)
Sample preparation techniques for light microscopy and electron microscopy
Other imaging methods; scanning probe microscopy and X-ray crystallography
Cyropreservations for microscopy
Detection of molecules in living cells, *in situ* localization by techniques such as FISH and GISH

UNIT – II

Biological and Histological Techniques; Fixation, preparation of temporary and permanent slides, whole mounts, smears, squashes and sections, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy
Centrifugation; basic principles of sedimentation, types of centrifuges, differential centrifugation, density gradient centrifugation, Ultracentrifugation
Chromatography; Principles and applications of gel filtration, ion-exchange, affinity, thin layer, gas chromatography and high pressure liquid chromatography (HPLC)
Electrophoresis; Principles and applications of agarose and polyacrylamide gel electrophoresis
Colorimetry

UNIT – III

Spectrophotometry and Spectroscopy; Principle and applications of colorimetry and spectrophotometry, Flame emission spectroscopy, Atomic absorption spectroscopy,
Analysis of biomolecules using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy, structure determination using X-ray diffraction and NMR; analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods.
Radiolabeling techniques: Properties of different types of radioisotopes normally used in biology, their detection and measurement; incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines.

UNIT – IV

Molecular biology techniques: Sequencing of proteins and nucleic acids; southern, northern and western blotting techniques, polymerase chain reaction (PCR), detection of molecules using ELISA, RIA, western blot
Methods for measuring nucleic acid and protein interactions, Real time PCR and Reverse transcriptase PCR, RFLP, RAPD and AFLP techniques.
Basics of Animal cell Culture: Setting of microbiological laboratory, Sterilization and Media preparation techniques, Inoculation and growth monitoring (Standard plate count technique), Isolation of a microbial colony and slant preparation, Culture media preparation, Cell proliferation measurements, Cell viability testing and Cell harvesting methods.

Suggested readings

1. Animal Cell Culture - A practical approach, Ed. John R.W. Masters, IRL Press.
2. Introduction to Instrumental analysis, Robert Brawn. McGraw Hill International Editions.
3. Randhir Singh. Practicals in Biochemistry
4. A Biologists Guide to Principles and Techniques of Practical Biochemistry, K. Wilson & K.H. Goulding, ELBS Edn.
5. Molecular Cell Biology, J. Darnell, H. Lodish and D. Baltimore Scientific American Book, Inc., USA.
6. K. Wilson and K.H. Goulding. A Biologist's guide to principles and techniques of practical biochemistry.
7. T.G. Cooper. Tools of Biochemistry.

ZOO – 408 EA
EVOLUTIONARY BIOLOGY

Max. Marks: 60
Credit:4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I
Emergence of evolutionary thoughts: Lamarck; Darwin–concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; spontaneity of mutations; the evolutionary synthesis.
Origin of cells and unicellular evolution: Origin of basic biological molecules; abiotic synthesis of organic monomers and polymers; concept of Oparin and Haldane; experiment of Miller (1953); the first cell; evolution of prokaryotes; origin of eukaryotic cells; evolution of unicellular eukaryotes; anaerobic metabolism, photosynthesis and aerobic metabolism.
Paleontology and evolutionary history: The evolutionary time scale; eras, periods and epoch; major events in the evolutionary time scale; origins of unicellular and multicellular organisms; Major groups of animals

UNIT – II
Molecular Evolution: Concepts of neutral evolution, molecular divergence and molecular clocks; molecular tools in phylogeny, classification and identification; protein and nucleotide sequence analysis; origin of new genes and proteins; gene duplication and divergence.
The Mechanisms: Population genetics – populations, gene pool, gene frequency; Hardy-Weinberg law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift; adaptive radiation and modifications; isolating mechanisms; speciation; allopatricity and sympatricity; convergent evolution; sexual selection; co-evolution.

UNIT – III
Macroevolution: major evolutionary events; Modes of speciation; allopatric, sympatric, parapatric and peripatric
Concepts of species; phylogenetic concept, biological concept and other concepts of species
Adaptation with special reference to deep sea, desert and aerial

Phenotypic plasticity, Polymorphism

UNIT – IV

Horse evolution
Stages in primate evolution including Homo (Human evolution)
Altruism, selfish gene, coevolution and kin selection
Extinctions and mass extinctions

Suggested readings

1. Mark Ridley, 2003. Evolution, John Wiley & Sons, UK.
2. Futuyama, D.J. Evolutionary Biology- III Ed. Sinauer Associates Inc. Massachusetts, 1998.
3. Gerhart, J and Kirchner, M. Cell, Embryos & Evolution. Blackwell Science Publishers, 1997.
4. Price, P.W. Biological Evolution. Saunders College Publishing, 1995.
5. Smith, J.M. Evolutionary Genetics. Oxford University Press
6. Camilo J.Cela - Conde and Francisco J. Ayala. 2007. *Human Evolution-Trails from the Past*. Oxford University Press.Oxford ,UK
7. Campbell.B.G.2009. *Human Evolution*. Transaction Publishers, NJ, USA
8. Darwin, C.D. 1859. *On the Origin of Species by Means of Natural Selection*. John Murray, London.
9. Dan, G. and Li,W.H. 2000. *Fundamentals of Molecualr Evolution*. (2nd edn.). Sinauer Associates Inc. MA, USA
10. Elliott,Sober, 2008. *Evidences and Evolution: The Logic Behind the Science*. Cambridge University Press,UK.
11. Simpson, GG, 1953. Horotely, bradytely, and tachytely, Ch. 10 in the 'major features of evolution', Columbia University Press, pp 313-337, New York. (download from www.stephenjaygould.org)
12. Hickman et al. 2006. Integrated principles of zoology, McGraw Hill International edition, NY

ZOO – 410 EA
APPLIED ZOOLOGY

Max. Marks: 60
Credit:4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – 1

Breeding in animals, including marker – assisted selection
Transgenic animals
Application of immunological principles (vaccines, diagnostics)
Microbial fermentation and production of small and macro molecules
Bioresource and uses of biodiversity
Genomics and its application to health, including gene therapy

UNIT – II

Animals of economic Importance:
Animals of Medical importance and control of *Pediculus humanus corporis, Anopheles, Culex, Aedes,* Apiculture and Pearl Culture including idustries and institutes in India

UNIT – III

Fish Technology: Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed
Camels:Economic and medical significance of Camels

UNIT- IV

Animal Husbandry and Poultry Farming: Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of estrus in cattle
Principles of poultry breeding, Management of breeding stock and broilers, Processing and Preservation of eggs

References

1. Economic zoology 1991-92, GS Shukla and VB Upadhyay, Rastogi publication, Meerut.
2. Fish and fisheries, Kamleshwar Pandey and JP Shukla, 2007, Rastogi publication, Meerut.
3. Fish and fisheries of India, VG Jhingran. 1982. Hindustan Publication, Corp.
4. A hand book on economic zooogy, Jawed Ahsan and Subhas Prasad Sinha, S Chand and Company Ltd, Ramnagar
5. Al-Juboori, Mohammed, M., Rashid, J., Kurian, j., and El Refaey, S. (2003). Nutritional and medicinal value of camels *Camelus dromedaries* milk. WTT Transactions on Ecology and the Environment, volume 170, WIT Press, www.witpress.com
6. Refer National Research Centre on Camel, Bikaner

ZOO – 412 OE

OPEN ELECTIVE

Max. Marks: 60
Credit: 3
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

Course offered by other Schools of the University

1. School of Humanities – English communication skills
2. School of Law – IPR
3. School of Agriculture -Vermicomposting
4. School of Pharmacy –
5. School of Management -

UNIT – 1

UNIT – II

References:

ZOO – 414 FE
FOUNDATION ELECTIVE

Credit: 2
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – 1

Research Process: scientific method, criteria for good research

Research design: meaning and need for research design, features of good design

Paragraph writing: proper use of verb, noun, pronoun, tense, use of MS office, excel, power point for preparing a scientific report

Presentation of numerical data and scientific figures, usage of line, bar graph, charts to describe the results,

UNIT – II

Scientific presentation: preparation and order of material, use of web information

Different ways to make impressive presentation: general gesture for presentation, speed, loudness, clarity during presentation, use of appropriate vocabulary during presentation, general discussion

Scientific paper and review writing: correspondence with editors and reviewers, appropriate citations, copyright and ethical issues in drafting, acknowledgement, keywords, usage of different softwares for MS preparation, checking plagiarism

References:

Richard, Ellis.Communication skills: step ladders to success for professional, Gutenberg Press, Malta

John, W. Davis. Communication skills: a guide for engineering and applied science students, Prantics Hall, 2001.

Gupta, S. Commiunicaiton skills and functional Grammar, University Science Press, N Delhi

Llyod, M., Bor, R. Communication skills for medicine, Elsevier press, Churchill Liverstone Elsevier.

ZOO – 416 LC - 3

LABORATORY COURSE – III

(ZOO 402C, 406C)

Paper Name: Laboratory course - I
Max. Marks: 150
Paper Code: ZOO – 108 LC
Examination Time: 6 hrs

List of practical for 'Biosystematics and Taxonomy'

1. **Lll**
2.

List of practical for 'Immunology'

1. **Lll**
2.

List of practical for 'Tools and Techniques'

1. **Lll**
2.

ZOO – 418 LC 4

LABORATORY COURSE – IV

(ZOO 408EA/410 EA)

Max. Marks: 150
Examination Time: 6 hrs

List of practical for ‘Evolutionary Biology

1. **Lll**
2.

List of practical for ‘Applied Zoology’

1. **Lll**
2.

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Developmental biology, evolutionary biology, molecular biology

1. Estimation of ovarian egg counts.
2. Culture of live food organisms and estimation of population density of live food organisms.
3. Identification of eggs, spawn, fry and fingerlings of cultivable fishes of India.
4. Collection and identification of aquatic weeds.
5. Collection and identification of aquatic insects.
6. Study of feeding habits of fishes by gut content analysis.
7. Aquarium design and maintenance.
8. Formulation and preparation of artificial fish food
9. Analysis of proximate composition (protein and fat) of fish
10. Analysis of proximate composition (protein and fat) of artificial fish food
11. To study the stages of Evolution of the prokaryotes.
12. To study the stages of Evolution of the eukaryotes.
13. To study evolutionary history of Primates.
14. Human evolutionary tree.
15. Study of evolutionary time scale.
16. Serial homology supporting evolution.
17. Phenotypic Plasticity supporting evolution.
18. Paleontological evidences supporting evolution.
19. Study of natural Selection in action.
20. To study different examples of co-evolution between different organisms.
21. Exercise for Hardy-Weinberg law.

PRACTICALS:

1. Study of frog and mouse sperm and sperm smear preparation.
2. Study of developmental stages of frog and chick embryos from permanent slides.
3. Observation of chick embryo.

Course no.: 16ZOO21CL2 M.M.: 100
Course Title: Laboratory Course Time: 6 Hr
Laboratory Course outcomes

CO1: Students would gain expertise in understanding the complex molecular mechanisms occurring in cell and the applications of molecular technologies.

CO2: The study of molecular biology provides the necessary information about the chemistry of life to allow the students to understand the basis of life. .

CO3: Students would gain expertise in physiology of animals

CO4: A suitable understanding of execution of each system of different groups of animals with their up to date comparison.

List of practicals

1. To perform extraction of nucleic acids
2. To perform SDS PAGE
3. To perform isolation of genomic genetic material
4. To estimate RNA in the given material/sample
5. To perform blotting to analyse the given sample
6. DNA gel extraction
7. Competent cell preparation
8. Microscopy applications

9. Solutions and Buffers preparation
10. To estimate DNA in the given material/sample
11. Assessment of proliferation in cultured cells by MTT assay
12. To find the blood group and Rh factor of own blood
13. To estimate the amount of Hb present in human blood
14. To estimate the RBC count present in $1mm^3$ volume of blood.
15. To estimate the WBC count present in $1mm^3$ volume of blood.
16. Determination of MCV, MCH, and MCHC.
17. Determination of colour Index of blood.
18. Demonstration of the blood clotting time.
19. Demonstration of the erythrocyte sedimentation rate.
20. Demonstration of the haemolysis.
21. To study the effect of osmolarity of solution on RBC
22. Qualitative estimation of salivary amylase
23. To study the effect of varying pH on salivary amylase
24. To determine the effects of varying temperatures on the activity of salivary amylase
25. To study the rate of respiration by aquatic animals
26. Spiro metric analysis of pollution impact on human beings and its implications.

M. Sc. II Year (III Semester)

ZOO – 501 C
VERTEBRATE ZOOLOGY

Max. Marks: 60
Credit:4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Introduction of Chordates and Vertebrates
Introduction: Origin of Chordates and recent theories, General organization and features of chordates. Protochordata: Life cycle of Salpa, Doliolum and Amphioxus, Significance of Retrogressive metamorphosis

UNIT- II

Fish and Amphibians
Origin, Evolution of Agnatha, Placoderms and Chondrichthyes, Osteichthyes
Adaptive radiation in bony fishes
Origin, Evolution and adaptive radiation in Amphibians
Pisces and Amphibia; salient features, description of their habit and habitats, movement, nutrition, gas exchange and transport, excretion, sensory system, reproductive patterns, development and larval characters

UNIT- III

Reptiles and birds
Origin and Evolution of Reptiles, Adaptive radiation in living Reptiles, Poisonous and Non-poisonous Snakes in India and Extinct Reptiles
Origin and evolution of Birds
Aerial adaptations, Mechanism of flight and migration

Reptilia, and Aves; description of their habit and habitats, movement, nutrition, gas exchange and transport, excretion, sensory system, reproductive patterns

UNIT- IV

Mammals

Origin and Evolution of Mammals. Adaptive radiations in Monotremes, Marsupials. Aquatic Mammals and Eutherians

Mammals; description of their habit and habitats, movement, nutrition, gas exchange and transport, excretion, sensory system, reproductive patterns, Dentition in Mammals

Suggested readings

1. Colbert
2. Kardong
3. Marshall, A.J. and Williams W.D. (Ed). Text Book of Zoology: Vertebrates-VII (Ed.) Vol. II AITBS, Publishers and Distributors, 1995.
4. Young, J.Z. The Life of Vertebrates. III Ed Clarendon Press, Oxford, 1981.
5. William, N. Mcfarland, F. and Harvey Pough Tom J.C. and Heiser J.B. Vertebrate Life. Collier-Macmillan Publihers, London, 1979.
6. Romer, W.B. The Vertebrates Body. Saunders, Philadelphia, 1956.

ZOO – 503C

DEVELOPMENTAL BIOLOGY

Max. Marks: 60
Credits:4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Basic concepts of developmental biology: Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.

UNIT – II

Gametogenesis, fertilization and early development:
Production of gametes, cell surface molecules in sperm-egg recognition in animals; fertilization and zygote formation, cleavage, blastula formation, gastrulation and formation of germ layers in animals; embryogenesis,
Morphogenesis and organogenesis in animals: Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila (role of maternal genes, patterning of early embryo by zygotic genes- gap genes, pair– rule genes, segment polarity genes, homeotic selector genes- bithorax and antennapedia complex), amphibia and chick;

UNIT – III

Organogenesis – vulva formation in *Caenorhabditis elegans*; eye lens induction, limb development and regeneration in vertebrates (epimorphic regeneration of reptile (salamander) limb); differentiation of neurons, post embryonic development-larval formation, metamorphosis; environmental regulation of normal development; sex determination.
Aging and senescence – Programmed cell death (apoptosis, autophagy and necrosis), aging and senescence, genes involved in alteration in timing of senescence

UNIT – IV

Applications and Medical implications of developmental biology –
Reproductive technologies; in-vitro fertilization, Intracytoplasmic sperm injection, GIFT, ZIFT, Cloning; SCNT, ECNT and Gene therapy; defective genes, somatic gene therapy, types of vectors used in gene therapy (retrovirus, adenovirus, plasmid), germ line gene therapy, Therapeutic use of stem cells
Teratogenesis; environmental assaults on human development, teratogenic agents like alcohol, retinoic acid etc

Suggested readings

1. SF Gilbert, 2006. Developmental biology, sinauer associates Inc. Massachusetts.
2. Wolpert et. al. 2007. Principles of development. Oxford university press.
3. Jonathan MW. Slack. Essential developmental biology, willey Blackwell publ.
4. LW Browder et.al. Developmental biology, saunders college publishing, Philadelphia.
5. Analysis of Biological Development, Kalthoff, (2nd Ed., 2000), McGraw-Hill Science, New Delhi.
6. Balinsky, B. I (1981) Introduction to Embryology. Hall Saunders, Philadelphia (5th ed.)
7. Rao, K.V. 1993. Developmental Biology: A Modern Synthesis. Oxford and IBH Publishing Co. Pvt. Ltd.
8. Subramanian, T. Developmental Biology, Narosa Publishing House, 2002.

ZOO – 505 DA 1
ENDOCRINOLOGY

Max. Marks: 60
Creidt:4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Definition and scope of endocrinology; Structure of various endocrine glands; Phylogeny of endocrine glands
Hormones as second messengers: endocrine, paracrine and autocrine hormones. Structure and function of the hypothalamus: hypothalamo – hypophyseal system; feedback mechanism. Biosynthesis and physiological roles of hormones

UNIT – II

Types of hormone receptors. Signal transduction mechanisms. Protein hormones: Membrane receptors G-proteins – cAMP signaling pathway. Thyroid hormones: Mechanism of action of thyroxine, tri-iodothyronine and tetra-iodothyronine. Mechanism of action of steroid hormones (genomic and non-genomic pathway).

Inhibitors of hormone biosynthesis and their use

UNIT – III

Renin – Angiotensin System (RAS). Erythropoietin and Atrial Natriuretic Factor (ANF). Thymosins and Growth factors. Role of parathormone, calcitonin and cholecalciferol (Vit D) in calcium homeostasis. Role of insulin and glucagon in glucose homeostasis.

UNIT – IV

Ovaries and testis, hormonal control of reproduction
Regulation of gonadal activity: Hypothalamus – hypophyseal – gonadal axis.
Oestrous and menstrual cycles and their regulation by hormones
Pineal and photoperiodic regulation of breeding cycle of vertebrates
Current developments in design and production of hormonal contraceptives,
Recombinant protein hormones production and application in regulation of fertility in farm animals and humans

List of Recommended Books

1. Mac E. Hadley, Jon E. Levine. Endocrinology, Pearson Prentice Hall, 2007
2. H. Maurice Goodman. Basic Medical Endocrinology, Fourth Edition, 2008, Academic Press, Elsevier
3. F Bolander. Molecular Endocrinology, 3rd Edition, 2004, Academic Press, Elsevier
4. E.J.W. Barrington. General and Comparative Endocrinology, Oxford, Clarendon Press.
5. P.J. Bentley. Comparative Vertebrate Endocrinology. Cambridge University Press.
6. R.H. Williams. Text Book of Endocrinology, W.B. Saunders
7. C.R. Martin. Endocrine Physiology. Oxford Univ. Press.
8. Bentley: Comparative Vertebrate Endocrinology (1998, Cambridge University Press)
9. Chester-Jones et al: Fundamentals of Comparative Endocrinology (1987, Plenum Press)
10. Gorbman et al: Comparative Endocrinology (1983, John Wiley)
11. Norris: Vertebrate Endocrinology (4th ed 2007, Elsevier)
12. Hadley: Endocrinology, Prentice Hall (2000, International Edition)

PRACTICALS:
1. Study of endocrine glands in rat.
2. Estimation of hormones by ELISA (LH, FSH, Progesterone).
3. Demonstration of Hypothalamohypophysio gonadal (HPG) axis.
4. Histological preparation and immunocytochemical demonstration of endocrine tissues.

ZOO – 507DA2C

CANCER AND RADIATION BIOLOGY

Max. Marks: 60
Creidt:4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth

UNIT-II

Hallmarks of Cancer I: Mechanism of tissue invasion and metastasis, Micrometastasis, dromancy, and colonization. Tumour angiogenesis. Tumour: Benign tumour, Malignant tumour, carcinoma and sarcoma, leukemia and lymphoma, epithelial and non epithelial tumours, specialized tumours

UNIT III

Genetic basis of cancer: Proto-oncogene and oncogene (ras, myc, abl). Tumour suppressor gene (p53, RB, BRCA1 and BRCA 2). Tumour viruses and retrotransposons. Growth factors and signal transduction. Euchromatin and heterochromatin, Preparation of metaphase plate (Chromosome banding pattern).

UNIT IV

Treatment of cancer: surgery, radiation therapy, chemotherapy, hormone therapy, immune therapy, hyperthermia, gene therapy, other treatment methods (cryosurgery, laser therapy, photodynamic therapy)

References

1. Lauren Pecorino (2012) Molecular Biology of Cancer: Mechanisms, Targets, and Therapeutics (2nd Edition) by Oxford University Press
2. Weinberg, Robert A. (2007) The Biology of Cancer. New York: Garland Science.
3. Raymond W. Ruddon (2007) Cancer Biology. Oxford University Press.
4. L. M. Franks, N. M. Teich (1997) Introduction to the Cellular and Molecular Biology of Cancer. Oxford University Press
5. John Mendelsohn (2008) The molecular basis of cancer. Saunders/Elsevier
6. Eric J. Hall and Amato Giaccia (2011) Radiobiology for the Radiologist.7th edition.Lippincott Williams and Wilkins.
7. A.P. Casarett (1968) Radiation Biology .Prentice Hall
8. Forshier Steven (2002) Essentials of Radiation Biology and Protection. Delmar

PRACTICALS

1. Study of Apoptotic and Necrotic morphology.
2. Trypan Blue dye exclusion Test.
3. Preparation of Metaphase plate.
4. Study of Chromosome aberration.

Z00 – 509DB1

PARASITOLOGY AND ZOONOSIS

Max. Marks: 60
Credit:4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Introduction: Origin and Evolution of Parasitism, Kinds of Hosts and Parasites,
Host parasite interaction: recognition and entry processes of different pathogens like bacteria, viruses into animals host cells, alteration of host cell behavior by pathogens, virus-induced cell transformation, cell-cell fusion in both normal and abnormal cells

UNIT – II
Pathogens and disease
Pathogenic Microorganisms
Pathogenic Protozoan's
Pathogenic Nemetodes
Pathogenic Trematodes
Pathogenic Cestodes

UNIT – III

Zoonoses: Definitions, Concept and classification of Zoonoses,
Ecological aspects of Zoonoses, Role of Wild animals (birds, bats etc.), domestic animals , and laboratory animals in transmission of zoonoses
Vectors-, Milk-, meat-, egg-, fish- and water- spread Zoonoses, Occupational zoonoses, Nosocomial zoonoses, xenozoonoses
Maintaining and improving animal and human health in the future with the better understanding of Zoonotic diseases

UNIT – IV

Nationally and internationally emerging and re-emerging Zoonoses
Principles of Zoonoses management: methods of prevention, control and eradication of

Zoonoses
Study of zoonotic pathogens as agents of bio-terrorism

References:

1. Hoare, C. A. Hand Book of Medicinal Protozoology. London, Baltimore, Tindall and Cox, 1950.
2. Levine, N. D. Protozoan parasites of Domestic Animals and Man. II Ed. Minncapolis: Burgess, 1978.
3. Noble, E.R. and Noble, G.A. Parasitology: The Biology of Animal Parasites. London Kimpton, 1961
4. Smith, K.G.V. Insects and other Arthropods of Medical Importance, London: British Museum of National

1. History. 1973.

5. Soulsby, E.J.L Biology of Parasites. New York: Academic Press, 1966.
6. Smyth, J.D. Introduction to Animal Parasitology. London: Hodder and Stoughton. 1976.
7. Zoonoses and communicable diseases common to man and animals. Vol.1-3. PAHO.
8. Krauss et al. Zoonoses Infectious diseases transmissible from animals to humans. 3rd Ed. ASM Press.
9. Hugh-Jones et al. Zoonoses Recognition, Control and Prevention. Iowa State University Press.
10. Marquardt et al. Biology of disease vectors. 2nd Ed. Elsevier.

Z00 – 511DB2

ANIMAL ECOLOGY, ETHOLOGY AND WILDLIFE CONSERVATION

You have to work out more ---------- , incude syllabus of ethology?

Max. Marks: 60
Credit: 4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT - I

The Environment: physical, biotic environment
Habitat and niche, resource partitioning, character displacement
Levels of ecological study
Characteristics of population, population growth curves, population regulation; life history strategies(r and k selection)
Concept of metapopulation (demes and dispersal, interdemic extinctions, age structured populations
Biogeographic zones of India,

UNIT – II

Community ecology ; community structure and attributes, levels of species diversity and its measurement, edges and ecotones, species interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis
Concept of climax
Energy flow and mineral cycling
theory of island biogeography

UNIT – III

Wildlife and its importance
Wildlife of India, status, monitoring and documentation, major drivers of biodiversity change,

Endangered species of India and their present status
Protected Areas in India; national parks, wildlife sanctuaries, hot spots, hope spots, etc.
IUCN classification of species, Red Data Book

UNIT- IV

Wildlife and illegal trade and its control
Problems in plantations and exploited forests
Management of wildlife habitats, biodiversity management approaches
Species conservation projects (for Tiger, Lion, Rhino and Crocodile) and Management plan for Protected Areas (Biosphere reserve programme)
Management of excess population and translocation
Captive breeding (*in-situ and ex-situ*) gene pool conservation
Wildlife protection Act, 1972, amendments and its applications
Indian biodiversity Act
Techniques to study wildlife; tools and techniques, use of biotechnology

Suggested readings

1. Rogers WA. Techniques for wildlife census in India (a field manual), wildlife institute of India, Dehradun.
2. Ali and Ripley. Handbook of birds of India (1-10 volumes), Oxford University Press, Bombay.
3. Prater, SH. The book of Indian animals, BNHS publication, Bombay.
4. EP Gee. The wildlife of India. Govt of India.
5. Saharia, VB. Wildlife in India, Natraj publications, Dehradun.
6. Majupuria, TC. Wildlife wealth of india, Tecpress services, LP., 487/42-SOL Wattenslip, Pratunam Bangkok, 10400, Thailand.
7. ENVIS Centre, wildlife Institute of India, Dehradun.
8. Chatrath, K.J.S. 1992. Wetlands of India, Ashish Publishing House,New Delhi.
9. Heywood, V.H. (Eds) 1995. Golbal Biodiversity, Published for UN Environmental Programme, Cambridge University Press.
10. Hosetti, B.B. 2006. Concepts in Wildlife Management, Daya Publishing House, Delhi. III edition
11. Stiling, P, 2002. Concepts in Ecology: Theories and Applications IV Ed. Prentice Hall of India Pvt. Ltd., New Delhi-110 001.
12. G. Sinclair and R.E. Anthony, 1994. Wildlife Ecology and Management, Blackwell Scientific Publ. Bostan.
13. Negi, S.S. 2002. Hand book of National Parks, Wildlife Sanctuaries and Biosphere reserves in India. Indus Publ., New Delhi.

Z00 – 513OE

OPEN ELECTIVE

Exchange programme between schools School of Law – IPR/ biodiversity Act

Z00 – 515 LC5

LAB COURSE

(Z00 501C, 503C)

List of practical for Vertebrate zoology

1. Ppp
2. Ppp
3. pp

List of practical for Developmental Biology

1. lll
2. kkk
3.

Z00 – 517 LC6
LAB COURSE
(Z00 505DA1/507 DA2 & 509 DB1/511DB2)

List of practical for ‘Endocrinology’

1. lll
2. kkk

List of practical in ‘Cancer and Radiation Biology’

1. lll
2. kkk

List of practical in ‘Parasitology and Zoonosis’

1. lll
2. kkk

List of practical ‘Animal Ecology and wildlife conservation’

1. lll
2. kkk

M. Sc. II Year (IV Semester)

ZOO – 502 C
BIOSTATISTICS AND BIOINFORMATICS

Max. Marks: 60
Credit: 4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Introduction and scope of Biostatistics
Basic concepts of Biostatistics: Variables, constants, observation, data, population.
Types and collection of data: Sampling, primary data, Secondary data. Presentation of data: Line diagram, bar diagram, pie diagram, graphic presentation of data.
Measurement of central tendency and dispersal: Mean, Median, Mode. Measures of dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Standard error, Coefficient of variation

UNIT – II

Probability distributions (Binomial, Poisson and normal); sampling distribution; difference between parametric and non-parametric statistics; confidence interval; errors; levels of significance; regression and correlation; t-test; analysis of variance; X^2 test; basic introduction to Multivariate statistics, etc.
Hypothesis testing – Null and Alternate hypothesis
Experimental design – components, CRD, RBD, RMD, LSD, strip and split plot.

UNIT – III

Application of Software -MS Word, MS Excel, MS PowerPoint, Acrobat Reader,
Statistical Software (MS Excel, SPSS, SPAR and MINITAB)
Databases -MS Access (Brief account only)
Global Information System -BIOSIS, Medline and Medlars, AGRIS; E Journals and E Books Publishing

UNIT – IV

Introduction and scope of Bioinformatics
Nucleic acid and protein sequence databases
Sequence alignment- pairwise, multiple, local and global alignment
Database searching - PAM, BLOSUM and BLAST.
Web-based tools for sequence searches, motif analysis and presentation
Gene structure prediction and detection of functional sites in DNA sequences
Protein secondary structure prediction, fold recognition, transmembrane topology prediction

Suggested readings

1. Bailey, N.T.J. 1994. Statistical Methods in Biology (3rdedn). Cambridge University Press.
2. Bright Wilson. 1990. An Introduction to Scientific Research. Dover Publications. NY.
3. Chap T.Le.2003.Introductory Biostatistics. John Wiley &Sons, NJ, USA.
4. Clough, P. and C.Nutbrown.2002. A Student's Guide to Methodology: Justifying Enquiry. Sage, London.
5. Daniel, W.W. 2006. Biostatistics: A Foundation for Analysis in the Health Sciences (7th edn). John Wiley & Sons, New York.
6. Dharmapalan, Biju. 2012. Scientific Research Methodology. Narosa Publishing House, New Delhi
7. Finney, D.J. 1980.Statistics for Biologists. Chapman and Hall, London
8. Frank, Harry and Steven C. Althoen, 1995. Statistics: Concepts and Applications. Cambridge University Press
9. Jeremy R. Garret.2012. The Ethics of Animal Research. The MIT Press, MA. USA
10. Kothari C.R., 2009. Research Methodology: Methods and Techniques (2ndedn.). NewAge International Publishers, New Delhi.
11. Pagano, M and K.Gauvreau. 2000. Principles of Biostatistics. Brooks/Cole, CA, USA
12. Paul Oliver.2005. Writing Your Thesis. Vistaar Publications.New Delhi.
13. Peter Medawar.1979. Advice to Young Scientist. Harper and Row, London.
14. Phillippe Cullet.2005. Intellectual Property Protection and Sustainable Development. Lexis NexisButterworths Wadhwa, Nagpur
15. Prabhakara ,G.N. 2006.Biostatistics.Jaypee Bro. New Delhi

16. Pradeep Sinha and Priti Sinha.2010.Computer Fundamentals. BPB Publications, New Delhi Rajathi A. and P. Chandran, 2010. SPSS for You. MJP Publishers, Chennai.
17. Shane Torbert.2011. Applied Computer Science. Springer-verlag, New York.
18. Zar, Jerrold H. 2008. Biostatistical Analysis (3rdedn.). Pearson Education Inc., New Delhi.
19. A.Malcolm Campbell, Laurie, J. Heyer., (2004): Discovery Genomics, Proteomics, and Bioinformatics: Pearson Education (Singapore) Pte. Ltd.,
20. Arthur, M. Lesk: (2003) Introduction to Bioinformatics: Oxford University Press
21. S.C.Rastogi, N.Mendiratta, P.Rastogi: (2005)- Bioinformatics –Methods and Application: Prentices Hall of India Pvt. Ltd –New Delhi.
22. T.K.Attwood., D.J.Parry-Smith., Samiron Phukan; (2007) – Introduction to Bioinformatics- Pearson Education.
23. 6. Prasad, S. 2004. Elements of Biostatistics. Rastogi publications. Meerut, India.
24. Robert R. Sokal & James F. Rohlf. 1994. Biometry- The Principles and Practice of Statistics in Biological Research. 3rd ed. W. H. Freeman & Company publishers.

ZOO – 504 C

ADVANCES IN APICULTURE

Max. Marks: 60
Credit: 4
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – I

Role of honey bee in agro-ecosystem and utilitarian value to man kind
History of Apiculture: Definition, Bee keeping in world-wide, In India
Traditional bee keeping, Modern beekeeping, Urban or backyard beekeeping
Honey bee species and identification: Introduction to honey bee; Origin, systematics and distribution; Types of honey bees, Species of honey bees and their identification
Colony organization, Polymorphism, Caste system, Division of labour

UNIT – II

Communication in honey bees: Bee learning and communication – Learning - Color learning in honeybees, Color discrimination, Color learning rates and preferences, Color memory, Timing in color learning, Neurobiology of color vision; Communication - Odor plume, Trophallaxis, Adaption of honey bees: Structural, Behavioral, Ecological and Physiological Adaptations of Bees. Necessities of honey bee adaptations

UNIT – III

Bee keeping as an occupation: Extent of Beekeeping in Rajasthan and India,
Limitations on the development of beekeeping, Advantages of extensive beekeeping, Beekeeping equipments and initiation into keeping a colony, the future of beekeeping
Beekeeping techniques and Apiary management; Establishment of a colony,
Routine management, Seasonal management, Migratory beekeeping, Harvesting and marketing of bee products, Bee flora and planned pollination services

UNIT – IV

Diseases and economics; diseases, preventive and curative measure
Use of honey, bee wax, propolis, royal Jelly, bee Venom
Composition of honey and its nutritive value
Important Institutions pertinent to Apiculture in Rajasthan and India: National Bee Board, Bee Research and Training Institute, Apiaries

Suggested readings

1. Dewey M. Caron, 2013. Honey Bee Biology and Beekeeping, Revised Edition. Wicwas Press, Kalamazoo.
2. Pradip V Jabde, 1993. Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac Culture, Agricultural Pests and their Controls. Discovery Publishing House, New Delhi.
3. Eva Crane, 1999. The World History of Beekeeping and Honey Hunting. Routledge, India.
4. Ted Hooper, 2010. Guide to Bees & Honey: The World's Best Selling Guide to Beekeeping. Northern Bee Books, Oxford.
5. D. P. Abrol. Scientific Publisher, New Delhi.
6. S. B. Withhead. Axis books Publisher, Jodhpur. Honey bees and their management
7. Honey bees: Diseases, Parasites, Pests, Predator and their management. N. Nagaraja and D. Rajagopal , M.J.P Publisher, Chennai.
8. A Handbook of Beekeeping Dharamsing and D. P. Singh (, Agrobios India (Publisher), Jodhpur.
9. http://ecoursesonline.iasri.res.in

Practical

1. Study of Honey bee species, Castes and Bee morphology.
2. Study of Beekeeping equipments: Bee box and tools.
3. Study of Bee products: Honey, Bees wax, Pollens, Royal Jelly, Propolis and Bee venom
4. A compulsory visit to an Apiary or Central Bee Research & Training Institute or a Beekeeper to gain a first hand experience in handling bees.
5. Study of bee flora in the locality and observations on bee foraging Behaviour.

ZOO – 506 D

MS DISSERTATION AND SEMINAR

Max. Marks: 300
Credit: 20
Examination Time: 48 hrs

This is kind of internship programme and the University will provide reference letter to the student to carry out his/her research in any of organization or research institutes in the locality

Taxonomy

1. To prepare the dichotomous key of the Porifera, Coelenterata, Arthrophoda, annelida, Mollusca and Echinodermata
2. Composition assessment of taxonomic diversity in a given habitat eg. Grassland, aridland, wetland etc.
3. Preparation of dichotomous key of 4 specimens up to family (insects/spiders/ fishes/ snakes of any three taxa).
4. Preparation of Cladogram based on the specimens provided (at least five museum specimen).

Tools and techniques

5. To study the principle of cell fractionation for isolation of sub-cellular organelles.
6. To separate and identify sugar by Thin Layer Chromatography
7. Qualitative estimation of given enzyme by colorimetric method.
8. To study the Beer Lambert's law for spectrophotometry.
9. To isolate chloroplast pigments from leaf by paper chromatography.
10. To isolate amino acids by paper chromatography/TLC.
11. To perform agarose gel electrophoresis.
12. To perform affinity column chromatography
13. To perform ion exchange column chromatography
14. To perform PCR for a given sample
15. To perform SDS-PAGE.
16. To dry SDS-PAGE.
17. To perform ELISA

METHODS IN BIOLOGY

Methods in field biology: Methods of estimating population density of animals and plants, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization-ground and remote sensing methods.
Ecology: Radio telemetry, Camera trapping, binoculars, telescope.

Paper Name: Animal Behaviour
Paper Code: ZOO – 403
Max. Marks: 60
Examination Time: 3 hrs

Note: *Examiner will set nine questions and the students will be required to attempt five questions in all. Question No. 1 is compulsory containing 'short answer types' questions covering the entire syllabus. Further, examiner will set two questions from each unit and the students will be required to attempt one question from each unit.*

UNIT – 1
Principles and mechanisms of animal behavior
Four propositions of Tinbergen, Stimuli, Fixed action pattern, imprinting, approaches and methods in study of behaviour

UNIT- 2
Cooperation and conflict
Male-male competition and sexual selection, Fisher's and handicap hypothesis, parent-offspring conflict, range of cooperative behaviours and prisoner's dilemma

UNIT - 3
Foraging
Optimal foraging theory, foraging and predation risk; defense strategies against predators, territoriality and group foraging

UNIT- 4
Sensory system and communication
Signal content and structure, orientation and cues, aggressive behavior, social dominance, migration

Suggested reading

1. Peter Marler and Hamilton, mechanism of animal behavior, John Wiley and sons, USA
2. John Alcock, animal behavior, sinauer associate, USA
3. Dawkins and Manning, An introduction to animal behavior, Cambridge university press, UK

Instruction for the students

Hard core – there are core courses in every semester. These courses are to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a ssia discipline of study.
Soft core elective – soft core is a course which can be chosen from a pool of papers. It will be supportive to the discipline of study and mandatory as per course curriculum.
Foundation course – the foundation course is based upon the content tht leads to knowledge enhancement. It is mandatory as per course curriculum.
Interdisciplinary course/open elective – open elective course may be from an unrelated discipline. It is interdisciplinary/open elective and mandatory as per course curriculum.

Practical Schedule

Veterinary Epidemiology & Zoonoses

Sr.No.	Topic
4	Demonstration of selected software programmes / models e.g. EPIZ00, Handi STATUS and India – Admas- EPITRAK. – bio-informatics, net surfing, hypothesis testing.
5	Study of Evaluation of vaccines and diagnostic tests. – quality assurance and quality testing of vaccines.
6	Determination of Association and risks : relative risks, odd's ratio and attributable risk.
7	Survey of an animal disease on farm. – data collection, clinical sampling, selection of sample size, estimation of disease rate, calculation of confidence interval, hypothetical testing, statistical analysis etc.
8	Study of field survey of zoonotic diseases.
9	Isolation and identification of important bacterias of zoonotic importance from animal and human sources including foods of animals origin.
10	Isolation and identification of important viruses of zoonotic importance from animal and human sources including foods of animal origin.
11	Isolation and identification of important parasites of zoonotic importance from animal and human sources including foods of animal origin.
12	Isolation and identification of important rickettsia and chlymydes of zoonotic importance from animal and human sources including foods of animal origin.
13	Isolation and identification of important fungi of zoonotic importance from animal and human sources including foods of animal origin.
14	Study of rural environment and health status of rural community.
15	Visit to primary health centre / human hospital.
16	Study of common diseases affecting rural / urban population and probable relationships of these human disease conditions with animal diseases present in the area.
	Structural organization in the field of zoonoses; National and international organizations, referral laboratories, datasheets; databank, websites, and other valuable repositories.
10.	Study of Geographic information system (GIS) and forecasting systems pertaining to zoonoses;
11.	Approaches and techniques for the diagnosis of zoonoses

12.	Definition, description, etiology, host range, epidemiology, diagnosis and management of important bacterial zoonoses – Anthrax, brucellosis, borreliosis,
13.	Campylobacteriosis, tuberculosis, paratuberculosis, etc
14.	Salmonellosis, shigellosis, yersiniosis, leptospirosis
15.	Listeriosis, plague, tularaemia, glanders, Malioidosis, staphylococcosis, streptococcosis, tetanus, botulism
16.	Clostridial infections, *E. coli*, Aeromonas hydrophilla, etc
17.	Bacillus cereus, plesiomonas, Vibrio parahaemolyticus, erysipelothrix rhusiopathie, cat scratch disease, etc
18.	Lyme disease, tularemia, necrobacillosis, rat bite fever, opportunistic pathogens, etc
19.	Rabies, vesicular stomatitis, influenza, contagious ecthyma, pox group and some rare and potential zoonoses e.g. Newcastle, etc
20.	Hantaviruses, herpes, ebola and Marburg viruses, Chandipura virus, etc
21.	Food-borne viruses *viz.* rota, tickborne encephalitis, FMD, hepatitis A & E, Norwalk, entero, parvo, adeno, cytomegalo, astro, calci and corona viruses
22.	Prion zoonoses (BSE, CJD, etc)
23.	Japanese encephalitis, Kyasanur forest disease, chickungunya, etc. Vector-borne viruses *viz.* Crimean-Congo haemorrhagic fever,
24.	dengue fever, West-Nile viruses, yellow fever, rift-valley fever, equine encephalitis, louping ill,
25.	Q fever and other rickettsiosis, Coxiella burnetii, Asian Ixido Ricketssiosis, Boutonneuse fever, Flea- borne typhus, Infection caused by Bartonella henselae, Queensland tick typhus, Rickettsial pox, rocky mountain spotted fever, scrub typhus, Zoonotic typhus caused by R. prowazekii
26.	Chlamydial zoonoses, Psittacosis
27.	Fungal zoonoses – Dermatophytosis, blastomycosis, coccidioidomycosis, cryptococcosis, histoplasmosis, aspergillosis
28.	Candidiasis, rhinosporidiosis, sporotrichosis, zygomycosis
29.	Parasitic zoonoses – Echinococcosis, taeniasis, cysticercosis,
30.	Toxoplasmosis, trichinellosis, cryptosporidiosis, filariasis
31.	fasciolopsiosis, sarcocystosis, zoonotic trematode infections, cutaneous and visceral larva migrans, schistosomiasis, leishmaniasis, trypanosomosis etc
32.	Socioeconomic impact of zoonosis

Practical Schedule

Course Title: ZOONOSES AND PUBLIC HEALTH

Course No.: VPH 604
Course Credits: (2+1)

Sr. No.	Topic
1.	Samples and sampling; use of random tables
2.	Estimation of sensitivity, specificity, analytical precision, etc of different tests employed for the diagnosis of zoonoses
3.	Isolation and identification of important bacterial zoonotic pathogens
4.	Isolation and identification of important viral zoonotic pathogens
5.	Isolation and identification of important parasitic zoonotic pathogens
6.	Isolation and identification of important rickettsial zoonotic pathogens
7.	Isolation and identification of important chlamydial zoonotic pathogens
8.	Isolation and identification of important fungal zoonotic pathogens
9.	Characterization of the metabolites, toxins, etc: bioassays, chromatography, etc Identification of virulence, pathogenicity, etc
10.	Diagnosis of zoonoses using immunological (allergic) tests
11.	Diagnosis of zoonoses using serological tests
12.	Diagnosis of zoonoses using molecular and other advanced techniques
13.	Calculation of incidence, prevalence, morbidity rate. Mortality rate, case fatality rate, odds ratio, etc
15.	Representation of zoonotic data: charts, pie, bar, etc
16.	Retrieval of data : national and global repositories

SCHOOL OF AGRICULTURAL SCIENCES (SOAS)

RAFFELS UNIVERSITY, NEEMRANA

B.Sc. (Hons.) Agriculture (4 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana

RAFFLES
UNIVERSITY

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Vision: To evolve as an Institution of Excellence, where scholars develop informed and inquiringminds and broaden the frontiers of pure and applied knowledge.

Mission: In graining the capacity to us usher in change by discovering nurturing and expanding
Individual skills talents and interests while standing forth as leader and path breaker in their futurecarrier.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 To providing subjective and practical knowledge as well as developing practical solutions and connections between theories

PEO 2 Hearten individual growth among the students and enhance their confidence by providing them an opportunity to become a part of agri-industry.

PEO 3 To make agriculture subjects interesting through technically, scientifically and experimentally.

PEO 4 To develop problem-solving skills through practical applications and research

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Comprehend the basic knowledge of agriculture and interrelated subjects in the current scenario of Indian and world Agriculture.
PO 2	Develop a sympathetic of communication methods, resources utilization, cultivation of crops, management of crops, and value addition of agricultural produces.
PO 3	Develop the skills and art to manage agricultural farms and orchard, enhance quality of farm-produces, and their commercial utilization.
PO 4	Demonstrate the methods used in collection, presentation of data and analysis of results of experiments in laboratories and fields and their validation.

PO 5	Understand all related methods in agriculture to increase the profit from crop fields and livestock.
PO 6	Learn to make optimum decision at various levels that enhances the success as an agricultural enterprise.
PO 7	Learn to make optimum decision at various levels that enhances the success as an agricultural enterprise.
PO 8	Harmonize the relation with Agriculture Research Institutions, State Agriculture Universities, KrishiVigyan Kendra (KVK), etc.
PO 9	Motivate for entrepreneurship, start-up through project planning and execution, research and training during field visits etc.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The Department of Agricultural Sciences, offers Four Year (comprising 8 semesters) Undergraduate Programin Science with objective of empowering students to acquire all-inclusive understanding of Agriculture Knowledge both theoretical and practical as an academic discipline. Upon completion of B. Sc. (Hons) Agriculture Degree Program successfully, the students shall acquire the following skills and competencies.

PSO 1	Demonstrate the thoughts of the legal and ethical issues of the environment impacting agriculture and food security of the local and global population and exhibit an understanding and appreciation of the ethical implications of decisions
PSO 2	To create a self-motivated system of agriculture education to attain the local and global demands of agriculture professionals in agriculture, allied sectors diversity in modern agriculture organizations
PSO 3	To develop analytical ability and team work spirit for the good understanding and analysing the current events and issues that are stirring in agriculture and their futuristic effects on agriculture.

Scheme of Examinations of B.Sc. Agriculture (Hons.)

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture I year (I Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme						Duration of Exam Hours	Credits	Theory/ Practical
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total	Grand Total			
1	HORTICULTURE	AHR-T-101	Fundamentals of Horticulture	1	0	-	20	-	30	50	100	3+3	1	T+P
2		AHR-P-101	Fundamentals of Horticulture	0	2	20	-	30	-	50			1	
3	BIOCHEMISTRY/ PHYSIOLOGY/ MICROBIOLOGY/ ENVIRONMENTAL SCIENCES	ABB-T-101	Fundamentals of Plant Biochemistry and Biotechnology	2	0	-	20	-	30	50	100	3+3	2	T+P
4		ABB-P-101	Fundamentals of Plant Biochemistry and Biotechnology	0	2	20	-	30	-	50			1	
5	SOIL SCIENCE & AGRICULTURAL CHEMISTRY	ASS-T-101	Fundamentals of Soil Science	2	0	-	20	-	30	50	100	3+3	2	T+P
6		ASS-P-101	Fundamentals of Soil Science	0	2	20	-	30	-	50			1	
7 8	BIOCHEMISTRY/ PHYSIOLOGY/ MICROBIOLOGY/ ENVIRONMENTAL SCIENCES	AES-T-101	Introduction to Forestry	1	0	-	20	-	30	50	100	3+3	1	T+P
9		AES-P-101	Introduction to Forestry	0	2	20	-	30	-	50			1	
10	LANGUAGE	ECT-T-101	Comprehension & Communication Skills in English	1	0	-	20	-	30	50	100	3+3	1	T+P
11		ECT-P-101	Comprehension & Communication Skills in English	0	2	20	-	30	-	50			1	
12	AGRONOMY	AAG-T-101	Fundamentals of Agronomy	3	0	-	20	-	30	50	100	3+3	3	T+P
13		AAG-P-101	Fundamentals of Agronomy	0	2	20	-	30	-	50			1	

14	REMEDIAL COURSES	ABI-T-101	Introductory Biology*	**1***	**0**	**-**	**20**	**-**	**30**	**50**	**100**	**3+3**	**1**	T+P
15		ABI-P-101	Introductory Biology* Practical	**1***	**2***	**20**	**-**	**30**	**-**	**50**			**1**	
16	REMEDIAL COURSES	AEM-T-101	Elementary Mathematics*	**2***	**0**	**20**	**30**	**-**	**50**	**100**	**100**	**3**	**2**	**T**
17	REMEDIAL COURSES	AEX-T-101	Agricultural Heritage*	1	0	**20**	**30**	**-**	**50**	**100**	**100**	**3**	**1**	**T**
18	AGRICULTURAL EXTENSION and COMMUNICATION	ASP-T-101	Rural Sociology & Educational Psychology	2	0	**20**	**30**	**-**	**50**	**100**	**100**	**3**	**2**	**T**
19	NON-GRADIAL COURSES	HME-T-101	Human Values & Ethics (non gradial)	1	0	**20**	**30**	**-**	**50**	**100**	**100**	**3**	**1**	**T**
20	NON-GRADIAL COURSES	NS/NC/PEY-P-101	NSS/NCC/Physical Education & Yoga Practices**	0	2	-	-	-	**100**	**100**	**100**	**-**	**2****	**P**

SCHOOL OF AGRICULTURAL SCIENCES
(Syllabus & Scheme of Studies w.e.f. 2021-22)
B.Sc. (Hons) Agriculture
I Year (I semester)

1. Fundamentals of Horticulture (AHR-T-101/AHR-P-101)2(1+1)

Course Outcomes:

1. Students will be able to identify plant vegetative structure.
2. Students will understand basic principles, processes and plant propagation methods.
3. Students will understand how to propagate plant, manage and harvest a variety of plant.
4. Students will learn how horticulture relates to the economy and environments, both currently and in the future.

2. Fundamentals of Plant Biochemistry and Biotechnology (ABB-T-101/ABB-P-101)3(2+1)

Course Outcomes:

1. Educate the outlines of bio-molecules, metabolic pathways morphology and anatomy of living cells
2. Develop the understanding of energy synthesis, hereditary mechanisms, enzymatic reactions, cellular function and growth, molecular tests, etc.
3. Develop the skills for applying principles and methods biochemistry and biotechnology to understand plant growth and metabolisms
4. Develop the ability to apply advance techniques for standardization of biochemical processes in plants, optimize cell and tissue growth and culture plant cell and tissue in the laboratory.

3. Fundamentals of Soil Science (ASS-T 101/ASS-P-101)

Course Outcomes:

1. Understand the fundamentals and principles of Soil Science.
2. Explain how different soils are formed and how does soils act as a mediumfor plant growth.

3. Explain soils of India and Land use capability, soil pollution and its effect oncrop and mitigation of soil pollution.
4. Analyze the soils for basic physical, physico-chemical & chemical properties.

4. Introduction to Forestry (AES-T-101/AES-P-101) 2(1+1)

Course Outcomes:

1. Students will understand recognize various harvesting, transportation, and processing systems used in the management of forest resources and production of forest products
2. Students will understand develop and evaluate management plans with multiple objectives and constraints
3. Students will learn how to develop and apply silvicultural prescriptions appropriate to management objectives
4. Students will understand analyze forest inventory information and project future forest, stand, and tree conditions
5. Student will understand nursery preparation of forest trees, tending operations, forest mensuration, selection of trees in agro-forestry, etc.

1. **5. Comprehension and Communication Skills in English (ECT-T-101/ECT-P-101) 2(1+1)**

Course Outcomes:

1. The students acquired the significance of proficiency, both in spoken (oral) and written language.
2. The student learnt the ways to develop comprehension skills, improved vocabulary, significant use of grammar, acquired understanding on writing skills, corresponded with others and enhanced skills in spoken English.
3. Acquainted knowledge in the field of agriculture and its allied branches by incorporation of Comprehension & Communication Skills in English.
4. Develop the understanding on the significance of communication and compared different types of communication with their use.
5. Develop the skills in different categories of writing styles, their implications in various areas, formats to be followed under these styles of writing and their significance.

7. Fundamentals of Agronomy (AAG-T-101/AAG-P-101)4(3+1)

Course Outcomes:

1. In modern terminology however the word has come to mean and denote a branch of science dealing with all aspects of crop cultivation and production.
2. A study of agronomy often involves a summoning of resources from related disciplines such as Botany, Soil Science, Irrigation, and plant protection, Plant Genetics and Breeding, Agro-meteorology etc.
3. In a more fundamental sense it can be categorized as an applied Science, the object of which is crop cultivation and management for the purpose of producing food for humans, feed for animals as well as raw materials for the industry.
4. Knowledge about Indian Agriculture and importance, present status, scope and future prospect.
5. Cropping seasons of India. Soil formation, classification, physical, chemical properties. Identification of important crops and crop seeds.

8. Agricultural Heritage (AEX-T-101) **1(1+0)**

Course Outcomes:

CO1. Acquaint the knowledge on concept, objectives, principles and philosophy of extension management.
CO2. Develop an understanding on the process, steps, principles and monitoring and evaluation involved in agricultural extension programme development for transfer of technology.
CO3. Develop the skills about genesis of agricultural extension, extension efforts in pre- and post independence era along with specific agricultural programmes
CO4. Apply new trends in agricultural extension like private extension, market led extension, expert systems, farmer led extension and cyber extension.
CO5. Evaluate different facets of rural development programmes, community development programmes, and rural leadership for capacity development of extension clienteles**.**

9. **Rural Sociology & Educational Psychology (ASP-T-101)2(2+0)**

Course Outcomes:

Course Outcomes,

1. Understanding concept of rural sociology, its importance in agricultural extension,

characteristics of Indian rural society

2. Understanding social groups, social stratification, culture, social values, social control and attitudes, leadership and training

3. Understanding concept of educational psychology, intelligence, personality, perceptions,

emotions, frustration, motivation, teaching and learning

4. Acquaint with characteristics of rural society, village institutions and social organizations.

5. Assess personality types, leadership types and emotions of human beings.

1. **Human Value and Ethics (HME-T-101)1(1+0)**

Course Outcomes:

CO1. Ability to integrate moral values with professional/personal lives that can enhance psychological well-being.
CO2. Ability to develop ethical behaviour by practicing virtues.

CO3. Ability to deal with the moral issues in practical situation.

CO4. Understanding the value of harmonious relationship based on trust and respect in their life and profession.

CO5. Understanding the role of a human being in ensuring harmony in society and nature.

CO-PO MAPPING

AHR-101	PO									
CO		1	2	3	4	5	6	7	8	9
	CO1	2	2	2	1	2	1	1	1	1
	CO2	1	2	2	2	1	2	1	2	2
	CO3	2	1	2	1	2	2	2	1	1
	CO4	2	2	1	2	2	1	1	2	1

ABB-101	PO									
CO		1	2	3	4	5	6	7	8	9
	CO1	1	1	2	1	2	1	1	1	1
	CO2	1	2	1	2	1	1	1	2	1
	CO3	2	1	1	1	2	2	2	1	1
	CO4	2	2	1	2	1	1	1	2	1

ASS-101	PO									
CO		1	2	3	4	5	6	7	8	9
	CO1	2	1	2	1	2	1	1	1	1
	CO2	1	1	1	2	1	1	1	2	1
	CO3	2	1	1	1	2	2	1	1	1
	CO4	2	2	1	2	1	1	1	2	1

ECT-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	2	1	2	2	1	1	1	1
	CO2	2	1	1	2	1	2	2	2	1
	CO3	1	1	2	1	1	2	1	1	1
	CO4	2	2	1	2	2	1	1	2	1
	CO5	1	1	2	1	2	2	1	2	2

AAG-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	1	1	1	1	1	1	1	1
	CO2	1	2	2	2	1	2	2	2	1
	CO3	1	1	2	1	2	2	1	1	1
	CO4	2	1	1	2	2	1	1	1	1
	CO5	1	1	2	1	1	1	1	2	1

AEX-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	3	1	3	3	3	3	3	3	2
	CO2	1	2	2	3	1	3	2	2	3
	CO3	3	1	1	2	2	2	1	1	1
	CO4	2	3	3	1	3	2	2	2	1
	CO5	3	1	2	2	3	1	2	1	3

ASP-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	3	2	3	3	2	2	3	3	1
	CO2	2	3	1	3	2	2	2	2	2
	CO3	1	2	2	3	3	1	2	2	1
	CO4	2	3	2	1	3	3	3	1	1
	CO5	1	3	2	2	1	2	3	2	3

HME-101	PO									
CO		1	2	3	4	5	6	7	8	9
	CO1	3	2	2	3	2	2	2	2	2
	CO2	2	2	2	2	2	2	2	3	2
	CO3	2	3	2	1	2	2	3	1	2
	CO4	2	2	2	2	3	3	3	3	2
	CO5	3	2	3	1	3	2	3	2	3

PSO-PO Mapping

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment Level*	2.20	1.59	1.34	0.73	1.34	0.37	1.47	1.10	0.98	0.98	1.96	2.20	1.83	1.10

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture I year (II Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme						Duration of Exam Hours	Credits	Theory/ Practical
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total	Grand Total			
1	GENETICS AND PLANT BREEDING	AGN-T-101	Fundamentals of Genetics	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
2		AGN-P-101	Fundamentals of Genetics	0	2	**20**	-	**30**	-	**50**			1	
3	MICROBIOLOGY	AMB-T-101	Agricultural Microbiology	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
4		AMB-P-101	Agricultural Microbiology	0	2	**20**	-	**30**	-	**50**			1	
5	AGRICULTURAL ENGINEERING	AEN-T-101	Soil and Water Conservation Engineering	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
6		AEN-P-101	Soil and Water Conservation Engineering	0	2	**20**	-	**30**	-	**50**			1	
7	BIOCHEMISTRY/ PHYSIOLOGY / MICROBIOLOGY/ ENVIRONMENTAL SCIENCES	ACP-T-101	Fundamentals of Crop Physiology	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
8		ACP-P-101	Fundamentals of Crop Physiology	0	2	**20**	-	**30**	-	**50**			1	
9	AGRICULTURAL ECONOMICS	AEC-T-101	Fundamentals of Agricultural Economics	2	0	**20**	**30**	-	**50**	**100**	**100**	**3**	2	T

10	PLANT PATHOLOGY	APP-T-101	Fundamentals of Plant Pathology	3	0	-	**20**	-	**30**	**50**	**100**	**3+3**	3	T+P
11		APP-P-101	Fundamentals of Plant Pathology	0	2	**20**	-	**30**	-	**50**			1	
12	ENTOMOLOGY	AET-T-101	Fundamentals of Entomology	3	0	-	**20**	-	**30**	**50**	**100**	**3+3**	3	T+P
13		AET-P-101	Fundamentals of Entomology	0	2	**20**	-	**30**	-	**50**			1	
14	AGRICULTURAL EXTENSION and COMMUNICATION	AEX-T-102	Fundamentals of Agricultural Extension Education	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
15		AEX-P-102	Fundamentals of Agricultural Extension Education	0	2	**20**	-	**30**	-	**50**			1	
16	AGRICULTURAL EXTENSION and COMMUNICATION	AEX-T-103	Communication Skills and Personality Development	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
17		AEX-P-103	Communication Skills and Personality Development	0	2	**20**	-	**30**	-	**50**			1	
18				**Total credit**									**24(16+8)**	

1. **1. Fundamentals of Genetics (AGN-T-101/AGN-P-101) 3(2+1)**

Course Outcomes:

1. Explain the scope of studying genetics and cell division,probability, dominance relationship and epistasis.
2. Explain Mendel's law of inheritance and pattern of inheritance genetics linkage and crossing over
3. Explain the structure of DNA and its replication, central dogma of molecular biology protein synthesis and lac-operon concept
4. Describe genes structure, chromosomes; explain pleiotropism, pseudo-alleles sex linkage, chromosome aberration and mutation.
5. Describe Mutation, Qualitative & Quantitative traits cytoplasm inheritance, genetic disorder and Multiple alleles.

2. **Agricultural Microbiology** (AMB-T-101/ AMB-P-101)**2(1+1)**

Course Outcomes:

1. Acquaint with basic terms of microorganisms, prokaryotic and eukaryotic microbes, microbial growth, pure culture, microbial association, soil fertility, symbiotic, associative and a symbiotic of microbes, bio-fertilizers, bio-pesticides, bio-degradation, etc.
2. Develop the understanding of the role of microbes in soil fertility, crop production and human welfare.
3. Develop the skills in utilization of various methods, equipment, laboratory tools, glassware, etc. for isolation, identification, preservation, classification and utilization of useful microbes.
4. Develop the ability to differentiate useful, virulent and non-useful microbes.

3. **Introductory Soil and Water Conservation Engineering** (**AEN-T-101/ AEN-P-101) 2(1+1)**

Course Outcomes:

1. To know about soil erosion via water various causes of soil erosion and forms of water erosion, classification of gully control measures or structures.
2. Course will give the knowledge of soil loss equation and it can estimate long – term annual soil loss and guide conservationists on proper cropping, management, and conservation practices.
3. This course will help the students to learn about Contour strip cropping designed to minimize soil erosion and Contour bunds which can save soils from erosion.

4. By this course students get the knowledge about Grassed waterways designed to move surface water across farmland without causing soil erosion and various water harvesting techniques.
5. Students will be able to understand the wind erosion, centrifugal pumps and various pressurized irrigation methods. So overall the importance of this technology in farm is given to students by teaching this course.

4.Fundamentals of Crop Physiology (ACP-T-101/ ACP-P-101)2(1+1)

Course Outcomes:

1. Role of crop physiology in crop health plant cell diffusion osmosis and absorption of water
2. Identification of deficiency symptoms of nutrients and mineral nutrition
3. To understand the metabolic and synthetic pathway of bio molecules photosynthesis
4. To know the difference between C3, C4 and CAM plant respiration glycolysis and fat metabolism
5. To understand Importance of growth hormone in plant and its function and type of plant hormone

6. Fundamentals of Agricultural Economics (AEC-T-101)2(2+0)

Course Outcomes:

CO1. To be able to acquire knowledge and analytical skills in addressing the issues of economics and agricultural economics.

CO2. Understanding of the basic concepts and law of economics.

CO3. Understanding of the globalization, national income, tax and its impact on agricultural development and trade.

CO4. To be able to understand and synthesize the magnitude and structure of the markets, inflation and deflation, agriculture finance.

CO5. Understanding of the basic concepts, agricultural policies, banking system and its effect on sustainable agricultural development.

5.Fundamentals of Plant Pathology (APP-T-101/APP-P-101)4(3+1)

Course Outcomes:

1. Imparting concepts, nomenclature, classification and characters of pathogens.

2. Understanding of disease identification, nature of pathogens and different strategies for management of plant diseases.
3. Applying different principles and methods for plant disease management.
4. Able to differentiate the fungicides and antibiotics (mode of action and formulations) on the basis of Nature of pathogen.
5. Develop the skills of crops diseases identification and marketing of relevant pesticides

7. **Fundamentals of Entomology (AET-T-101/AET-P-101)4(3+1)**

Course Outcomes:

1. Educate the basic concept of entomology, insect collection and preservation, dissection, and morphology of insects.
2. Develop an understanding of anatomy, physiology, the taxonomy of insects, and the effect of biotic and biotic factors on insects.
3. Demonstrate the principles of Pest surveillance, Pest forecasting, recent and traditional methods of pest management including IPM
4. Evaluating the economic importance of insects and eco-friendly control measures for pest management to sustainable agriculture.
5. Formulating the application of Insecticides and mass production techniques of Bio-control agents.

8. Fundamentals of Agricultural Extension Education (AEX-T-102/AEX-P-102)3(2+1)

Course Outcome:-

CO1. Acquaint the knowledge on concept, objectives, principles and philosophy of extension management

CO2. Develop an understanding on the process, steps, principles and monitoring and evaluation involved in agricultural extension programme development for transfer of technology

CO3. Develop the skills about genesis of agricultural extension, extension efforts in pre- and post independence era along with specific agricultural programmes

CO4. Apply new trends in agricultural extension like private extension, market led extension, expert systems, farmer led extension and cyber extension.

CO5. Evaluate different facets of rural development programmes, community development programmes, and rural leadership for capacity development of extension clienteles.

2. **Communication Skills and Personality Development (AEX-T-103/AEX-P-103)2 (1+1)**

Course Outcome:-

1.Students will be able to analyze basic communication skills and intercultural communication skills.

2. Students will be able to analyze interpersonal communication skills and public speaking communication skills.

3. Students will be able to learn about structural and functional grammar; meaning and process of communication, verbal and nonverbal communication.

4. Students will be able to listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

5. Students will also be able to understand reading and comprehension of general and technical articles, precise writing, summarizing, abstracting

CO-PO MAPPING

AGN-101	**PO**									
CO		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	CO1	1	1	1	1	1	1	1	1	1
	CO2	2	1	2	1	1	1	2	1	1
	CO3	1	2	1	2	2	1	1	1	1
	CO4	1	1	1	1	1	1	1	1	1
	CO5	1	1	3	2	1	2	1	1	1

ABB-101	**PO**									
CO		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	CO1	1	1	1	2	1	1	1	1	1
	CO2	3	1	2	1	1	1	3	2	1
	CO3	1	3	1	2	2	2	1	1	1
	CO4	1	1	1	1	3	1	1	1	1

AEN-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	1	1	1	1	1	1	1	1
	CO2	2	1	3	1	1	3	2	2	1
	CO3	3	2	1	2	2	1	1	1	2
	CO4	1	1	1	1	1	1	1	1	1
	CO5	1	1	2	2	1	2	1	1	1

ACP-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	1	2	1	1	1	1	-	1
	CO2	1	1	1	1	1	1	2	-	1
	CO3	2	1	1	2	2	1	1	-	1
	CO4	1	1	3	1	1	1	1	-	1
	CO5	1	2	1	2	1	1	1	-	1

AEC-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	3	3	3	1	3	3	3	0	1
	CO2	3	3	3	3	1	1	3	2	1
	CO3	3	1	3	2	2	2	1	1	1
	CO4	3	3	1	1	1	1	1	3	1
	CO5	3	3	2	2	1	2	1	1	3

APP-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	2	1	1	1	1	1	1	1
	CO2	1	3	3	3	1	1	3	2	1
	CO3	2	1	3	2	2	2	1	1	1
	CO4	2	3	1	1	1	1	1	1	1
	CO5	3	3	2	2	1	2	1	1	1

AET-101	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	1	2	1	1	1	1	1	1	1
	CO2	1	1	2	1	1	1	2	2	1
	CO3	2	1	1	2	2	2	1	1	1
	CO4	2	1	1	1	1	1	1	1	1
	CO5	1	2	2	2	1	2	1	1	1

AEX-103	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	3	3	2	2	3	3	2	2	1
	CO2	1	3	2	3	1	3	2	2	2
	CO3	3	3	3	3	2	3	2	2	1
	CO4	2	3	1	1	2	1	3	3	1
	CO5	2	3	2	2	1	2	3	3	3

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture II year (III Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme						Duration of Exam Hours	Credits	Theory/ Practical
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total	Grand Total			
1	AGRONOMY	AAG-T-201	Crop Production Technology – I (Kharif Crops)	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
2		AAG-P-201	Crop Production Technology – I (Kharif Crops)	0	2	**20**	-	**30**	-	**50**			1	
3	GENETICS AND PLANT BREEDING	AGN-T-201	Fundamentals of Plant Breeding	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
4		AGN-P-201	Fundamentals of Plant Breeding	0	2	**20**	-	**30**	-	**50**			1	
5	AGRICULTURAL ECONOMICS	AEC-T-201	Agricultural Finance and Cooperation	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
6		AEC-P-201	Agricultural Finance and Cooperation	0	2	**20**	-	**30**	-	**50**			1	
7	STATISTICS, COMPUTER APPLICATION AND IPR	ACS-T-201	Agri-Informatics	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
8		ACS-P-201	Agri-Informatics	0	2	**20**	-	**30**	-	**50**			1	
9	AGRICULTURAL ENGINEERIN	AEN-T-201	Farm Machinery and Power	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P

10	G	AEN-P-201	Farm Machinery and Power	0	2	**20**	**-**	**30**	**-**	**50**			1	
11	HORTICULTURE	AHR-T-201	Production Technology for Vegetables and Spices	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
12		AHR-P-201	Production Technology for Vegetables and Spices	0	2	**20**	**-**	**30**	**-**	**50**			1	
13	BIOCHEMISTRY/ PHYSIOLOGY / MICROBIOLOGY/ ENVIRONMENTAL SCIENCES	AES-T-201	Environmental Studies and Disaster Management	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
14		AES-P-201	Environmental Studies and Disaster Management	0	2	**20**	**-**	**30**	**-**	**50**			1	
15	STATISTICS, COMPUTER APPLICATION AND IPR	AST-T-201	Statistical Methods	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
16		AST-P-201	Statistical Methods	0	2	**20**	**-**	**30**	**-**	**50**			1	
17	ANIMAL PRODUCTION	AAP-T-201	Livestock and Poultry Management	3	0	-	**20**	-	**30**	**50**	**100**	**3+3**	3	T+P
18		AAP-P-201	Livestock and Poultry Management	0	2	**20**	**-**	**30**	**-**	**50**			1	
				Total credit									**23(14 +9)**	

1. Crop Production Technology-I (*Kharif*Crops) (AAG-T-201/AAG-P-201) 2(1+1)

Course Outcomes:

1. In the course study the students will be able to know about origin, geographical distribution, and
2. economic importance of Kharif crops
3. In the course study the students will be able to know about Soil and climatic requirements, varieties,cultural practices and yield of Kharif crops.
4. Analysis of comparative benefits of the different Kharif crops
5. Constraints in production of oilseeds and pulses maybe identified through course content.
6. Production technology of kharif cereals and millets fulfil the need of human consumption and milchcattle.

2. Fundamentals of Plant Breeding (AGN-T-201/AGN-P-201) 3(2+1)

Course Outcomes:

1. Establish the concept of plant breeding and idea about commercial plant breedingcompany to developed new superior crops varieties.
2. Develop the insect and disease resistant varieties for environment friendlymanagement of disease and insect with better understanding of genetic and plantmorphology.
3. Develop the idea of Plant Breeding to serve quality food in the market by developinghigh yield and nutritive varieties.
4. Increase the farm yield to get higher income on farm by developing higher yield cropvarieties.
5. Start a consultant company to guide & supply the better hybrid and varieties to thefarmers and to develop skill of molecular breeding.

3. Agricultural Finance and Co-Operation (AEC-T-201/ AEC-P-201) 3(2+1)

Course Outcomes (CO)

CO1: Explain the broad feature of Indian financial institutions with instruments to control credit in the country.

CO2: Effectively narrate the kinds and components of money with its regulatory system. Be aware of the functions, objectives and limitations of commercial bank.

CO3: Identify the existence and development of non- banking financial institutions, know the important role of mutual fund. LIC investment companies etc. Utilize and

effectively participate in the development process.

CO4: Understand about different financial statements and how agricultural cooperation works

CO5: Understand the role of agricultural cooperation institutions in India

4.**Agri-Informatics (ACS-T-201/ACS-P-201) 2(1+1)**

Course Outcomes (CO)

1. Acquaint with basic terms of software and hardware, input/output devices, database, World Wide Web, DBMS in Agriculture, ICT in Agriculture, etc.
2. Develop the understanding of application software, smart phone apps, programming languages, geospatial technology for generating valuable agri-information, decision support systems, etc.
3. Develop the skills in selection of input and output devices, software utilization, appropriate ICT tools, preparation of crop-planning using IT tools, etc.
4. Applythe 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 and smart phone apps in agriculture for farm advises market price, postharvest management, etc.

1. Farm Machinery and Power (AEN-T-201/AEN-P-201) 2(1+1)

Course Outcomes:

1. To understand the working principle of different systems and parts of internal combustion engines.
2. To equip the students with technical knowledge and skills required for the operation of Tillage, Sowing and intercultural.
3. To enable the plant protection machinery needed for agricultural farms.
4. To train the students with skills required for the operation, maintenance and evaluation of harvesting, threshing machinery needed for agricultural farms.

7.Production Technology for Vegetable and Spices (AHR-T-201/AHR-P-201) 2 (1+1)

Course Outcomes:

1. Students will understand practical knowledge on specialized production techniques of vegetables and spices.
2. Students understand will Importance of vegetables & spices in human nutrition improved and national economy.
3. Students will knowledge about quality requirement and production and techniques.

4. Managing skill for solving field problems.

7.Environmental Studies and Disaster Management (AES-T-201/AES-P-201) 3 (2+1)

Course Outcomes

1. Acquire the knowledge of the environment and its various challenges and understand the complexrelationships components of the environment.
2. Develop the skills in identification of useful natural resources and their management practices.
3. Aware about the factors sensitive to the environment and environmental challenges.
4. Understand the values, feelings and participation of society in protection activities of the environment. 5. Encourage to individual or community involvement to the overall benefit of the environment

8.Statistical Methods (AST-T-201/AST-P-201) 2(1+1)

Course Outcomes (CO)

1. Educate basics terms used in statistics and biostatistics.
2. Develop understanding of use of various formulas, principles and methods of statistical calculations used in agriculture.
3. Develop the skills in methods of collection of any type of data, classification of data, presentation of data, analysis of data, descriptive statistics, parametric and non-parametric tests, etc.
4. Develop the ability to analyze results of statistical calculations and their validation.
5. Develop the ability to make statistical hypothesis and design experiment in agriculture.

9.Livestock & Poultry Management (AAP-T-201/AAP-P-201) 4 (3+1)

Course Outcomes

Course Outcomes

1. Give knowledge of indigenous and exotic breeds of cattle, buffalo, sheep , goat and poultry birds (poultry, duck, fowl).
2. Develop the understanding of principles, planning, and technical approach for reproduction management in different farm animals. And introduce the diseases of livestock and poultry and its prevention (including vaccination schedule) and control of important diseases of livestock and poultry.
3. Develop the ability to select types of houses suited in specific climatic conditions for best management of calves, growing heifers and milch animals.

4. Develop the understanding digestion system of livestock and poultry, classification of feedstuffs, nutrients and their functions, feed supplements, feed additives and feeding of livestock and poultry and develop ability to calculate daily ration of cattle.
5. Visit of the IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records.

CO and PO Mapping

AAG-201	**PO**									
CO		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	CO1	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**1**
	CO2	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**2**
	CO3	**2**	**1**	**2**	**1**	**2**	**2**	**1**	**3**	**1**
	CO4	**2**	**2**	**1**	**2**	**2**	**1**	**1**	**2**	**1**
	CO5	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**
	CO6	**2**	**1**	**3**	**1**	**1**	**1**	**2**	**1**	**2**

AGN-201	**PO**									
CO		1	1	1	2	1	1	1	-	1
	CO1	2	1	1	1	1	1	1	-	1
	CO2	1	1	1	2	2	1	1	-	1
	CO3	1	1	1	1	1	1	1	-	1
	CO4	1	1	1	2	1	2	1	-	2
	CO5	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**2**	**2**

AEC-201	**PO**									
CO		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
	CO1	3	3	3	3	3	3	3	2	3
	CO2	3	1	2	1	2	1	2	2	2
	CO3	3	3	2	2	2	3	1	1	3
	CO4	2	1	2	3	2	1	1	1	3
	CO5	1	3	1	2	2	2	1	3	1

ACS-201	PO								
		1	2	3	4	5	6	7	8	9
CO	CO1	2	2	1	1	2	2	2	2	1
	CO2	2	1	2	1	2	1	2	2	2
	CO3	1	2	1	2	2	1	1	1	2
	CO4	2	1	2	3	2	1	1	1	2

AEN-201	PO								
		1	2	3	4	5	6	7	8	9
CO	CO1	2	3	1	1	1	1	1	2	1
	CO2	2	1	2	1	3	1	2	2	2
	CO3	1	2	1	2	2	1	1	1	2
	CO4	2	1	2	1	2	3	1	1	3

AHR-201	PO								
		1	2	3	4	5	6	7	8	9
CO	CO1	1	1	1	2	1	2	1	2	1
	CO2	2	1	2	1	2	1	2	1	2
	CO3	1	2	1	2	2	1	1	1	2
	CO4	2	1	2	1	2	2	1	1	1

AES-201	PO								
		1	2	3	4	5	6	7	8	9
CO	CO1	2	3	2	1	1	2	1	2	1
	CO2	2	1	2	1	2	1	2	1	2
	CO3	1	1	1	2	2	1	1	1	2
	CO4	2	2	2	1	2	2	1	1	1

AST-201	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	2	2	2	2	1	3	1	2	3
	CO2	2	1	3	1	3	1	2	1	1
	CO3	1	1	1	2	2	1	1	1	2
	CO4	3	2	2	1	1	2	1	1	1

AAP-201	PO								
CO		1	2	3	4	5	6	7	8	9
	CO1	2	1	2	2	1	2	1	2	2
	CO2	1	1	2	1	2	1	2	2	1
	CO3	1	3	1	2	2	3	1	1	1
	CO4	2	1	2	1	1	1	1	1	3
	CO5	1	3	1	2	2	2	1	3	1

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture II year (IV Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme						Duration of Exam Hours	Credits	Theory/ Practical
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total	Grand Total			
1	AGRONOMY	AAG-T-202	Crop Production Technology –II (Rabi Crops)	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
2		AAG-P-202	Crop Production Technology –II (Rabi Crops)	0	2	**20**	-	**30**	-	**50**			1	
3	HORTICULTURE	AHR-T-202	Production Technology for Ornamental Crops, MAP and Landscaping	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
4		AHR-P-202	Production Technology for Ornamental Crops, MAP and Landscaping	0	2	**20**	-	**30**	-	**50**			1	
5	AGRICULTURAL ENGINEERING	AEN-T-202	Renewable Energy and Green Technology	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
6		AEN-P-202	Renewable Energy and Green Technology	0	2	**20**	-	**30**	-	**50**			1	
7	SOIL SCIENCE & AGRICULTURAL CHEMISTRY	ASS-T-201	Problematic Soils and their Management	2	0	**20**	**30**	**0**	**50**	**100**	**100**	3	2	T

8	HORTICULTURE	AHR-T-203	Production Technology for Fruit and Plantation Crops	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
9		AHR-P-203	Production Technology for Fruit and Plantation Crops	0	2	**20**	-	**30**	-	**50**			1	
10	GENETICS AND PLANT BREEDING	AGN-T-202	Principles of Seed Technology	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
11		AGN-P-202	Principles of Seed Technology	0	4	**20**	-	**30**	-	**50**			2	
12	AGRONOMY	AAG-T-203	Farming System & Sustainable Agriculture	1	0	**20**	**30**	**0**	**50**	**100**	**100**	**3**	1	T
13	AGRICULTURAL ECONOMICS	AEC-T-202	Agricultural Marketing Trade & Prices	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
14		AEC-P-202	Agricultural Marketing Trade & Prices	0	2	**20**	-	**30**	-	**50**			1	
15	AGRONOMY	AAG-T-204	Introductory Agro-meteorology & Climate Change	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
16		AAG-P-204	Introductory Agro-meteorology & Climate Change	0	2	**20**	-	**30**	-	**50**			1	
17	ELECTIVE COURSE	AET-T-201*	Agrochemicals	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2*	T+P
18		AET-P-201*	Agrochemicals	0	2	**20**	-	**30**	-	**50**			1*	
19		AEC-T-203	Agribusiness Manageme	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P

			nt											
20		AEC-P-203	Agribusiness Management	0	2	**20**	-	**30**	-	**50**			1	
21		AGN-T-203	Commercial Plant Breeding	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
22		AGN-P-203	Commercial Plant Breeding	0	4	**20**	-	**30**	-	**50**			2	
23		AHR-T-204	Landscaping	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
24		AHR-P-204	Landscaping	0	2	**20**	-	**30**	-	**50**			1	
				Total credit									**19(11+8) + 3**	

1. Crop Production Technology-II (*Rabi* crops) (AAG-T-202/AAG-P-202) 2(1+1)

Course Outcomes (CO)

1. Acquaint the knowledge on the Rabi season crops, its classification (cereal crops, oilseed crops, pulse crops, sugar crops, fodder crops) and its importance in agriculture and national economy.
2. Discuss the production techniques of Rabi crops and their origin, economic importance, geographical distribution and botanical description.
3. Implement the sowing methods of Rabi crops in the field and their management.
4. Distinguish all Rabi crops (wheat, barley, pea, chickpea, mustard, sugarcane etc.) with their cultivation practices.

2. Production Technology for Ornamental Crops, MAPs and Landscaping (AHR-T-202/AHR-P-202)

2 (1+1)

Course Outcomes:

1. The production technology identifies causes of low production problems, quantify potential impacts, analyze options, identify viable solutions, and evaluate actions and consequences of treatments and interventions.

2. Identify different types of flower, ornamental and medicinal crops.
3. To planned and layout of garden and landscaping and its principles.
4. To perform intercultural operations in flowers and medicinal and aromatic crops.

3. Renewable Energy and Green Technology(AEN-T-202/AEN-P-202) 2(1+1)

Course outcome:

1. Students will be able to understand the role of renewable sources in agriculture sector.
2. Students will be able to evaluate and understand the bio fuel production and their applications in today's world.
3. Students will be able to understand and utilizing the solar energy in various aspects.
4. Students will be able to understand and learn the environmental aspects of non-conventional energy resources and know the need of renewable energy resources and latest developments.
5. Students will also be able to acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications

1. Problematic Soils and their Management(ASS-T-201/ASS-P-201) 2(2+0)

Course Outcomes

1. Students will be able to understand about waste land and problematic soils inIndia and management of the soils.
2. Students will be able to know the different reclamation and managementpractices for the development of the soils.
3. Students will be able to understand different factors responsible for saline,sodic and acidic soils and their properties.
4. Students will be able to use the fundamentals of soil science disciplines forthe reclamation of degraded soils.
5. Students will also be able to demonstrate fundamental knowledge to identifyproblematic soils and associated problems and identify processes resulting indeterioration of soil physical and chemical properties.

2. Production Technology for Fruit and Plantation Crops(AHR-T-203/AHR-P-203) 2(1+1)

Course Outcomes

1. Understand the diversity and importance of fruits, their culture and utilizationand Able to establish orchards of fruits and plantation crops.
2. Apply horticultural principles to the successful growth and production of fruitand plantation crops.
3. Synthesize and integrate information to solve fruit problems andcommunicate effectively within the discipline and also be able to transmitknowledge and skills to lay-persons in the general public.
4. Demonstrate competence with laboratory and/or field-based technologies used in modernhorticulture and anticipate and recognize problems, identifycauses of these problems, quantify potential impacts, analyze options, identifyviable solutions, and evaluate actions and consequences of treatments andinterventions.
5. Understand how global issues including climate change, energy use, wateravailability, and/or food safety impact sustainability of horticultural systemslocally, nationally, and globally and quantify economic importance of fruitsand plantation in managed ecosystems and the impact of horticultural crops infood systems.

3. Principles of Seed Technology (AGN-T-202/AGN-P-202) 3(1+2)

Course Outcomes:

1. Students will be able to define and types of seed, scope of seed technologist and relation of seed technology with other branches of agriculture.
2. Students will be able to understand different methodology of seed production for each crop.
3. Students will be able to evaluate and understand acts related to seed and at the end need of various act related to seed.
4. Students will be able to learn different method to assess the quality of seed and prevent seed from deterioration.
5. Students will also be able to understand importance and types of seed quality, seed storage and techniques of different seed treatment and seed marketing.

4. Farming System and Sustainable Agriculture (AAG-T-203)1(1+0)

Course Outcomes:

1. Student can able to understand about maximum possible return and profitability by different enterprises
2. A solid understanding of the utilization and conservation of available resources

3. To show how agricultural scientists are attempting to minimize agricultural pollution and sustain food production adequate for the increasing population
4. The student will be able to understand IFS model in different agro-climatic zones
5. The student will study about farming systems and sustainable agriculture

1. Agricultural Marketing, Trade and Prices (AEC-T-202/AEC-P-202) 3(2+1)

Course Outcomes:

CO1. Learning of marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange.

CO2. Understanding of the role of Govt. in agricultural marketing: Public sector institutions-CWC, SWC, FCI, CACP & DMI – their objectives and functions.

CO3. Gaining of knowledge of optimization of Resource use and Output Management: An efficient agricultural marketing system leads to the optimization of resource use and output management. An efficient marketing system can also contribute to an increase in the marketable surplus by scaling down the losses arising out of inefficient processing, storage and transportation. A well designed system of marketing can effectively distribute the available stock of modern inputs, and thereby sustain a faster rate of growth in the agricultural sector.

CO4. Evaluation of the efficient marketing system ensures higher levels of income for the farmers by reducing the number of middlemen or by restricting the commission on marketing services and the malpractices adopted by them in the marketing of farm products.

CO5. Understanding of the marketing system is essential for the success of the development programmes which are designed to uplift the population as a whole plan of economics.

2. Introductory Agro-meteorology& Climate Change (AAG-T-204/AAG-P-204) 2(1+1)

Course Outcomes:

1. To understand roles of agro meteorology in agriculture and its relation to other areas of agriculture to acquaint with recent developments in agro meteorology with historical development of climate change.
2. Agro meteorology or Agricultural meteorology studies meteorological and hydrological factors in relation to agriculture.
3. Agro meteorology studies the behaviour of the weather elements that have direct relevance to agriculture and their effect on crop production.
4. Weather and climate are the factors determining the success or failure of agriculture.

5. To develop weather based agro advisories to sustain crop production utilizing various.

Articulated attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	3	2	2	1	1	-	1	-	1	2	-	1
CO-2	2	2	2	1	-	1	-	-	1	2	2	1
CO-3	2	1	1	1	1	-	1	-	1	2	-	1
CO-4	2	1	1	1	-	1	-	-	1	1	1	1
Average	2.3	1.5	1.5	1	1	1	1	-	1	1.8	1.5	1

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	2	2	1	-	1	-	-	-	1	1	1
CO-2	2	2	2	-	-	-	1	-	-	2	1	1
CO-3	1	1	1	1	-	1	-	-	-	1	2	2
CO-4	1	1	1	2	-	-	1	-	-	1	2	2
Average	1.3	1.5	1.5	1.3	-	1.0	1.0	-	-	1.3	1.5	1.5

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	1	2	1	2	2	1	-	-	-	1	1	2
CO-2	1	1	2	2	1	1	-	-	-	1	1	2
CO-3	1	2	1	2	3	1	-	-	-	1	1	2
CO-4	1	1	1	2	2	1	-	-	-	1	1	2
Average	1.0	1.5	1.3	2.0	2.0	1.0	-	-	-	1.0	1.0	2.0

Articulated Attainment

COs	PO-1	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PO-	PSO	PSO	PSO

		2	3	4	5	6	7	8	9	-1	-2	-3
CO-1	1	1	1	1	1	2	1	-	-	1	3	1
CO-2	2	2	2	1	-	1	1	-	-	1	-	-
CO-3	1	1	-	1	2	-	1	-	-	2	-	2
CO-4	2	1	1	1	1	2	1	-	-	1	5	1
CO-5	1	1	-	1	2	-	1	-	-	2	-	2
Average	1.5	1.25	1.33	1	1.33	1.6	1	-	-	1.25	1.25	1

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3
CO-1	2	2	1	2	-	-	-	-	-	1	-	1
CO-2	1	2	2	-	-	-	-	-	-	-	-	-
CO-3	2	1	1	1	-	-	-	-	-	2	1	-
CO-4	1	1	2	-	-	-	-	-	-	-	1	-
CO-5	2	2	1	2	-	-	-	-	-	1	-	1
Average	1.5	1.5	1.5	1.0	-	-	-	-	-	0.75	0.5	0.25

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3
CO1	3	2	-	-	3	1	3	1	-	-	-	-
CO2	3	3	1	1	3	3	2	-	-	-	-	-
CO3	3	3	1	1	3	2	1	-	-	-	-	-
CO4	2	2	1	-	2	-	1	-	2	-	2	-
Average	2.75	2.5	1	1	2.75	2	1.75	1	2	-	2	-

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3
CO-1	3	2	2	1	1	-	1	-	1	2	-	1
CO-2	2	2	2	1	-	1	-	-	1	2	2	1
CO-3	2	1	1	1	1	-	1	-	1	2	-	1
CO-4	2	1	1	1	-	1	-	-	1	1	1	1

CO-5	2	1	1	1	-	1	-	-	1	1	1	1
Average	2.3	1.5	1.5	1.0	1.0	1.0	1.0	-	1.0	1.8	1.5	1.0

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	2	1	2	1	-	1	1	-	-	3	1	1
CO-2	1	2	-	1	-	1	2		-	2	1	1
CO-3	2	1	2	1	2	1	2	-	-	2	2	1
CO-4	1	1	1	1	2	1	1	-	-	1	3	1
CO-5	1	1	1	1	2	1	1	-	-	1	3	1

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	3	3	2	2	1	-	-	-	-	-	-	-
CO-2	3	3	2	2	3	-	-	-	-	-	-	-
CO-3	2	2	2	2	3	1	-	-	-	-	-	-
CO-4	3	3	2	2	3	-	-	-	-	-	-	-
CO-5	3	1	1	2	-	-	-	-	-	-	-	-
Average	2.8	2.5	1.8	2.2	2.2	1.0	-	-	-	-	-	-

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture III year (V Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme					Grand Total	Duration of Exam Hours	Credits	Theory/ Practical
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total				
1	PLANT PATHOLOGY	APP-T-301	Principles of Integrated Pest and Disease Management	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
2		APP-P-301	Principles of Integrated Pest and Disease Management	0	2	**20**	-	**30**	-	**50**			1	
3	SOIL SCIENCE & AGRICULTURAL CHEMISTRY	ASS-T-301	Manures, Fertilizers and Soil Fertility Management	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
4		ASS-P-301	Manures, Fertilizers and Soil Fertility Management	0	2	**20**	-	**30**	-	**50**			1	
5	ENTOMOLOGY	AET-T-301	Pests of Crops and Stored Grain and their Management	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
6		AET-P-301	Pests of Crops and Stored Grain and their Management	0	2	**20**	-	**30**	-	**50**			1	
7	PLANT PATHOLOGY	APP-T-302	Diseases of Field and Horticultural Crops and	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P

			their Management -I											
8		APP-P-302	Diseases of Field and Horticultural Crops and their Management -I	0	2	**20**	-	**30**	-	**50**			1	
9	GENETICS AND PLANT BREEDING	AGN-T-301	Crop Improvement-I (Kharif Crops)	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
10		AGN-T-301	Crop Improvement-I (Kharif Crops)	0	2	**20**	-	**30**	-	**50**			1	
11	AGRICULTURAL EXTENSION and COMMUNICATION	AEX-T-301	Entrepreneurship Development and Business Communication	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
12		AEX-P-301	Entrepreneurship Development and Business Communication	0	2	**20**	-	**30**	-	**50**			1	
13	AGRONOMY	AAG-T-301	Geoinformatics and Nano-technology and Precision Farming	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
14		AAG-P-301	Geoinformatics and Nano-technology and Precision Farming	0	2	**20**	-	**30**	-	**50**			1	
15	AGRONOMY	AAG-P-302	Practical Crop Production – I (Kharif crops)	0	4	**20**		**80**	**0**	**100**	**100**	3	2	P
16	Intellectual Property Rights	IPR-T-301	Intellectual Property Rights	1	0	**20**	**30**	**0**	**50**	**100**	**100**	3	1	T

17	Elective Course	AFT-T-301	Food Safety and Standards	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
18		AFT-P-301	Food Safety and Standards	0	2	**20**	-	**30**	-	**50**			1	
19		AET-T-302	Biopesticides & Biofertilizers	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
20		AET-P-302	Biopesticides & Biofertilizers	0	2	**20**	-	**30**	-	**50**			1	
21		AEN-T-301	Protected Cultivation	2	0	-	**20**	-	**30**	**50**	**100**	**3+3**	2	T+P
22		AEN-P-301	Protected Cultivation	0	2	**20**	-	**30**	-	**50**			1	
23		AHR-T-301	Micro propagation Technologies	1	0	-	**20**	-	**30**	**50**	**100**	**3+3**	1	T+P
24		AHR-P-301	Micro propagation Technologies	0	4	**20**	-	**30**	-	**50**			2	
				Total credit									**21(12+09)+ 3**	

1. Principles of Integrated Pest and Disease Management (APP-T-301/APP-P-301) 3(2+1)

Course Outcomes:

1. Students knowledgeable about the effects of biotic and abiotic factors on insect development, population growth, species interactions, physiological requirements and insect behaviour.
2. Students are skilled in determining pest levels and impact on plant and animal hosts and the management of these pests by Integrated Pest Management approach.
3. To be able to address complex problems facing entomology or toxicology professionals taking into account related ethical, social, legal, economic, and environmental issues.

4. To be able to surveillance and forecasting of insect pests and assessment of insect pest population and recent pest outbreaks and manage them by using different tools and recent methods pest management.
5. To Understands about different classes of insecticides, their formulation, toxicity, poisoning, first aid and antidotes and their effect on plants, animals and environment.

1. Manures, Fertilizers and Soil Fertility Management(ASS-T-301/ASS-P-301) 3(2+1)

Course Outcomes:

1. Knowledge of different manure and fertilizers used in different crops according to soil condition
2. To understand essentiality of plant nutrients and mechanism of nutrient transport to plant and factor affecting nutrient availability.
3. To be able about procedure of soil testing and establish soil testing laboratory in future as an entrepreneur.

1. Pests of Crops and Stored Grains and their Management (AET-T-301/AET-P-301)3(2+1)

Course Outcomes:

1. Familiarized with identification of different insect pest of field, horticulture, ornamentals, vegetables and stored grains at the field level.
2. Understand how insects affect animal and Plant health and agricultural production, and be able to safely manipulate populations of beneficial and destructive species in habitats and in production agro-ecosystems with minimal environmental impact.
3. To be able about the biology, diversity, distribution of insects, and their relationships to crop and the environment condition of a particular area.
4. To understand identification of nature of damage and symptoms caused by the pest so suitable technique of pest management can be apply for effective control.
5. Management of crop pest through Integrated Pest Management approach without side effect on plant, animal and environment health.

1. Diseases of Field & Horticultural Crops & their Management-I (APP-T-302/APP-P-302) 3(2+1)

2. Crop Improvement – I (*Kharif*) (AGN-T-301/AGN-P-301) 2(1+1)

Course Outcomes:

1. Learner learn importance of wild relative to produce new varieties of Kharif crop.
2. Learner learns gene preservation method for further use to improve Kharif varieties.
3. Learner learns to apply knowledge of genetics in breeding method to improve kharif crops.
4. Learner learns identification of resistance gene relate to kharif crop with high yield, quality and potential

against pest and pathogen.

5. Learner learns new genetic approaches to achieve hybrid production in Kharif crop.

3. Entrepreneurship Development and Business Communication (AEX-T-301/AEX-P-301) 2(1+1)

Course Outcomes:

1. Development of entrepreneurial competencies among students.
2. Students may learn about the principles to develop an Enterprise or any business unit.
3. Understanding of the key risks and the most effective processes in bringing different types of products or services to market.
4. Understanding different methods that can be used to minimize uncertainties atdifferent stages of the entrepreneurial process.
5. Understanding the dynamics of how teams develop and function as well as thevarious types of conflicts that can arise during teamwork.

4. Geoinformatics, Nano-technology and Precision Farming (AAG-T-301/AAG-P-301) 2(1+1)

Course Outcomes:

1. The concept of "doing the right thing in the right place at the right time" has a strong intuitive appeal which gives farmers the ability to use all operations and crop inputs more effectively.
2. More effective use of inputs results in greater crop yield and/or quality, without polluting the environment.
3. Precision agriculture can address both economic and environmental issues that surround production agriculture today.
4. Encourage the farmers to study of spatial and temporal variability of the input parameters using primary data at field level.
5. Creating awareness amongst farmers about consequences of applying imbalanced doses of farm inputs like irrigation, fertilizers, insecticides and pesticides.

5. Practical Crop Production-I *(Kharif Crops) (*AAG-P-302*)* 2(0+2)

Course Outcomes

1. In the course study students will be acquainted with the knowledge of profitable crop production technology.
2. Course content will help to students/farmers about ruminative crop production techniques.
3. It helps to adopt diversified farming system according to available farming situation.
4. It will assist to encourage the sustainable agriculture system.
5. Profitable based farming system can we adopted with the help of course content

6. Intellectual Property Rights (IPR-T-301) 1(1+0)

Course Outcomes:

1. Skill to understand the concept of intellectual property rights.
2. Develops procedural knowledge to Legal System and solving the problem relating to intellectual property rights.
3. Skill to pursue the professional programs in Company Secretary ship, Law, Business, Agriculture, International Affairs, Public Administration and Other fields.
4. Employability as the Compliance Officer, Public Relation Officer and Liaison Officer.
5. Establishment of Legal Consultancy and service provider.

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3
CO-1	1	1	1	1	1	2	1	-	-	2	2	1
CO-2	2	2	1	1	-	1	1	-	-	1	-	-
CO-3	1	2	-	1	2	-	1	-	-	2	-	2
CO-4	1	1	2	-	1	2	1	-	-	1	1	1
CO-5	1	-	2	1	1	-	-	-	-	-	-	1
Average	1.2	1.5	1.5	1	1.2	1.3	1	-	-	1.5	1.5	1.2

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3
CO-1	1	1	1	1	1	2	1	-	-	2	2	1

CO-2	2	2	1	1	-	1	1	-	-	1	-	-
CO-3	1	2	-	1	2	-	1	-	-	2	-	2
Average	1.2	1.5	1.5	1	1.2	1.3	1	-	-	1.5	1.5	1.2

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3
CO-1	1	2	2	1	1	2	1	-	-	2	1	1
CO-2	1	1	2	1	1	1	1	-	-	1	-	-
CO-3	2	1	-	1	-	-	1	-	-	2	-	2
CO-4	1	2	1	1	1	2	1	-	-	1	2	1
Average	1.3	1.5	1.3	1.0	1.0	1.3	1.0	-	-	1.5	1.5	1.0

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	2	1	1	1	1	-	-	-	-	-	-	-
CO-2	1	2	1	1	1	-	1	-	-	-	-	-
CO-3	1	1	1	2	-	-	1	-	-	-	-	-
CO-4	1	-	1	1	1	-	-	-	-	-	-	-
CO-5	-	1	1	1	-	-	1	-	-	-	2	-
Average	1.3	1.3	1.0	1.3	1.0	-	1.0	-	-	-	2.0	-

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	3	1	2	3	2	1	1	-	-	-	-	-
CO2	1	1	2	2	1	2	-	-	1	-	-	-
CO3	2	-	2	2	-	-	-	-	-	-	-	-
CO4	2	-	1	1	1	1	1	-	1	-	-	-
CO5	3	2	1	1	3	2	1	-	-	-	-	-
Average	2.2	1.3	1.6	1.8	1.8	1.5	1	-	1	-	-	-

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3
CO-1	3	3	2	1	2	2	2	3	3	1	1	1

CO-2	3	3	2	1	2	2	2	2	3	1	1	1
CO-3	2	2	1	-	1	1	1	2	3	1	-	1
CO-4	1	1	-	-	-	1	1	1	3	-	-	-
CO-5	3	3	2	1	2	2	2	2	3	1	1	1
Average	2.3	2.3	1.7	1.0	1.7	1.5	1.5	2.0	3.0	1.0	1.0	1.0

Articulated Attainment

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3
CO1	3	2	2	2	1	-	1	-	1	1	1	1
CO2	3	2	2	2	1	-	-	-	1	1	-	-
CO3	3	2	2	2	1	-	-	-	-	1	-	-
CO4	3	2	2	2	1	-	-	-	-	1	-	-
CO5	3	2	2	2	1	-	-	-	-	1	-	-
Average	3.0	2.0	2.0	2.0	1.0	-	-	-	-	1.0	1.0	1.0

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3
Average	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1	2	1	1	-	-	-	-	-	-
CO2	2	2	2	-	2	2	1	-	-	-	-	-	1
CO3	2	1	2	2	3	2	1	-	1	-	-	1	-
CO4	1	-	1	1	2	1	-	-	-	-	-	-	1
CO5	1	-	1	1	2	1	-	-	-	-	-	-	1
Average	2.0	2.0	1.8	1.3	2.3	1.5	1.0	-	1.0	-	-	1.0	1.0

SCHOOL OF AGRICULTURAL SCIENCES

SCHEME OF STUDIES AND EXAMINATION w.e.f.

B.Sc. (Hons.) Agriculture III year (VI Semester) Batch - 2022-26

Sl. No.	Subjects	Paper code No.	Name of paper	Teaching scheme Hrs/Weeks		Examination Scheme						Dura E H
				L	P	Internal Assessment	Mid Terms	Practical	End term exam	Total	Grand Total	
1	AGRONOMY	AAG-T-303	Rainfed Agriculture & Watershed Management	1	0	-	**20**	-	**30**	**50**	**100**	3
2		AAG-P-303	Rainfed Agriculture & Watershed Management	0	2	**20**	-	**30**	-	**50**		
3	AGRICULTURAL ENGINEERING	AEN-T-302	Protected Cultivation and Secondary Agriculture	1	0	-	**20**	-	**30**	**50**	**100**	3
4		AEN-P-302	Protected Cultivation and Secondary Agriculture	0	2	**20**	-	**30**	-	**50**		
5	PLANT PATHOLOGY	APP-T-303	Diseases of Field and Horticultural Crops and their Mgt. -II	2	0	-	**20**	-	**30**	**50**	**100**	3
6		APP-P-303	Diseases of Field and Horticultural Crops and their Mgt.-II	0	2	**20**	-	**30**	-	**50**		
7	HORTICULTURE	AHR-T-302	Post-harvest Management and Value Addition of Fruits and Vegetables	1	0	-	**20**	-	**30**	**50**	**100**	3
8		AHR-P-302	Post-harvest Management and Value Addition of Fruits and Vegetables	0	2	**20**	-	**30**	-	**50**		
9	ENTOMOLOGY	AET-T-303	Management of Beneficial Insects	1	0	-	**20**	-	**30**	**50**	**100**	3
10		AET-P-303	Management of Beneficial Insects	0	2	**20**	-	**30**	-	**50**		
11	GENETICS AND PLANT BREEDING	AGN-T-302	Crop Improvement-II (Rabi crops)	1	0	-	**20**	-	**30**	**50**	**100**	3
12		AGN-P-302	Crop Improvement-II (Rabi crops)	0	2	**20**	-	**30**	-	**50**		
13	AGRONOMY	AAG-P-304	Practical Crop Production – II (Rabi crops)	0	4	**20**		**80**	**0**	**100**	**100**	
14	AGRONOMY	AAG-T-305	Principles of Organic Farming	1	0	-	**20**	-	**30**	**50**	**100**	3

15		AAG-P-305	Principles of Organic Farming	0	2	**20**	-	**30**	-	**50**		
16	AGRICULTURAL ECONOMICS	AEC-T-301	Farm Management, Production & Resource Economics	1	0	-	**20**	-	**30**	**50**	**100**	3
17		AEC-P-301	Farm Management, Production & Resource Economics	0	2	**20**	-	**30**	-	**50**		
18	FOOD SCIENCE & TECHNOLOGY	AFT-T-302	Principles of Food Science and Nutrition	2	0	**20**	**30**	**0**	**50**	**100**	**100**	
19	Elective Course	AHR-T-303	Hi-tech. Horticulture	2	0	-	**20**	-	**30**	**50**	**100**	3
20		AHR-P-303	Hi-tech. Horticulture	0	**2**	**20**	-	**30**	-	**50**		
21		AAG-T-306	Weed Management	2	0	-	**20**	-	**30**	**50**	**100**	3
22		AAG-P-306	Weed Management	0	**2**	**20**	-	**30**	-	**50**		
23		AAG-T-307	System Simulation and Agro-advisory	2	0	-	**20**	-	**30**	**50**	**100**	3
24		AAG-P-307	System Simulation and Agro-advisory	0	**2**	**20**	-	**30**	-	**50**		
25		AEX-T-302	Agricultural Journalism	2	0	-	**20**	-	**30**	**50**	**100**	3
26		AEX-P-302	Agricultural Journalism	0	**2**	**20**	-	**30**	-	**50**		
				Total credit								

1. Rainfed Agriculture and Watershed Management (AAG-T-303/AAG-P-303) 2(1+1)

Course Outcomes:

1. Student can able to understand objective, principles and component of watershed management
2. Student can able to understand about rainfed agriculture and its introduction, problem and prospects in India and management of crops in rainfed areas
3. Student can able to understand about the soil and climatic conditions of rainfed areas
4. Student can able to understand about the drought , crop adaptation and mitigation to drought,

water conservation techniques and contingent crop planning for aberrant weather conditions.

5. Student can able to understand about the water harvesting and efficient utilization of water through soil and crop management practices

2. Protected Cultivation and Secondary Agriculture (AEN-T-302/AEN-P-302) 2(1+1)

Course Outcomes:

1. Students able to perform the various cultural practices under greenhouse such as drying and green house equipments.
2. To understand the response of plant to controlled conditions and irrigation system.
3. To understand the planning, design criteria cost and economic analysis of greenhouses.
4. Understanding the principle, theoretical aspects and developing skills in protected cultivation of horticultural crops.

3. Diseases of Field & Horticultural Crops & their Management-II (APP-T-303/APP-P-303**) 3(2+1)**

Course Outcomes (CO)

1. By the end of this course students studied symptoms, involved pathogens, disease cycle, best possible management practices available and able to resolve the problem of yield reduction in crops.
2. In this course students will be able to prepare culture, identify and understand the biology of pathogens in the laboratory.
3. Students will able to understand best possible management of field crops.
4. In this course students apply different fungicides and antibiotics (mode of action and formulations) on the basis of Nature of pathogen, manage crops disease corresponding to involved pathogen and examine loss in quality and yield.
5. By the end of this course students develop skills about detection and diagnosis of plant diseases and application of pesticides.

4. Post-harvest Management and Value Addition of Fruits and Vegetables (AHR-T-302/AHR-P-302) 2(1+1)

Course Outcomes:

1. To make the students aware of the new innovative technologies of processing, harvesting, drying and canning.

2. Prolong the post harvest storage life of horticultural commodities and increase income through value addition of the products and to reduce post harvest losses.
3. To understand the various packaging and storage methods for preservation of fruits and vegetables after post harvest.To learn the making various processed and fermented products.

5. Management of Beneficial Insects (AET-T-303/AET-P-303) 2(1+1)

Course Outcomes

1. Students can adopt apiculture, sericulture and lac culture as an entrepreneur according to agro climaticzone.
2. To understand commercial methods of rearing, equipment, seasonal management, insect pest anddisease and important species for commercial use of honey bee, silkworm and lac insect.
3. Identification of different bio control agents (Predator, Parasite and Parasitoids) and their use forsustainable pest management.
4. Learn about mass multiplication technique of biological control agents and established a bio control labin future as an entrepreneur.

6. Crop Improvement – II (*Rabi*) (AGN-T-302/AGN-P-302) 2(1+1)

Course Outcomes:

1. Learner learn importance of wild relative to produce new varieties of Rabi crop
2. Learner learns gene preservation method for further use to improve Rabi varieties
3. Learner learns to apply breeding method to improve Rabi crops and nature of gene action
4. Learner learns identification of resistance gene relate to Rabi crop with high yield, quality and potential against pest and pathogen and utilization genes
5. Learner learns new genetic approaches to achieve a definite ideotype of Rabi crop, hybrid production and climate resilient crop varieties

7. Practical Crop Production-II *(Rabi Crops)(AAG-P-304)* 2(0+2)

8. Principles of Organic Farming (AAG-T-305/AAG-P-305) 2(1+1)

Course Outcomes:

1. Helps in understanding the Concept, Principles, Scope and Opportunities of Organic Farming.

2. Helps in understanding the Role of an Organic Grower.

3. Can develop an organic production system

4. Use of various organic inputs for crop production.

5. Use of non-synthetic agents for crop production, will get some idea about organic certification.

6. It helps students can explain to the farmers what is organic farming, why it is needed today, how it can be promoted, how it can be used for more production in less cost, by Government of India What steps are being taken for this, and how farmers can increase the yield of their crop without using chemicals, as well as how to make their fields fertile.

1. Farm Management, Production and Resource Economics (AEC-T-301/AEC-P-301) 2(1+1)

Course Outcomes:

CO1: The course contains a comprehensive treatment of farm management and its concept traditional agricultural production economics topics employing both detailed graphics and differential calculus

CO2: Focus on cost and neoclassical factor-product, factor-factor and product- product models, and is suitable for an advanced undergraduate or a beginning graduate –level course in static production economics

CO3: Understand limited resources available in the economy. Realize the need to exploit and utilize through development and improvement of production techniques

CO4: Make them aware of the availability of rich natural endowments to achieve sustainable agricultural development with this knowledge they can challenge the problems of unemployment inequality shortage of food productions, poverty and be useful to compete advanced agricultural economies.

CO5: Gain knowledge of the causes of regional variations in productivity and production, social and economic inequality, size of land holdings and lack of quality inputs etc. And suggest appropriate measures for the whole economy.

2. Principles of Food Science and Nutrition (AFT-T-302) 2(2+0)

Course Outcomes

1. Students will be able to critically evaluate information on food science and nutrition issues appearing in the popular press.

2. Students will be able to discuss the important pathogen and spoilage microorganism in foods.
3. Students will be able to discuss basic principles and practices of cleaning and sanitation in food preparation operation.
4. Students will be able to identify and explain nutrients in foods and the specific functions in maintaining health.

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	1	1	-	1	-	1	2	-	1	1
CO-2	2	2	2	1	1	1	-	-	1	2	2	1	1
CO-3	2	2	1	2	1	-	1	-	1	2	-	1	-
CO-4	2	1	2	1	-	1	-	-	1	1	1	1	1
Average	2.3	1.8	1.8	1.3	1.0	1.0	1.0	-	1.0	1.8	1.5	1.0	1.0

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	1	1	-	1	1	-	-	1	1	2	-
CO-2	2	1	-	2	-	-	-	-	-	-	2	1	1
CO-3	1	-	2	-	-	1	-	-	-	2	-	1	2
CO-4	1	2	2	1	-	2	1	-	-	1	2	2	2
Average	1.5	1	1.3	1	-	1	-	-	-	1	1.3	1.5	1.3

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO-2	1	2	1	1	1	-	2	-	-	-	-	-	3

CO-3	1	1	1	2	-	-	1	-	-	-	-	-	-
CO-4	1	-	1	1	1	-	-	-	-	-	-	-	1
CO-5	-	1	1	1	-	-	3	-	-	-	2	-	2
Average	1.3	1.3	1.0	1.3	1.0	-	2.0	-	-	-	2.0	-	2.0

Articulated attainment

Cos	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PsO 1	PSO 2	PSO 3	PSO 4
CO1	3	-	1	-	-	-	-	-	-	1	-	-	-
CO2	2	1	-	2	-	1	-	-	-	-	2	-	-
CO3	2	1	-	2	-	1	-	-	-	-	2	-	-
CO4	-	-	1	1	-	1	1	-	1	-	-	1	-
Average	2.3	1.0	1.0	1.6	-	1.0	1.0	-	1.0	-	2.0	1.0	-

Articulated attainment

Cos	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	Ps O1	PS O2	PS O3	PS O-4
CO1	3	2	2	-	1	-	-	-	-	-	2	1	-
CO2	2	1	2	-	-	-	-	-	-	-	1	-	1
CO3	1	2	1	-	2	-	-	-	-	-	-	-	-
CO4	2	2	2	-	1	-	-	-	-	-	1	-	1
Averag e	2	1.8	1.8	-	1.3	-	-	-	-	-	1.3	1.0	1.0

Articulated Attainment

COs Pos	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PS O1	PS O2	PS O3	PS O4
CO1	3	1	2	-	2	1	1	-	-	-	-	-	-
CO2	1	1	2	-	1	2	-	-	1	-	-	-	-

CO3	2	-	2	-	-	-	-	-	-	-	-	-	-
CO4	2	-	1	-	1	1	1	-	1	-	-	-	-
CO5	3	2	1	-	3	2	1	-	-	-	-	-	-
Average	2.2	1.3	1.6	-	1.8	1.5	1	-	1	-	-	-	-

Articulated Attainment

Cos	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PS O1	PS O2	PS O3	PS O4
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3
Average	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PS O-1	PS O-2	PS O-3	PS O-4
CO-1	1	1	1	-	1	2	1	-	-	-	2	1	-
CO-2	1	2	2	-	-	1	1	-	-	1	-	-	1
CO-3	1	1	1	-	2	-	1	-	-	2	-	2	1
CO-4	1	2	1	-	1	2	1	-	-	1	1	1	2
CO-5	1	1	1	-	2	-	1	-	-	2	-	2	1
CO-6	1	2	1	-	1	2	1	-	-	1	1	1	2
Average	1.0	1.5	1.3	-	1.3	1.6	1.0	-	-	1.3	1.5	1.0	1.3

Articulated Attainment

Cos	PO-1	PO -2	PO -3	PO -4	PO -5	PO -6	PO -7	PO -8	PO -9	PS O-1	PS O-2	PS O-3	PS O-4
CO-1	1	1	2	1	-	1	1	-	-	3	1	1	1
CO-2	1	1	-	1	-	1	2	-	-	2	1	1	1

CO-3	2	1	2	1	2	1	2	-	-	2	2	1	1
CO-4	1	1	2	1	2	2	1	-	-	1	2	1	1
CO-5	1	1	2	1	2	2	1	-	-	1	2	1	1
Average	1.3	1.0	1.5	1.0	1.0	1.3	1.5	-	-	2.0	1.5	1.0	1.0

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PsO 1	PSO 2	PSO 3	PSO 4
CO1	1	-	-	-	-	-	-	-	-	1	-	-	-
CO2	2	-	1	-	1	-	1	-	2	-	1	1	2
CO3	2	-	1	-	1	-	1	-	2	-	1	1	2
CO4	1	-	-	-	-	-	-	-	-	1	-	-	-
Average	1.5	-	1	-	1	-	1	-	2	1	1	1	2

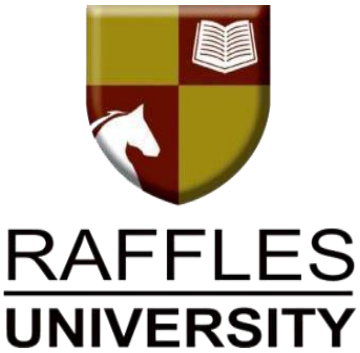
SCHOOL OF AGRICULTURAL SCIENCES			
SCHEME OF STUDIES AND EXAMINATION w.e.f.			
B.Sc. (Hons.) Agriculture IV year (VII Semester) Batch - 2022-26			
Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE &AIA)			
Sl. No.	**Activities**	**No. of weeks**	**Credit Hours**
1	General orientation & On campus training by different faculties	1	14
2	Village attachment	8	
	Unit attachment in Univ./ College. KVK/ Research Station Attachment	5	
3	Plant clinic	2	2
	Agro-Industrial Attachment	3	4
4	Project Report Preparation, Presentation and Evaluation	1	
Total weeks for RAWE & AIA		20	20

SCHOOL OF AGRICULTURAL SCIENCES			
SCHEME OF STUDIES AND EXAMINATION w.e.f.			
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2	Village attachment	8	
	Unit attachment in Univ./ College. KVK/ Research Station Attachment	5	
3	Plant clinic	2	2
	Agro-Industrial Attachment	3	4
4	Project Report Preparation, Presentation and Evaluation	1	
Total weeks for RAWE & AIA		20	20

B.Sc. (Hons.) Agriculture IV year (VIII Semester) Batch - 2021-25		
Sl.No.	**Title of the Module**	**Credits**
1	Production Technology for Bioagents and Biofertilizer	0+10
2	Seed Production and Technology	0+10
3	Mushroom Cultivation Technology	0+10
4	Soil, Plant, Water and Seed Testing	0+10
5	Commercial Beekeeping	0+10
6	Poultry Production Technology	0+10
7	Commercial Horticulture	0+10
8	Floriculture and Landscaping	0+10
9	Food Processing	0+10
10	Agriculture Waste Management	0+10
11	Organic Production Technology	0+10
12	Commercial Sericulture	0+10
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 package of modules in the VIII semester.		

B.Sc. (Hons) Agriculture

Syllabus(2022-2026)



Department of Agricultural Sciences

RAFFLES UNIVERSITY
Japanese Zone, National Highway-48, Neemrana-301705,
District: Alwar, RAJASTHAN, INDIA www.rafflesuniversity.edu.in

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Fundamentals of Horticulture **Paper Code: (AHR-T-101/AHR-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Horticulture-Itsdefinitionandbranches,importanceandscope;horticulturalandbotanical classification;climateandsoilforhorticulturalcrops.

UNIT-II

Plantpropagation-methodsandpropagating structures; Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning.

UNIT-III

Juvenility and flower bud differentiation; unfruitfulness; pollination,pollinizersandpollinators;fertilizationandparthenocarpy.

UNIT-IV

Medicinalandaromatic plants; importance of plant bio-regulators in horticulture.Irrigation methods, Fertilizer application in horticulturalcrops.

Practical

Identificationofgardentools.Identificationofhorticulturalcrops.Preparationofseedbed/ nurserybed.Practiceofsexualandasexualmethodsofpropagationincludingmicro-propagation. Layoutandplantingoforchard.Trainingandpruningoffruittrees.Preparationofpottingmixture.Fertilizer applicationindifferentcrops.Visitstocommercialnurseries/orchard.

Recommended Books:

1. Parthasvathy. V. A. Chattopadhyay. P.K. and Bose.T.K., Plantation Crops.NayaProkash, Kolkatta 2006
2. Bose. T.K., Kabir.J.,Das.P. &Joy.P.P., Tropical Horticulture. NayaProkash. Calcutta 2000
3. Bal. J.S., Fruit Growing. Kalyani Publisher, New Delhi 1997
4. Singh. S.P., Commercial Fruits.Kalyani Publishers, New Delhi 1997

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Fundamentals of Plant Biochemistry and Biotechnology **Paper Code: (ABB-T-101/ABB-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Importance of Biochemistry.Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharide's, Reducing and oxidizing properties of Monosaccharide's, Mutarotation; Structure of Disaccharides and Poly saccharides. Lipid:Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids.

UNIT-II

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. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

UNIT-III

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, another 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-IV

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/ Mono-saccharides. 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 on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.

Recommended Books:

1. Lehninger AL, Principles of Biochemistry, Freeman and Company, USA2004
2. Goodwin, TW and Mercer EI, Introduction to Plant Biochemistry, Progamon Press Inc. Deffered UK

1998
3. Sahney SK and Singh RR, Introductory Practical Biochemistry, Narosa Publishing House, New Delhi 2002
4. Yadav VK and Yadav N, Biochemistry and Biotechnology-A laboratory Manual, Pointer Publishers, Jaipur 2007

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Fundamentals of Soil Science **Paper Code: (ASS-T-101/ASS-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Soilasanaturalbody,Pedologicalandedaphologicalconceptsofsoil;Soilgenesis:soilforming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components ofsoil;Soilphysicalproperties:soil-texture,structure,densityandporosity,soilcolour,consistence and plasticity.

UNIT-II

Elementary knowledge of soil taxonomy classification and soils of India; Soilwater retention, movement and availability; Soil air, composition, gaseous exchange, problem andplantgrowth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth.

UNIT-III

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.

UNIT-IV

Soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and micro organisms, their beneficial and harmful effects; Soil pollution - behaviour 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.

Recommended Books:

1. Sharma, N.L. & Singh, T.B. Soil Science, Rama pub. House, BarotMerrut(U.P) 1996
2. Das, D.K. Introductory Soil Science, Kalyani publisher, New Delhi 2002
3. Mehra R.K. Text book of Soil Science, ICAR, New Delhi 2004

4. Biswas, T.D. and Mukherjee, S.K. Text book of soil science. Tata McGraw Hill publishing Co. Ltd, New Delhi 2006

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Introduction to Forestry **Paper Code: (AES-T-101/AES-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, and salient features of Indian Forest Policies. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration objectives, choice between natural and artificial regeneration, essential preliminary considerations.

UNIT-II

Crown classification, Tending operations – weeding, cleaning, thinning-: mechanical, ordinary, crown and advance thinning. Forest menstruation – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method.

UNIT-III

Instrumental methods of height measurementgeometric 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.

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Comprehension and Communication Skills in English **Paper Code: (ECT-T-101/ECT-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

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.

Lecture Per Week : 4

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Fundamentals of Agronomy **Paper Code: (AAG-T-101/AAG-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Cropnutrition,manuresandfertilizers,nutrientuseefficiency.

UNIT-II

Waterresources,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,cropweedcompetition,conceptsofweedmanagement-principlesandmethods,herbicides-classification,selectivityandresistance,allelopathy.

UNIT-IV

Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotationanditsprinciples,adaptationanddistributionofcrops,cropmanagementtechnologies inproblematicareas,harvestingandthreshingofcrops.

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.

Recommended Books:

1. De, Gopal Chandra, Fundamentals of Agronomy. Oxford & IBH Publishing Co., New-Delhi 1989
2. ICAR, Handbook of Agriculture, Indian Council of Agricultural Research, New-Delhi 1989
3. Michael, A.M. and Ojha, T.P. Principles of Agricultural Engineering, Vol.II Jain Brothers , New Delhi. 1986
4. Morachan, Y.B., Crop production and management, Oxford & IBH Publishing Co., New-Delhi 1986

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Introductory Biology **Paper Code: (ABI-T-101/ABI-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

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 flowing 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.

Recommended Books:

1. Biology NCERT 2015
2. General Biology I: Molecules, Cells and Genes Dog Ear Publishing, LLC 2017
3. General Biology II: Organisms and Ecology Dog Ear Publishing, LLC 2017

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Elementary Mathematics **Paper Code: (AEM-T-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

THEORY

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 st. 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 diameters 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 problems on limit, Simple problems on continuity, Differentiation of xn , ex , 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).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.

Recommended Books:

1. Algebra: Hall & Knight
2. Trigonometry: S.L. Loney

3. Coordinate- Geometry: S. L. Loney
4. Differential –Calculus: Gorakh-Prasad

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Agricultural Heritage **Paper Code: (AEX-T-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

UNIT-I

Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture; Past and present status of agriculture and farmers in society.

UNIT-II

Journey of Indian agriculture and its development from past to modern era; Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world.

UNIT-III

Agriculture scope; Importance of agriculture and agricultural resources available in India; Crop significance and classifications.

UNIT-IV

National agriculture setup in India;Current scenario of Indian agriculture; Indian agricultural concerns and future prospects

RAFFLES UNIVERSITY

Lecture Per Week : 1

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Rural Sociology & Educational Psychology **Paper Code: (ASP-T-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology, Rural society, Social Groups.

UNIT-II

Social Stratification, Culture concept, Social Institution, Social Change & Development.

UNIT-III

Educational psychology: Meaning & its importance in agriculture extension.

UNIT-IV

Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

Recommended Books:

1. Bhatia, H.R. A Text Book of Educational Psychology, Asia Publishing House, New Delhi 1965

2. Chitamber, J.B., Introductory Rural Sociology: Willey Easter Ltd. New Delhi. 1990

3. Dhama, O.P. &Bhatnagar, O.P., Education & Communication for Development,

RAFFLES UNIVERSITY

Lecture Per Week : 1

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Human Value and Ethics **Paper Code: (HME-T-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Values and Ethics-An Introduction.Goal and Mission of Life.

UNIT-II

Vision of Life.Principles and Philosophy.Self Exploration.Self Awareness.Self Satisfaction.

UNIT-III

Decision Making.Motivation.Sensitivity.Success.Selfless Service.Case Study of Ethical Lives.

UNIT-IV

Positive Spirit.Body, Mind and Soul.Attachment and Detachment.Spirituality Quotient.Examination.

Recommended Books:

1. R.R. Gaur, R. Sangal and G.P. Bagaria A Foundation Course in Human Values and Professional Ethics 2010

2. Govindarajan M Professional Ethics &Human Value 2013

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : **Fundamentals of Genetics** **Paper Code: (AGN-T-101/AGN-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

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.Chromosomal theory of inheritance- cell cycle and cell division- mitosis and meiosis.Probability and Chi-square.Dominance relationships, Epistatic interactions with example.

UNIT-II

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. Structural and numerical variations in chromosome andtheir implications, Use of haploids, dihaploids and doubled haploids in Genetics.Mutation, classification, Methods of inducing mutations & CIB technique, mutagenic agents and induction of mutation.

UNIT-III

Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance.Genetic disorders.Nature, structure & replication of genetic material.

UNIT-IV

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, Experiments 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.

Recommended Books:

1.Singh, B.D., Plant Breeding. Kalyani Publishing House, New Delhi. 2005
2.Singh, P., Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, New Delhi.

2001
3.Singh, P., Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, New Delhi. 2001
4.Alard, R.W., Principles of Plant Breeding. John Willey & Sons, New York. 2000

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Agricultural Microbiology **Paper Code:** (AMB-T-101/ AMB-P-101)

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Agricultural Microbiology

Theory

UNIT-I

Introduction Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth.

UNIT-II

Bacterial genetics: 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. Biological nitrogen fixation- symbiotic, associative and asymbiotic.Azolla, blue green algae and mycorrhiza.Rhizosphere and phyllosphere.

UNIT-IV

Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel 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.

Recommended Books:

1. Mukherjee, N. and Ghosh T., Agricultural Microbiology, Kalyani Publishers, New Delhi. 1998.

2. Pelczar, Jr. Michel J. Chan, E.C.S. and Krieg, Noel R., Microbiology. Tata McGraw - Hill Edition, 1993. India. 1997.

3. Mukherjee, N. and Ghosh T., Agricultural Microbiology, Kalyani Publishers, New Delhi. 1998.

4. Rao, N.S., Soil Microbiology, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. 2000.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : **Introductory Soil and Water Conservation Engineering** **Paper Code: (AEN-T-101/ AEN-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Introduction to Soil and Water Conservation causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures.

UNIT-II

Soil loss estimation by universal Loss Soil Equation.Soil loss measurement techniques. Principles of erosion control: Introduction to contouring, strip cropping. Contour bund.

UNIT-III

Graded bund and bench terracing.Grassed water ways and their design.Water harvesting and its techniques.

UNIT-IV

Winderosion: 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 water ways.Design of contour bunds.Design of graded bunds.Design of bench terracing system.Problem on wind erosion.

Recommended Books:

1. Majumdar, D.K. Irrigation Water Management- Principles and Practice. Prentice Hall of India New-Delhi. 2004
2. Reddy,S.R. Principles of Crop Production , Kalyani Publishers, New-Delhi. 2000
3. Lenka, D. Irrigation and Drainage .Kalyani Publishers, New-Delhi. 1999
4. Sankara Reddy, G.H. and YellamandaReddi, T. Efficient use of Irrigation Water.Kalyani Publishers, NewDelhi. 1995
5. Parihar, S.S. and Sandhu, B.S. Irrigation of Field Crops- Principles and Practices, ICAR, New-Delhi. 1978

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : **Fundamentals of Crop Physiology** **Paper Code: (ACP-T-101/ ACP-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

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.

UNIT-II

Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants.

UNIT-III

Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown.

UNIT-IV

Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: 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 testfor mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO2 assimilation by Infra Red Gas Analyzer (IRGA).

Recommended Books:

1. N.K. Gupta &Sunita Gupta, Plant Physiology. Oxford & IBH Publication, New Delhi 2004 2. R.L. Agarwal, Seed Technology, Oxford & IBH Publication, New Delhi 1995
3. J.B. Salisbury and C.W. Ross. Plant Physiology, Wadswar Publishing Company, Belmont, California 1992
4. S.N. Pandey& B.K. Sinha.Vikas, Plant Physiology, Publishing House Pvt. Ltd., New Delhi. 1995

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : **Fundamentals of Agricultural Economics** **Paper Code: (AEC-T-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

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. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare.

UNIT-II

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.

UNIT-III

Production: process, creation of utility, factors of production, input output relationship. Laws of returns: Law of variable proportions and law of returns 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, shut down and break even points.

UNIT-IV

Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit. 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. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. Tax: meaning, direct and indirect taxes, agricultural taxation, VAT. Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

Recommended Books:

1. G.B. Jathar and S.G. Beri, Elementary Principles of Economics, Oxford University Press (10th Edition), Delhi. 1996

2. S.K. Mishra and V.K. Puri, Indian Economy, Himalaya Publishing House, New Delhi 1996 3. P.A. Samuelson & W.D. Nordhaus, Economics, McGraw-Hill, Singapore 1987
4. K.K. Dewett and J.D. Verma, Elementary Economic Theory, S.Chand& Company, New Delhi. 1986

RAFFLES UNIVERSITY

Lecture Per Week : 4

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Fundamentals of Plant Pathology **Paper Code: (APP-T-101/APP-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

Introduction: Importance of plant diseases, scope and objectives of PlantPathology, 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. *Nematodes:* General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (*Heterodera, Meloidogyne, Anguina, Radopholus*etc.)

UNIT-IV

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**.**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 withvarious laboratory equipmentsandmicroscopy.Collectionandpreservation 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**.**

Recommended Books:

1. Mehrotra, R.S. and Aggarawal, A. Plant Pathology. Tata McGraw Hill Publishing Co. Ltd., New Delhi. 2007
2. Agrios, G.N. Plant Pathology, Academic Press, New Delhi. 1996
3. Singh, R.S. Introduction to Principles of Plant Pathology. Oxford & IBH, New Delhi. 1996
4. Alexopolus, C.J., Mims, C.W. and Blackwell, M. Introductory Mycology, John Wiley Estern Private Limited, New York. 1996

RAFFLES UNIVERSITY

Lecture Per Week : 4

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Fundamentals of Entomology **Paper Code: (AET-T-101/AET-P-101)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark.*

Theory

UNIT-I

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropodaupto 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.Metamorphosis and diapause in insects.Types of larvae and pupae.Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects.Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

UNIT-II

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- III

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 – IV

Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insectaupto

Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera:Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae, Tephritidae.

Practical

Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Blister beetle; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus. Types of insect larvae and pupae; Dissection of digestive system in insects (Grasshopper); Dissection of male and female reproductive systems in insects (Grasshopper); Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance. Insecticides and their formulations.Pesticide appliances and their maintenance.Sampling techniques for estimation of insect population and damage.

Recommended Books:

1. ShravanHaldhar, Agricultural Entomology, New Vishal Publication, New Delhi
2. T. V. Prasad, Handbook of Entomology, New Vishal Publication, New Delhi
3. S. V. Sai Prasad, Agri Facts – Entomology & Nematology, New Vishal Publication, New Delhi
4. K. SankariMeena, P. Manji, Glimpses of Crop Protection, New Vishal Publication, New Delhi
5. K. SankariMeena, P. Manji, Plant Nematology - a quick glance, New Vishal Publication, New Delhi

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : **Fundamentals of Agricultural Extension Education** **Paper Code: (AEX-T-102/AEX-P-102)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selecting one question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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. 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.)

UNIT-II

Various extension/ agriculture development programs 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; 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.

Recommended Books:

1. Dhama, O.P. &Bhatnagar, O.P., Education and Communication for Development, Oxford & IBH

Publishing Co. New-Delhi. 1985
2. Kelsey, L.D. & Hearne, C.C., Cooperative Extension Work: Cornell University Press, New York, USA. 1963
3. Ray, G.L., Extension Communication and Management, NayaPrakash, 206 BidhanSarni, Calcutta-6. 2003
4. Reddy, A.A., Extension Education, ShriLaxmi Press, Baptala. 1993

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Communication Skills and Personality Development **Paper Code:(AEX-T-103/AEX-P-103)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Communication Skills: Structural and functional grammar; meaning and process of communication.

UNIT-II

Verbal and nonverbal communication; 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, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation.

UNIT-IV

Public speaking; Group discussion.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, precise writing, summarizing, abstracting; individual and group presentations.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Crop Production Technology-I (*Kharif*Crops) **Paper Code:(AAG-T-201/AAG-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif*crops. Cereals – rice, maize, sorghum, pearl millet and finger millet.

UNIT-II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Pulses-pigeonpea, mungbean and urdbean.

UNIT-III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Oilseeds- groundnut, and soybean.

UNIT-IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Fibre crops- cotton & jute; forage crops-sorghum, cowpea, cluster bean and napier.

Practical

Rice nursery preparation, transplanting of rice, sowing of soybean, pigeonpea and mungbean. 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 importantagronomic experiments at experimental farm. Study of forage experiments, morphological description of *kharif*season crops, visit to research centers of related crops.

Recommended Books:

2) Dr. Rajendra Prasad, Text book of Field crops production Volume-I & II, Publisher ICAR, New Delhi.
3) S.R. Reddy &Ramu Y. Reddy, Agronomy of Field Crops, Kalyani Publishers 2006
4) U.S.Walia, Science of Agronomy, Scientific Publishers 2012
5) P. Balasubrananiyan, S.P.Palaniappan, Principles and Practices Of Agronomy, Agrobios India 2010
6) S.R. Reddy., Principles of Agronomy, Kalyani Publishers 2015

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Fundamentals of Plant Breeding **Paper Code: AGN-T-101/AGN-P-101**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Historical development, concept, nature and role of plant breeding, majorachievements and future prospects; Genetics in relation to plant breeding, modes of reproductionandapomixes, self-incompatibilityandmale-sterility- genetic consequences, cultivar options.

UNIT-II

Domestication, Acclimatization and Introduction; Centre's 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; Multiline concept.

UNIT-III

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; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection.

UNIT-IV

Wide hybridization and pre- breeding; Polyploidy in relation to plant breeding.Mutation breeding-methods and uses; 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 segregationpopulations.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.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Agricultural Finance and Co-Operation **Paper Code: (AEC-T-201/ AEC-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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.

UNIT-II

Micro financing including KCC. 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.Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.

UNIT-IV

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 firsthand 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.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Agri-Informatics **Paper Code: (ACS-T-201/ACS-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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): Concepts and components.

UNIT-II

Introduction to computer programming languages, concepts and standard input/output operations.e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes.

UNIT-III

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 advises, 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.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Farm Machinery and Power **Paper Code: (AEN-T-201/AEN-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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 , Study of different components ofI.C. engine, I.C. engine terminology and solved problems.

UNIT-II

Familiarization with different systems of I.C. engines: 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-III

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-IV

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 drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different inter- cultivation equipment, Familiarization with harvesting and threshing machinery.

Recommended Books:

1. Michael, A.M. and T.P. Ojha. Principles of Agricultural Engineering.Vol. I. Jain Brothers, Jodhpur. 1987
2. Rai and Jain, Farm Tractors, Maintenance and Repair. Tata McGraw Hill Publ. New Delhi. 1989
3. Elements of Farm Machinery. Srivastava, A.C. Oxford IBH Publ. Company, New Delhi. 1989
4. Singhal, O.P., Elements of Agricultural Engineering, Vol. I & III.SurajPrakashan, Allahabad. 1989
5. Sahay and Jagdishwar, Element of Agricultural Engineering. Agro.Book Agency, New Chitragupta Nagar, Patna. 1990

RAFFLES UNIVERSITY

Lecture Per Week	**: 2**	
Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Production Technology for Vegetable and Spices**	**Paper Code: (AHR-T-201/AHR-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

UNIT-I

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices **Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin.**

UNIT-II

Brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices -**French bean, Peas Cole crops such as Cabbage, Cauliflower, Knol-khol.**

UNIT-III

Brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices **Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot.**

UNIT-IV

Brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable and spices **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.Fertilizers applications.Harvesting & preparation for market.Economics of vegetables and spices cultivation.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Environmental Studies and Disaster Management **Paper Code: (AES-T-201/AES-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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.

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-II

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). Biodiversity and its conservation: - Introduction,

definition, genetic, species & ecosystem diversity and bio-geographical 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.Hot-sports 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-III

Environmental Pollution: definition, cause, effects and control measures of: a. Air pollutionb. 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 urban and industrial wastes. Role of an individual in prevention of pollution.Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies. Wasteland reclamation.Consumerism and waste products.Environment Protection Act.Air (Prevention and Control of Pollution) Act.Water (Prevention and control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare.Role of Information Technology in Environment and human health.

UNIT-IV

Disaster Management

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.Disaster Management- Effect to migrate natural disaster at national and global levels.International strategy for disaster reduction.Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media.Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Practical

Pollution case studies. Case Studies- Field work: Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain, visit to a local polluted site-Urban/Rural/Industrial/ Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Statistical Methods **Paper Code: (AST-T-201/AST-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability.

UNIT-II

Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram.Karl Pearson's Coefficient of Correlation.Linear Regression Equations.

UNIT-III

Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table. Introduction to Analysis of Variance, Analysis of One Way Classification.

UNIT-IV

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 ×2 contingency table.Analysis of Variance One Way Classification.Analysis of Variance Two Way Classification.Selection of random sample using Simple Random Sampling.

Recommended Books:

1. C.H. Goulden, Method of Statistical Analysis.
2. G.W. Snedecor and W.G. Cochran, Statistical Methods.
3. R.G. Steel and J.H. Torrie, Principles and Procedures of Statistics (with special reference to Biological Sciences)
4. V.G. Panse and P.V. Sukhatme, Statistical Methods for Agricultural workers.
5. .Ram Singh Chandel, A Handbook of Agricultural Statistics.
6. R.Rangaswamy, A Text Book of Agricultural Statistics.

RAFFLES UNIVERSITY

Lecture Per Week **: 4**

Examination Time **: 3 Hrs** **Maximum Marks: 50 (20+30)**

Subject **: Livestock & Poultry Management** **Paper Code:(AAP-T-201/AAP-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Crop Production Technology-II (*Rabi* crops) **Paper Code: (AAG-T-202/AAG-P-202)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; **Cereals –wheat and barley**

UNIT-II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of **Pulses-chickpea, lentil, peas**

UNIT-III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of **Oilseeds-rapeseed, mustard and sunflower**

UNIT-IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of **Sugar crops-sugarcane; medicinal and aromatic crops-mentha, lemon grass**

and citronella, 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.

Recommended Books:

1. S.R. Reddy &Ramu Y. Reddy, Agronomy of Field Crops, Kalyani Publishers 2006
2. U.S.Walia, Science of Agronomy, Scientific Publishers 2012
3. P. Balasubrananiyan, S.P.Palaniappan, Principles and Practices Of Agronomy, Agrobios India 2010
4. S.R. Reddy., Principles of Agronomy, Kalyani Publishers 2015

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Production Technology for Ornamental Crops, MAPs and Landscaping**	**Paper Code: (AHR-T-202/AHR-P-202)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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, lilium 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. 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.

Recommended Books:

1. S.K. Bhatacharjee& L.C. De., Post Harvest Technology of Flowers and Ornamental Plants, M/s. Advance Books Shastri Nagar, Jaipur 2006
2. Bose,Maity,Dhua and Das, Floriculture and Landscaping, N.P Sales Pvt.Ltd 2014
3. J.S. Arora, Introduction to Floriculture, Kalyani Publishers 2001

4. G.S. Randhawa& A. Mukhopadhyay, Floriculture in India, Allied Publishers, New Delhi 2001

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Renewable Energy and Green Technology**	**Paper Code: (AEN-T-202/AEN-P-202)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Classification of energy sources, contribution of these of 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, bio-alcohol, biodiesel and bio-oil production and their utilization as bio-energy resource, introduction of solar energy, collection and their application.

UNIT-III

Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application.

UNIT-IV

Introduction of wind energy and their application.

Practical

Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier, 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.

Recommended Books:

1. Ghanshyan Das, Hydrology and Soil Conservation Engineering, McGraw Hill
2. Dutta SK., Soil Conservation and Land Management, International Distributors, Dehradun
3. Loucks D.P., Water Resource System Planning and Analysis, Prentice Hall

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Problematic Soils and their Management**	**Paper Code: (ASS-T-201/ASS-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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.

Recommended Books:

1. D. K. Das, Introductory Soil Science, Kalyani Publishers 2015
2. R.K Mehra, Textbook of Soil Science, ICAR Publication 2006
3. V.N. Sahai, Fundamentals of Soil, Kalyani Publishers 2015
4. A. Rathinasamy& B. BakiyathuSaliha, Fundamentals of Soil Science, Scientific Publisher 2014

4. Production Technology for Fruit and Plantation Crops(AHR-T-203/AHR-P-203) 2(1+1)

Theory

UNIT-I

Importance and scope of fruit and plantation crop industry in India; Importance of **rootstocks.**

UNIT-II

Production technologies for the cultivation of **major fruits-mango, banana, citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond.**

UNIT-III

Production technologies for the cultivation of **minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry.**

UNIT-IV

Production technologies for the cultivation of **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, Importantpests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchards.

Recommended Books:

1. S. N. Ghosh, Tropical & Sub Tropical Fruit Crops : Corp Improvement& Varietal Wealth 2 Vols Set, Narendra Publishing House 2014
2.Nirmal Sharma, V. K. Wali, ParshantBakshi, Biometrical Methods in Horticulture Sciences, New India Publishing Agency 2016
3.Dhillon& Bhatt, Fruit Tree Physiology, Narendra Publishing 2011
4.A.S. Salaria, B.S. Salaria, A2Z Solutions Horticulture at a Glance Vol. - I,(Fruits and Plantation Crops), Intellects - Nurture to Excel 2016

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Principles of Seed Technology **Paper Code: (AGN-T-202/AGN-P-202)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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.

UNIT-II

Foundation and certified seed production of important **cereals, pulses, oilseeds, fodder and vegetables**. Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement.

UNIT-III

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. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production.

UNIT-IV

Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage. 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, Pigeonpea, 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.

Recommended Books:

1. P.K. Agrawal, Principles of Seed Technology, Indian Council of Agricultural Research 2010
2. Phundan Singh, Principles of Seed Technology, Kalyani Publishers 2013
3. P. Ravishankar, G. Sarika, G.V. Basauaraju, A Text Book of Seed Science and Technology 2014
4. Phundan Singh, Seed Technology at a Glance, Kalyani Publishers 2016

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Farming System and Sustainable Agriculture**	**Paper Code: (AAG-T-203)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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.

UNIT-II

Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system; Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture.

UNIT-III

HEIA, LEIA and LEISA and its techniques for sustainability, 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.

Recommended Books:

1. S.R. Reddy., Principles of Agronomy, Kalyani Publishers 2015
2. P.L. Maliwal, Agronomy at a Glance, Jain Brothers 2013
3. S.C. Panda, Organic Farming for Sastainable Agriculture, Kalyani Publishers 2014
4. S.Krishnaprabu, Agronomy: Theory and Practice, Satish Serial Publishing House 2016

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Agricultural Marketing, Trade and Prices**	**Paper Code: (AEC-T-202/AEC-P-202)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Agricultural Marketing: Conceptsanddefinitions 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 agri-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 agri-commodities.

UNIT-II

Product life cycle (PLC) and competitive strategies: 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).

UNIT-III

Market functionaries and marketing channels: 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 futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-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 elasticity's**;** 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 a 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.

Recommended Books:

1. S.S. Acharya, Agricultural Marketing in India, OXF-IBH
2. A N Sadhu, Amarjit Singh, Fundamentals of Agricultural Economics, Himalayan Publishing House
3. Lakshmi DharHatai, Agricultural Marketing Management, NIPA Publications, New Delhi
4. H. S. Agarwal, A Textbook Of Economic Analysis, Ane Books Pvt Ltd.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Introductory Agrometeorology& Climate Change**	**Paper Code: (AAG-T-204/AAG-P-204)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Meaningandscopeofagriculturalmeteorology;Earthatmosphere-itscomposition,extent andstructure;Atmosphericweathervariables;Atmosphericpressure,itsvariationwithheight; Wind,typesofwind,dailyandseasonalvariationofwindspeed,cyclone,anticyclone,landbreeze andseabreeze;Natureandpropertiesofsolarradiation,solarconstant,depletionofsolarradiation, short wave, longwave and thermal radiation, net radiation, albedo.

UNIT-II

Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, verticalprofile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure,processofcondensation,formationofdew,fog,mist,frost,cloud;Precipitation,process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification;Artificialrainmaking.

UNIT-III

Monsoon-mechanismandimportanceinIndianagriculture, Weatherhazards-drought,floods,frost,tropicalcyclonesandextremeweatherconditionssuchas heat-waveandcold-wave.Agricultureandweatherrelations.

UNIT-IV

Modificationsofcropmicroclimate, climaticnormalsforcropandlivestockproduction.Weatherforecasting-typesofweatherforecast andtheiruses.Climatechange,climaticvariability,globalwarming,causesofclimatechangeand itsimpactonregionalandnationalAgriculture.

Practical

Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and longwave 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.

Recommended Books:

1. G.S. Mahi, P.K. Kingro, Fundamentals of Agrometerology, Kalyani Publishers 2015
2. K. Govindan, K. Thirumurugan, Agricultural Metrology and Dry Farming, Kalyani Publishers 2013
3. S.R. Reddy, D.S. Reddy, Agrometerology, Kalyani Publishers 2015
4. P. Balasubrananiyan, S.P. Palaniappan, Principles and Practices Of Agronomy, Agrobios India 2010

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Agrochemicals **Paper Code: (AET-T-201/AET-P-201)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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

Organicfungicides-Modeofaction-Dithiocarbamates-characteristics,preparationanduse of Zineb andmaneb.Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroidsNeonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricteduse,Fateofinsecticidesinsoil&plant.IGRsBiopesticides,Reducedriskinsecticides, Botanicals,plantandanimalsystemicinsecticidestheircharacteristicsanduses.

UNIT-III

Fertilizersandtheirimportance.Nitrogenousfertilizers:FeedstocksandManufacturingof ammoniumsulphate,ammoniumnitrate,ammoniumchloride,urea.SlowreleaseN-fertilizers.
Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag.Potassic fertilizers: Natural sources of potash, manufacturing of potassiumchloride, potassium sulphate and potassiumnitrate.

UNIT-IV

Mixedandcomplexfertilizers:Sourcesandcompatibility–preparationofmajor,secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates,

nitrophosphatesandNPKcomplexes.Fertilizercontrolorder.Fertilizerlogisticsandmarketing.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 kin market.Estimation of nitrogen in Urea.Estimation of water soluble P2O5 and citrate soluble P2O5 in single super phosphate.Estimation of potassium in Muraite 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.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Agri-business Management **Paper Code: (AEC-T-203/AEC-P-203)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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, Classification of industries and types of agro based industries. Institutional arrangement, procedures to set up agro based industries.

UNIT-II

Constraints in establishing agro-based industries.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, polices procedures, rules, programs and budget.

UNIT-III

Components of a business plan, Steps in planning and implementation. 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. Marketing mix and marketing strategies.

UNIT-IV

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 evaluation techniques.

Practical

Study of agri-input markets: Seed, fertilizers, pesticides. Study of output markets: grains, fruits, vegetables, flowers. Study of product markets, retails 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.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Principles of Integrated Pest and Disease Management **Paper Code: (APP-T-301/APP-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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 economics 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 farmer's fields.

Recommended Books:

1. Reddy, S M & H N Gour, Integrated Plant Pathology, Today & Tomorrows Printers and Publishers 2009
2. Amerika Singh, O.P. Sharma, D.K. Garg, Integrated Pest Management: Principles and Applications, CBS Publishers 2005
3. J.N. Sharma, R.C. Sharma, Integrated plant Disease Management, Scientific Publishers 2011
4. A. Ciancio, K.G. Mukerji, General Concepts in Integrated Pest and Disease Management, Springer 2007

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Manures, Fertilizers and Soil Fertility Management **Paper Code: (APP-T-301/APP-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients.

UNIT-IV

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 ofS in plants.

Recommended Books:

1. K.S Yawalkar, J.P Agarwal, S. Bokde, Manures and Fertilizers, Agri Horticultural House 1996
2. Sharma, Renuka, Fertilizer and manures, Discovery Publishing house 2014
3. M.V Durani, A Handbook of Soil- Plant-Water-Fertilizer, NIPA Publisher 2014
4. Rakshit, A., Manures Fertilizers and Pesticides Theory and Applications, CBS Publishers & Distributors 2015.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : **Pests of Crops and Stored Grains and their Management** **Paper Code: (AET-T-301/AET-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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 insecticides 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.

Recommended Books:

1. M.C. Bhargava, K.C. Kumawat, Pests of Stored Grains and Their Management, NIPA Publishers, New Delhi
2. B.P. Khare, Stored grain pests and their management, CRC Press
3. Omkar, Pests and their Management, Springer 2018
4. AbhishekShukla, Crop Pest and Their Management, LAP Lambert Academic Publishing 2011

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Diseases of Field & Horticultural Crops & their Management-I **Paper Code: (APP-T-302/APP-P-302)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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.

UNIT-II

Bajra :downy mildew and ergot; Groundnut: early and late leaf spots, wilt, Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: 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.

UNIT-II

Castor: Phytophthorablight;Tobacco: black shank, black root rot and mosaic. 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 andblack 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.

Recommended Books:

1. A.K. Misra, Diseases of Fruit Crops, Indian Phytopathological Society 2014
2. S.K. Gupta, T. S. Thind, Disease Problems in Vegetable Production, Scientific Publishers 2012
3. M. K. Kalita, Diseases of Field Crop and their Management, Kalyani Publishers 2014
4. Tarlochan S. Thind, Diseases of Field Crops and Their Management, Daya Publishing House 2007

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Crop Improvement – I (*Kharif*)**	**Paper Code: (AGN-T-301/AGN-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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 andvegetatively 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 stresstolerance and quality (physical, chemical, nutritional);

UNIT-IV

Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, 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, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, 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 decent 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.

Recommended Books:

1. D.A. Sleper, J. M. Poehlam, Breeding Field Crops 5th edn, Wiley Publication 2006
2. J.A.S. Watson, Crops: Varieties and Plant Breeding, Satish Serial Publishing House 2005 3. G.A. Slafer, Genetic Improvement of Field Crops, Marcel Dekker 1993
4. M.Jackson, B.Fordloyd, M. Parry, Plant Genetic Resource and Climate Change, Cabi Publication 2013

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Entrepreneurship Development and Business Communication**	**Paper Code: (AEX-T-301/AEX-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs.

UNIT-II

SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/ Agrienterprises, Entrepreneurial Development Process.

UNIT-III

Business Leadership Skills; Developing organizational skill (controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills).

UNIT-IV

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.

Recommended Books:

1. RenuArora, S. K. Sood, Entrepreneurship & Fundamentals of Small Business, Kalyani Publishers 2012
2. H. S. Mukerjee, Business Communication, Oxford University Press 2016
3. S. Sharma, Entrepreneurship Development, PHI Learning Pvt. Ltd. 2017
4. S.S. Khanka, Entrepreneurial Development, S. Chand & Company 2006

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Geoinformatics, Nano-technology and Precision Farming**	**Paper Code: (AAG-T-301/AAG-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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; Remote sensing concepts and application in agriculture.

UNIT-III

Image processing and interpretation; 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

Introductionto GIS software, spatial data creationandediting.Introductiontoimage processing software.Visual and digital interpretation of remote sensing images.Generation of spectralprofiles of different objects.Supervised and unsupervised classification and acreage estimation.Multispectral remote sensing for soil mapping.Creation of thematic layers of soil fertility based on GIS.Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology.Use of GPS for agricultural survey.Formulation, characterization and applications of nanoparticles in agriculture. Projects formulation and execution related to precision farming.

Recommended Books:

1. A.K. Singh & U.K. Chopra, Geoinformatics application in Agriculture, New India Publishing Agency, NewDelhi-110088
2. B.L.Jana, Precision Farming, Agrotech Publishing Academy, New Delhi
3. K.S. Subramanian, Nano-Technology in Agriculture New India Publishing Agency, 2015 New Delhi110088

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Practica Crop Production-I **Paper Code: *(*AAG-P-302*)***
(Kharif Crops)

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

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.

Recommended Books:

1. S.Krishnaprabu, Agronomy: Theory and Practice, Satish Serial Publishing House 2016
2. P.C.Das, Crops and their Production : Technology under Different Conditions, Kalyani Publishers 2010
3. S.R. Reddy, Ramu Y. Reddy, Agronomy of Field Crops, Kalyani Publishers 2006
4. S.S. Singh, Rajesh Singh, Crop Management, Kalyani Publishers 2016

RAFFLES UNIVERSITY

Lecture Per Week : 1

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Intellectual Property Rights **Paper Code: (IPR-T-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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.Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights,Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets.

UNIT-II

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.

UNIT-IV

Traditional knowledge-meaning and rights of TK holders.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.

Recommended Books:

1. N. Pandey, Intellectual Property Rights, PHI Learning 2014
2. P. Singh, IPR and Plant Breeder's Rights, New Vishal Publications 2009
3. B.L. Wadehra, Law Relating to Intellectual Property, Universal Law Publishing 2016
4. M. Venkataraman, An Introduction to Intellectual Property Rights, Innovative Timber leaf 2015

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Biopesticides & Biofertilizers **Paper Code: (AET-T-302/AET-P-302)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

History and concept of biopesticides.Importance, scope and potential of biopesticide.Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales.Botanicals and their uses.Mass production technology of bio-pesticides.Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes.Methods of application of biopesticides.Methods of quality control and Techniques of biopesticides.Impediments and limitation in production and use of biopesticide.

UNIT-II

Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- *Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium* and *Frankia*; Cynobacterial biofertilizers- *Anabaena, Nostoc*, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza.

UNIT-III

Nitrogen fixation -Free living and symbiotic nitrogen fixation.Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Productiontechnology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers.

UNIT-IV

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, Metarhyzium*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 inoculums production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Protected Cultivation **Paper Code: (AEN-T-301/AEN-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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/ poly house. Greenhouse design, environment control, artificial lights, Automation.

UNIT-II

Soil preparation and management, Substrate management.Types of benches and containers.

Irrigation and fertigation management.Propagation and production of quality planting material of horticultural crops.

UNIT-III

Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, 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 protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Rainfed Agriculture and Watershed Management **Paper Code: (AAG-T-303/AAG-P-303)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India.

UNIT-II

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, Management of crops in rainfed areas.

UNIT-IV

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.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Protected Cultivation and Secondary Agriculture**	**Paper Code: (AEN-T-302/AEN-P-302)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.

UNIT-II

Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, 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.

UNIT-IV

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, re-circulatory dryer and solar dryer). 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.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**

Subject : Diseases of Field & Horticultural Crops & their Management-II **Paper Code: (**APP-T-303/APP-P-303**)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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 PokkahBoeng;Sunflower: Sclerotinia stem rot andAlternaria 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.Strawberry: leaf spot

UNIT-IV

Potato: early and late blight, black scurf, leaf roll, and mosaic; Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, andStemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spotCoriander: 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.

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Management of Beneficial Insects**	**Paper Code: (AET-T-303/AET-P-303)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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 honey bee. Role of pollinators in cross pollinated plants.

UNIT-II

Types of silkworm, voltinism 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, voltinism 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.

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Crop Improvement – II (*Rabi*)**	**Paper Code: (AGN-T-302/AGN-P-302)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder 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 *rabi*crops. Ideotype concept and climate resilient crop varieties for future.

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 decent methods; Study of field techniques for seed production and hybrid seeds 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.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Practical Crop Production-II *(Rabi Crops)***	**Paper Code: *(AAG-P-304)***

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

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.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Principles of Organic Farming (AAG-T-305/AAG-P-305)**	**Paper Code: (AAG-T-305/AAG-P-305)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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.

UNIT-II

Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming;

UNIT-III

Choice of crops and varieties in organic farming; 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 enrich compost, vermicompost, 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.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Farm Management, Production and Resource Economics**	**Paper Code: (AEC-T-301/AEC-P-301)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor 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.

UNIT-IV

Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies**,** Crop/livestock/machinery insurance- 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.

RAFFLES UNIVERSITY

Lecture Per Week : 2

Examination Time : 3 Hrs **Maximum Marks: 50 (20+30)**
Subject : Principles of Food Science and Nutrition **Paper Code: (AFT-T-302)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each****. Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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, colors, miscellaneous bioactive, important reactions).

UNIT-III

Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods); Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.).

UNIT-IV

Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/ modified diets, Menu planning, New trends in food science and nutrition.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Hi-tech. Horticulture**	**Paper Code: (AHR-T-303/AHR-P-303)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

UNIT-I

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods.

UNIT-II

Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding.

UNIT-III

Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA).

UNIT-IV

Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

Practical

Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: Weed Management**	**Paper Code: (AAG-T-306/AAG-P-306)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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.Allelopathy and its application for weed management.

UNIT-III

Bio-herbicides and their application in agriculture.Concept of herbicide mixture and utility in agriculture.Herbicide compatibility with agro-chemicals and their application.

UNIT-IV

Integration of herbicides with non chemical 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.

RAFFLES UNIVERSITY

Lecture Per Week : 3

Examination Time	**: 3 Hrs**	**Maximum Marks: 50 (20+30)**
Subject	**: System Simulation and Agro advisory**	**Paper Code: (AAG-T-307/AAG-P-307)**

Note: *Examiner will set nine questions in all and the students will be required to attempt only five questions selectingone question from each unit which will be of 6 marks each.* ***Question number one is compulsory containing six shortanswer type*** *questions covering the entire syllabus and will be of 1 mark*

Theory

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 modeling 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; Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars.

UNIT-IV

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.

SCHOOL OF ENGINEERING & TECHNOLOGY (SOET)

RAFFELSUNIVERSITY

NEEMRANA

Department of Mechanical Engineering

B.Tech (4 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

RAFFLES
UNIVERSITY

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Vision

To be a centre of excellence by producing high caliber, competent and self-reliant computer Science engineers, who possess scientific temperament and would engage in activities relevant to industries with ethical values and flair to research.

Mission

- To provide efficient engineers for global requirements by imparting quality education.
- To explore, create and develop innovations in various aspects of engineering through industries and institutions.
- To emphasize on practical skills and socially relevant technology

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
RAFFLES UNIVERSITY, NEEMRANA
Department of Mechanical Engineering
B.Tech (4 Years Degree Program)

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.
PO 2	Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO 4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO 5	Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make

	effective presentations and give and receive clear instructions.
PO 11	Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO 12	Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change

Program Education Objectives

PEO 1	To impart deep knowledge of mechanical engineering and interdisciplinary subjects.
PEO 2	To use modern tools in academic to enhance the technical skills of the students for implementation of the scientific concepts.
PEO 3	To prepare the students to address social, technical and engineering challenges innovatively.
PEO 4	To enhance various skills of the students involved in decision making.
PEO 5	To motivate and prepare the students to take-up career in different industries or to pursue higher studies in mechanical and interdisciplinary programs.

Program Specific Objectives

PSO 1	To impart proper knowledge of science and mechanical engineering related subjects to the students.
PSO 2	To enhance the skills of the students with the ability to implement the scientific concepts for betterment of the society.
PSO 3	To prepare the students to become innovators who can address social, technical and engineering challenges.

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

B.Tech (1st Semester)

(Common to all branches)

S.No	Category	Code	Course Title	Hours Per Week			CIE	ESE	Total	Credits
				L	T	P				
1	BSC	BSC-101	Engineering Physics-I	3	1	THEORETICAL	40	60	100	4
2	BSC	BSC-102	Engineering Mathematics-I	3	1		40	60	100	4
3	ESC	ESC-101	Computer Fundamentals	3	1		40	60	100	4
4	ESC	ESC-102	Basics of Mechanical Engineering	3	1		40	60	100	4
5	MC	MC-I	Environmental Studies	2	0		40	60	100	0
6	HSMC	HSMC-101	Communicative English	3	0		40	60	100	3
7	ESC	ESC-103	Workshop Practice Lab	PRACTICAL	0	3	60	40	100	2
8	BSC	BSC-103	Engineering Physics-I Lab		0	2	60	40	100	1
9	ESC	ESC-104	Computer FundamentalsLab		0	2	60	40	100	1
10	HSMC	HSMC-102	Language Lab		0	2	60	40	100	1
			Total	**17**	**4**	**9**	**480**	**520**	**1000**	**24**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Engineering Physics (BSC-101)

Course Outcomes:

CO1: Understand and apply Maxwell's equations, which describe the fundamental laws of electromagnetism, including Gauss's law for electricity, Gauss's law for magnetism, Faraday's law of electromagnetic induction, and Ampère's law with Maxwell's addition.

CO2: Understand, apply, and manipulate Maxwell's equations to describe and analyze electromagnetic phenomena in both static and dynamic situations.

CO3: Understand and describe the impact of solid-state device capabilities and limitation on electronic circuit performance.

CO4: Understand the concepts of X-Rays and Ultrasonics.

CO5: Understand the basic concepts such as Nuclear Detectors, Characteristics of gas filled detectors and properties of Ionization chamber, proportional counter, G. M. Counter and Scintillation Counter.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	2		1			3				3	3	3	3
CO2	3	2	1		1			3	2			3	3	3	2
CO3	3	2	2		1		2	3	1		3	3	3	3	2
CO4	3	2	1		1		2	3	2			3	3	3	2
CO5	3	2	3		1			3	2		3	3	3	3	3

2. Engineering Mathematics-I (BSC-102)

Course Outcomes:

CO-1: To explore the fundamental knowledge of asymptote, curvature and their types.

CO-2: Use the Euler’s theorem, homogeneous function.

CO-3: Develop knowledge of double integration.

CO-4: Understand how to determine the natural of first order and higher order differential equation.

CO-5: Understand how to determine the nature of second order differential equation.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2	3

3. Computer Fundamentals (ESC-102)

Course Outcomes:

CO1: Demonstrate knowledge on C Programming constructs learn to develop simple applications in C using basic constructs.

CO2: Design and implement applications using arrays and string

CO3: Develop and implement modular applications in C using functions

CO4: Develop applications in C using structures and pointers.

CO5: Design applications using sequential and random access file processing.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3		1		2			2				3	3	3	3
CO2	3	1	1		2			2				3	3	3	3
CO3	3	2			2			2				3	3	3	3
CO4	3	3	2		2			2				3	3	3	3
CO5	3	2	1		2			2	1			3	3	3	3

4. Basics of MechanicalEngineering (ESC-102)

Course Outcomes:

CO1: Apply various laws of thermodynamics to various processes and real systems.

CO2: Familiarize you with the refrigerants, vapour compression refrigeration system and multi stage vapour compression system.

CO3: Under the basic concepts such as stress, strain, Hooks law, stress-strain diagram.

CO4: Familiarity with common manufacturing processes, such as machining, casting, welding, and their advantages and limitations.

CO5: Identify and analyze common machine elements and components, such as bearings, gears, shafts, and fasteners.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	1							3	3	3	3	3
CO2	3	3	2	1							3	3	3	3	3
CO3	3	3	2	1	2						3	3	3	3	3
CO4	3	3	2	1	2						3	3	3	3	3
CO5	3	3	2	1	2						3	3	3	3	3

5. Environmental Studies (MC-1)

Course Outcomes:

CO1: On completion of this course students will be able to describe the scientific inquiry in the field of modern ecology, explain the main limitations on patters of productivity, Energy Flow through the natural food chain and food webs, ecosystem dynamics and patterns in population and communities.

CO2: The students will understand the chemical properties of materials occurring in the environment, the phenomenon in the environment and apply the knowledge to various environmental processes.

CO3: Develop the ability to understand the patterns of air pollution dispersion with respect to micrometeorological changes.

CO4: The students will be able to describe the physical and chemical composition of water and wastewater and elucidate how and why these compositions fluctuate, main source of water pollution, the main types of pollutants and how each type can be controlled.

CO5: The students will understand the technical, legal and economic aspects of collection, transportation and management of hazardous wastes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	1	1	1	1	2	2						1	2		
CO2		1	2	2									1	1	
CO3			2						1			1			
CO4	1			2			1						2		
CO5															

6. Communicative English (HSMC-101)

Course Outcomes:

CO1: Use English Language effectively in spoken and written forms.

CO2: Comprehend the given texts and respond appropriately.

CO3: Communicate confidently in various contexts and different cultures.

CO4: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								3		3		3			2
CO2								3	2	3		3			2
CO3								3	2	3		3			2
CO4								3		3		3			2
CO5								3		3		3			2

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

B.Tech (2nd Semester)

(Common to all branches)

S.No	Category	Code	Course Title	Hours Per Week			CIE	ESE	Total	Credits
				L	T	P				
1	BSC	BSC-104	Communicative English II (BSC-104)	3	1	THEORETICAL	40	60	100	4
2	BSC	BSC-105	Engineering Mathematics-II	3	1		40	60	100	4
3	ESC	ESC-105	Programming with 'C'	3	0		40	60	100	3
4	ESC	ESC-106	Basics of Electrical & Electronics Engineering	3	1		40	60	100	4
5	ESC	ESC-107	Engineering Mechanics	3	1		40	60	100	4
6	BSC	BSC-106	Engineering Chemistry	3	0		40	60	100	4
7	ESC	ESC-108	Basics of Electrical & Electronics Engineering Lab	PRACTICAL	0	2	60	40	100	1
8	BSC	BSC-107	Engineering Physics-II Lab		0	2	60	40	100	1
9	ESC	ESC-109	Engineering Drawing Lab		0	3	60	40	100	1
10	ESC	ESC-110	Programming with 'C' Lab		0	2	60	40	100	1
11	BSC	BSC-108	Engineering Chemistry Lab		0	2	60	40	100	1
			Total	**18**	**4**	**11**	**540**	**560**	**1100**	**28**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Communicative English II (BSC-104)

Course Outcomes:

CO1: Use English Language effectively in spoken and written forms.

CO2: Comprehend the given texts and respond appropriately.

CO3: Communicate confidently in various contexts and different cultures.

CO4: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								3		3		3			2
CO2								3	2	3		3			2
CO3								3	2	3		3			2
CO4								3		3		3			2
CO5								3		3		3			2

2. Engineering Mathematics-II (BSC-105)

Course Outcomes:

CO1: Explore the knowledge of integration and differentiation to solve the orthogonality of two spheres.

CO2: define the rank of matrix to find the nullity of matrix and calculate the Eigen values.

CO3: Develop the knowledge of integration and differentiation to solve the curl and gradients questions.

CO4: Explore the knowledge of half range Fourier sine and cosine series.

CO5: Use Lagrange's function to solve the differential problems.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3

CO1	3	3	2	3	1	2	1		2	2	1	2	3	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2	3

3. Programming with C (ESC-105)

Course Outcomes:

CO1: Demonstrate knowledge on C Programming constructs learn to develop simple applications in C using basic constructs

CO2: Design and implement applications using arrays and string

CO3: Develop and implement modular applications in C using functions

CO4: Develop applications in C using structures and pointers.

CO5: Design applications using sequential and random access file processing.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2			2			2	3	3	3	3
CO2	3	3	2		2			2			2	3	3	3	2
CO3	3	3	2		2			2			2	3	3	3	2
CO4	3	3	3	3	2			2			2	3	3	3	2
CO5	3	2	3	3	2			2	3		2	3	3	3	3

4. Basics of Electrical Engineering (ESC-106)

Course Outcomes:

CO1: Students will gain knowledge regarding the various laws and principles associated with electrical systems.

CO2: Students will gain knowledge regarding DC network and apply them for practical problems.

CO3: Students will gain knowledge regarding various types' of semiconductors.

CO4: Student will gain knowledge about transistors and their application.

CO5: Student will gain knowledge on Basic Electronic Circuits and Instrumentation.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	1	2	1						2	1	1	1	
CO2	2	2	2	3	2						2	2	3		
CO3	3	1	2	2								1	1		
CO4	3	1	2	3	1							2		1	
CO5	3	2	2		2						3	2	1	2	

5. Engineering Mechanics (ESC-107)

Course Outcomes:

CO1: Students will understand the concepts of engineering mechanics.

CO2: Understand the phenomenon of friction and transmission of power and ability to solve problem related to the same.

CO3: Students will gain knowledge regarding center of gravity and moment of inertia and apply them for practical problems.

CO4: Modelling and analysis of forces systems acting on rigid bodies to evaluate position velocity and acceleration.

CO5: Fundamental understanding of mechanical vibrations and finding out natural frequency for mechanical systems. Application of free damped and forced vibrations on mechanical systems

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	1	3	2	2	3	3	3	3
CO2	3	3	3	3	3	3	2	1	2	2	2	3	3	3	3
CO3	3	3	3	3	3	2	2	1	2	2	2	3	3	3	3
CO4	3	3	3	3	3	3	3	1	2	2	2	3	3	3	3
CO5	3	3	3	3	3	3	3	1	2	3	2	3	3	3	3

6. Engineering Chemistry (BSC-106)

Course Outcomes:

CO1: Analyze the need, design and perform a set of experiments.

CO2: Identify the structure of unknown/new compounds with the help of new engg material.

CO3: Differentiate hard and soft water, solve the related numerical problems on water purification and its significance in industry and daily life.

CO4: Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.

CO5: Understand the causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	1	2	1		2	2	1	2	3	2	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	2	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	2	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	1
CO5	3	2	1	1	3	3	2		1	1	1	2	3	3	2

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (3rd Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	BSC	BSC- 201	Mathematics III (Multidisciplinary	3	1	THEORY	4	40	60	100
2	PCC	PCC- ME-201	Strength of Materials (Major Core)	3	1		4	40	60	100
3	PCC	PCC -ME - 202	Thermodynamics (Major Core)	3	1		4	40	60	100
4		PCC- ME-203	Material Science and Engineering (Major Core)	3	0		3	40	60	100
5	PCC	PCC- ME - 204	Manufacturing Process I (Major Core)	3	0		3	40	60	100
6	MC	MC-III	Introduction of Indian Law (Value Added Courses)	2	0		0	40	60	100
7	PCC	PCC-M-205	Machine Drawing and Auto Cad Lab (Major (Core)	PRACTICAL		3	1	60	40	100
8	PCC	PCC-ME-206	Thermodynamics Lab (Minor Core)			2	1	60	40	100
9	PCC	PCC-ME-207	Manufacturing Process I Lab (Major Core)			2	1	60	40	100
10	PCC	PCC-ME-208	Strength of Materials Lab (Major Core)			2	1	60	40	100
11	PCC	PCC-ME 209	Material Science & Engineering Lab			2	1	60	40	100
TOTAL				**17**	**03**	**11**	**24**	**480**	**560**	**1100**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Mathematics III (BSC-201)

Course Outcomes:

CO1: To explore the fundamental knowledge of transforms and their types.

CO2: Laplace Transform and their applications.

CO3: Develop knowledge of double integration.

CO4: Explore the distribution in different situations.

CO-5: Use Analytic functions

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3		3	2	2		1	2	1	2	3	3	2	3
CO2	3	3		3	2	2		1	1	1	2	3	2	2	3
CO3	3	3		2	2	2		1	2	1	2	3	3	2	3
CO4	3	2		3	2	2		1	1	1	2	3	3	2	3
CO5	3	2		3	2	2		1	1	1	2	3	3	2	3

2. Strength of Materials (PCC- ME-201)

Course Outcomes:

CO1: Apply materials and their elastic constants for composite bar subjected to various loads including thermal load.

CO2: Solve the problems on structural members subjected to Uni-axial load.

CO3: Construct Shear Force, Bending moment and Bending stress distribution in beams subjected to transverse load.

CO4: Determine the deflection of statically determinant beam.

CO5: Design Columns with different end conditions.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	1	1	2	2	2	3	3	3	2
CO2	3	2	3	3	3	3	1		2	2	2	3	3	3	2

CO3	3	2	3	3	3	2	1		3	2	2	3	3	3	2
CO4	3	2	3	3	3	2	1		3	2	2	3	3	3	2
CO5	3	2	3	3	3	3	1	1	2	2	2	3	3	3	2

3. Thermodynamics (PCC -ME -202)

Course Outcomes:

CO1: Apply various laws of thermodynamics to various processes and real systems.

CO2: Apply the concept of Entropy, Calculate heat, effort and other important thermodynamics properties for various ideal gas processes.

CO3: Estimate performance of various thermodynamics gas power cycles and gas refrigeration cycles and availability in each case.

CO4: Estimate stoichiometric air required for combustion, performance of vapour power cycle and vapour compression cycle.

CO5: Use psychometric charts and estimates various essential properties related to Psychrometry and process.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1					2	3	3	3	2
CO2	3	3	3	3	3	1					2	3	3	3	2
CO3	3	3	3	3	3	1					2	3	3	3	2
CO4	3	3	3	3	3	1					2	3	3	3	2
CO5	3	3	3	3	3	1					2	3	3	3	2

4. Material Science and Engineering (PCC -ME -203)

Course Outcomes:

CO1. Identify and depict the crystal structure and their properties based on the structure.

CO2. Quantify the imperfections in a crystal.

CO3. Analyze the mechanical properties of engineering materials, draw the stress – strain diagrams.

CO4. Classify composite materials and their importance in engineering design and determine the type of fracture mechanism.

CO5. Outline heat treatment process to obtain required mechanical properties for a given alloy.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2						3	3	3	3	3
CO2	3	3	3	3	2						3	3	3	2	3
CO3	3	3	3	3	2						3	3	3	2	3
CO4	3	3	3	3	2						2	3	3	3	2
CO5	3	3	3	3	2						2	3	3	3	2

5. Manufacturing Process- I (PCC -ME -204)

Course Outcomes:

CO1. To apply the knowledge of various manufacturing processes

CO2. To identify various process parameters and their effect on processes

CO3: Students should be able to design and analyze various manufacturing processes and tooling

CO4: To figure out the application of modernization in machining.

CO5: Get the knowledge of Jigs and Fixtures so as to utilize machine capability for variety of operations

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						2	3	3	3	3
CO5	3	3	3	3	3						2	3	3	3	3

6. Introduction of Indian Law (MC-1)

Course Outcomes:

CO1 Describe the Salient (Outstanding) features of Indian Constitution

CO2. Gain a deep understanding of the concept of equality as a fundamental human right and its significance in legal systems.

CO3. Students should be able to explain and analyze the three sub-clauses of Article 20 - protection against double jeopardy, protection against self-incrimination, and protection against retrospective criminal laws.

CO4. Students should be able to identify and understand the diverse minority communities in India and their unique cultural and educational needs.

CO5. Students should be familiar with the historical and socio-political context in which the original right to property provisions were framed.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								2	2	3	3	3			2
CO2								2	2	3	3	3			2
CO3								2	2	3	3	3			2
CO4								2	2	3	3	3			2
CO5								2	2	3	3	3			2

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (4th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-210	Kinematics of Machine (Minor Core)	2	1	THEORY	3	40	60	100
2	PCC	PCC-ME-211	Fluid Mechanics (Major Core)	3	0		3	40	60	100
3	PCC	PCC-ME-212	Manufacturing Process II (Major Core)	3	0		3	40	60	100
4	PCC	PCC ME 303	IC Engines (Major (Core)	2	1		3	40	60	100
5	PCC	PCC-ME-214	Industrial Engineering	2	1		3	40	60	100
6	PCC	PCC-ME-215	Design of Machine Element	2	1		3	40	60	100
7	PCC	PCC-ME-216	Kinematics of Machine Lab	2	0		1	40	60	100
8	PCC	PCC-ME-217	Fluid Mechanics Lab	PRACTICAL		2	1	60	40	100
9	PCC	PCC-ME-218	Manufacturing Process-II Lab			2	1	60	40	100
10	PCC	PCC-ME-219	Heat Transfer Lab			2	1	60	40	100
11	PCC	PCC ME 308	IC Engine Lab (Minor Core)			2	1	60	40	100
TOTAL				**16**	**03**	**06**	**22**	**460**	**540**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Kinematics of Machine (PCC -ME-210)

Course Outcomes:

CO1: Designing a suitable mechanism depending on application

CO2: Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers,

CO3: Drawing velocity and acceleration diagrams for different mechanisms,

CO4: Selecting gear and gear train depending on application.

CO5: Understand the kinetics of the rigid bodies and solve simple problems using work-energy method.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1					3	3	3	3	3
CO2	3	3	3	3	3	1					3	3	3	3	3
CO3	3	3	3	3	3	1					3	3	3	3	3
CO4	3	3	3	3	3	1					3	3	3	3	3
CO5	3	3	3	3	3	1					3	3	3	3	3

2. Fluid Mechanics (PCC -ME-211)

Course Outcomes:

CO1: To familiarize with the properties of fluids and fluid kinematics.

CO2: Apply Bernoulli's equation to fluid flow problems.

CO3: To understand the concept of dimensional analysis and incompressible flow.

CO4: Apply appropriate equations and principles to analyze pipe flow problems and turbulent flow.

CO5: Apply the boundary layer theory to determine lift and drag forces on a submerged body.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2							3	3	2	3

CO2	3	3	3	3	2							3	3	2	3
CO3	3	3	3	3	2							3	3	2	3
CO4	3	3	3	3	2							3	3	2	3
CO5	3	3	3	3	2							3	3	2	3

3. Manufacturing Process-II (PCC -ME -212)

Course Outcomes:

CO1: Student should be able to apply the knowledge of various manufacturing processes.

CO2: Student should be able to identify various process parameters and their effect on processes.

CO3: Student should be able to design and analyze various manufacturing processes and tooling.

CO4: Student should be able to figure out application of modernization in machining.

CO5: Students should get the knowledge of Jigs and Fixtures so as to utilize machine capability for variety of operations.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2					3	3	3	3	3
CO2	3	3	3	3	3	2					3	3	3	3	3
CO3	3	3	3	3	3	2					3	3	3	3	3
CO4	3	3	3	3	3	2					3	3	3	3	3
CO5	3	3	3	3	3	2					3	3	3	3	3

4. I.C Engines (PCC-ME-303)

Course Outcomes:

CO1: Understand different types of engines, applications, ideal cycles of operation and deviation with actual cycle and performance parameters

CO2: Understand fuel air cycles and deviations with actual cycles, effect of various operating variables of SI and CI engines, value timing diagrams and working of 2-S and 4-S engines.

CO3: Understand combustion phenomena in SI and CI engines and combustion chamber design, Knocking phenomena, fuel additives and different types of fuels.

CO4: Understand fuel supply systems, cooling systems and lubrication systems.

CO5: Apply basic calculations of the engine on performance and understand governing methods.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2						3	3	3	3	3
CO2	3	3	3	3	2						3	3	3	3	3
CO3	3	3	3	3	2						3	3	3	3	3
CO4	3	3	3	3	2						3	3	3	3	3
CO5	3	3	3	3	2						3	3	3	3	3

5. Industrial Engineering (PCC -ME -214)

Course Outcomes:

CO1: Students will be able to understand the Basic Concepts of Industrial Engineering as well as the organization structures of Industry.

CO2: Students will be able to understand the Various Production Systems and Sale Forecasting Methods.

CO3: Students will be able to understand the concept of work study to improve productivity of men, machines and materials.

CO4: Students will be able to understand the Importance of Planning in the Industry

CO5: Students will be able to know the Importance of Inventory Control and Material Handling systems.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	2			1	2	3	3	3	3	3
CO2	3	2	3	2	3	2			1	2	3	3	3	3	3
CO3	3	2	3	2	3	2			1	2	3	3	3	3	3
CO4	3	2	3	2	3	2			1	2	3	3	3	3	3
CO5	3	2	3	2	3	2			1	2	3	3	3	3	3

6. Design of Machine Element (PCC -ME -215)

Course Outcomes:

CO1: To understand and apply principles of gear design for Spur, Helical, Bevel and Worm gear

CO2: To understand and analyse the concepts of Mechanical Joints like Riveted Joint, Welded Joints and Screwed Joints

CO3: To develop capability to design and analyse the Shaft diameter and different spring parameters.

CO4: To inculcate an ability to design belt drives and selection of belt, rope and chain drives.

CO5: To achieve an expertise in design of Sliding contact bearing in industrial applications.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (5th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC ME 301	Dynamics of Machines (Major Core)	2	1	THEORY	3	40	60	100
2	PCC	PCC ME 302	Hydraulic Machines (Major Core)	2	1		3	40	60	100
3	PCC	HSMC 301	Principle of Management (Value Added Courses)	3	0		3	40	60	100
	PCC	PCC-ME-213	Heat Transfer (Major Core)	2	1		3	40	60	100
5	HSMC	PCC ME 304	Design of Transmission Systems (Major Core)	2	0		2	40	60	100
6	PEC	PCC ME 305	Measurement and Metrology (Multidisciplinary)	2	0		2	40	60	100
7	PCC	PCC ME 306	Hydraulic Machines Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
8	PCC	PCC ME 307	Dynamics of Machines Lab (Major Core)			2	1	60	40	100
	PCC	PCC ME 308	Heat Transfer Lab (Minor Core)			2	1	60	40	100
	PCC	PCC-ME 309	Measurement & Metrology Lab			2	1	60	40	100
10	PROJ	PROJ ME 301	Industrial Training/ Project Seminar			2	1	60	40	100
TOTAL				**13**	**03**	**10**	**20**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Dynamics of Machines (PCC-ME-301)

Course Outcomes:

CO1: To equip the student with fundamental knowledge of dynamics of machines so that student can appreciate problems of dynamic force balance, transmissibility of forces, isolation of systems, vibrations.

CO2: Compute frictional losses, torque transmission of mechanical systems.

CO3: Develop knowledge of analytical and graphical methods for calculating balancing of rotary and reciprocating masses.

CO4: Develop understanding of dynamic balancing, gyroscopic forces and moments.

CO5: Understand how to determine the natural frequencies of continuous systems starting from the general equation of displacement.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

2. Hydraulic Machines (PCC-ME -302)

Course Outcomes:

CO1: Work out the hydrodynamic force by liquid jet on plane surface and curved vanes for fixed and moving conditions.

CO2: Apprehend working of impulse and reaction turbine and their components parts.

CO3: Design and analysis performance characteristics of Pelton wheel, Kaplan turbine and Francis turbine

CO4: Comprehend working of different types of pumps and work out the efficiency of Centrifugal pump.

CO5: Compare hydropower plants with other types of power plants and calculate load factor and capacity factor for the hydropower plants.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2							3	3	3	3
CO2	3	3	2	2	2							3	3	2	3
CO3	3	3	2	2	2							3	3	2	3
CO4	3	3	2	2	2							3	3	3	3
CO5	3	3	2	2	2							3	3	2	3

3. Principle of Management (HSMC-301)

Course Outcomes:

CO1: Identify and apply appropriate management techniques for managing business

CO2: Have a conceptual knowledge about the planning and decision making

CO3: Apply the concept of organizing for the effective functioning of a management

CO4: Evaluate leadership style to anticipate the consequences of each leadership style

CO5: Demonstrate the techniques for controlling and coordination

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3
CO2	3	3	3	2	3	2	2	3	3	3	3	3	3	3	3
CO3	3	3	3	2	3	2	2	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3

4. Heat Transfer (PCC -ME -213)

Course Outcomes:

CO1: Apply the principles of heat transfer to analyze and solve practical engineering problems.

CO2: Demonstrate proficiency in conducting experiments related to heat transfer.

CO3: Analyze and design heat exchangers and other heat transfer equipment.

CO4: Apply computational tools and software for heat transfer analysis.

CO5: Evaluate and select appropriate heat transfer techniques for specific engineering applications.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	2	2
CO2	3	3	3	3	3						3	3	3	2	2
CO3	3	3	3	3	3						3	3	3	2	2
CO4	3	3	3	3	3						3	3	3	2	2
CO5	3	3	3	3	3						3	3	3	2	2

5. Design of Transmission Systems (PCC-ME-304)

Course Outcomes:

CO1: Apply materials and their elastic constants for composite bar subjected to various loads including thermal load.

CO2: Solve the problems on structural members subjected to Uni-axial load.

CO3: Construct Shear Force, Bending moment and Bending stress distribution in beams subjected to transverse load.

CO4: Able to Determine the deflection of statically determinant beam.

CO5: Able to Design Columns with different end conditions.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

6. Measurement and Metrology (PCC-ME-305)

Course Outcomes:

CO1: Develop a solid understanding of the fundamental principles and concepts of measurement, including units, standards, and measurement systems.

CO2: Gain knowledge about the role of limits, fits, and tolerances in ensuring proper assembly and functionality of mechanical components.

CO3: Gain a comprehensive understanding of various measuring instruments used for dimensional measurement, such as calipers, micrometers, gauges, and dial indicators. Understand their working principles, features, and applications.

CO4: Gain proficiency in using thread gauges, thread micrometers, and other specialized measuring instruments for thread measurement.

CO5: Develop a comprehensive understanding of the geometric principles and concepts related to machine tools.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3		2				3	3	3	3	3
CO2	3	3	3	3	3		2				3	3	3	3	3
CO3	3	3	3	3	3		2				3	3	3	3	3
CO4	3	3	3	3	3		2				3	3	3	3	3
CO5	3	3	3	3	3		2				3	3	3	3	3

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (6th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME 310	Automobile Engineering	3	0	THEORY	3	40	60	100
2	OEC	PCC-ME 311	Mechanical Vibration	3	1		4	40	60	100
3	OEC	PCC-ME 312	Operation Research	3	1		4	40	60	100
4	PCC	PEC ME 301-303	Professional Elective-1 Multidisciplinary	3	1		4	40	60	100
5	OEC	OEC-301-303	Open Elective I (Multidisciplinary)	3	0		3	40	60	100
6	OEC	OEC-304-306	Open Elective II (Value Added Courses)	3	0		3	40	60	100
7	PCC	PCC-ME 313	Automobile Engineering Lab	PRACTICAL		2	1	60	40	100
8	PCC	PCC-ME 314	Mechanical Vibration Lab			2	1	60	40	100
TOTAL				**18**	**03**	**04**	**23**	**360**	**480**	**800**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Automobile Engineering (PCC-ME -310)

Course Outcomes:

CO1: Identify the different parts of the automobile

CO2: Explain the working of various parts like engine, transmission, clutch, Brakes

CO3: Describe how the steering and the suspension systems operate.

CO4: Understand the environmental implications of automobile emissions

CO5: Develop a strong base for understanding future developments in the automobile industry

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1	2				3	3	3	3	3
CO2	3	3	3	3	3	1	2				3	3	3	3	3
CO3	3	2	3	3	3	1	2				3	3	3	3	3
CO4	3	2	3	3	3	1	2				3	3	3	3	3
CO5	3	3	3	3	3	1	2				3	3	3	3	3

2. Mechanical Vibration (PCC-ME -311)

Course Outcomes:

CO1: Obtain equations of motion to understand the behavior of oscillatory systems.

CO2: Understand the fundamentals of various damping systems to reduce vibration.

CO3: Learn various vibration excitations, practical aspects of isolations, and vibration measuring instruments.

CO4: Analyze the mathematical modeling of the two degrees of freedom systems and various vibration-absorbing devices.

CO5: Understand the characteristics of noise, sound, and its relationship with power and intensity.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2				3	3	3	3	3
CO2	3	3	3	3	3	2	2				3	3	3	3	3
CO3	3	3	3	3	3	2	2				3	3	3	3	3
CO4	3	3	3	3	3	2	2				3	3	3	3	3
CO5	3	3	3	3	3	2	2				3	3	3	3	3

3. Operation Research (PCC-ME-312)

Course Outcomes:

CO1: Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.

CO2: Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods, Finding initial basic feasible and optimal solution of the Transportation problems

CO3: Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.

CO4: Model competitive real-world phenomena using concepts from game theory.

CO5: Formulate Network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these Network problems

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2			2	2	3	3	3	2	3
CO2	3	3	3	3	3	2			2	2	3	3	3	2	3
CO3	3	3	3	3	3	2			2	2	3	3	3	2	3
CO4	3	3	3	3	3	2			2	2	3	3	3	2	3
CO5	3	3	3	3	3	2			2	2	3	3	3	2	3

4. Tribology (PCC-ME-302)

Course Outcomes:

CO1: Understand the different techniques used to solve mechanical engineering problems.

CO2: Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.

CO3: Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.

CO4: Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.

CO5: Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3						1	3	3	3	2
CO2	3	3	2	2	3						1	3	3	3	2
CO3	3	3	2	2	3						2	3	3	3	2
CO4	3	3	2	2	3						2	3	3	3	2
CO5	3	3	2	2	3						1	3	3	3	2

5. Total Quality Management (OEC-302)

Course Outcomes:

CO1: To understand and apply the principles of total quality management.

CO2: Choose appropriate statistical techniques for improving processes.

CO3: Develop the organizational, competitive and economic potential of quality.

CO4: Integrate biblical principles with the practice of total quality management.

CO5: Identify requirements of quality improvement programs

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO2	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO3	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO4	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO5	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (7th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-401	Computer Aided Design (Major Core)	3	0	THEORY	3	40	60	100
2	PCC	PCC-ME-402	Refrigeration and Air Conditioning (Major Core)	3	1		4	40	60	100
3	HSMC	HSMC-401	Engineering Economics (Value Added Courses)	3	0		3	40	60	100
4	PEC	PEC-ME 401-403	Professional Elective-II (Skill Enhancement Course)	4	0		4	40	60	100
5	OEC	OEC-401-403	Open Elective-III	3	1		3	40	60	100
6	PCC	PCC-ME-403	Refrigeration and Air Conditioning Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
7	PROJ	PROJ-ME-402	Project-I			12	6	120	80	200
8	PROJ	PROJ-ME-401	Industrial Training /Project Seminar			2	2	120	80	200
TOTAL				**16**	**02**	**16**	**26**	**500**	**500**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Computer Aided Design (PCC-ME-401)

Course Outcomes:

CO1: Provide basic foundation in CAD, computer graphics and Coordinate systems etc.

CO2: Understand and develop the Mathematical representations of curves used in geometric construction

CO3: Understand and develop the Mathematical representations of solids used in geometric construction

CO4: Understand the concepts of Scan Conversion, Rendering, Rasterising polygons and Hidden surface removal etc.

CO5: Creation of part drawings and 3D models using CAD techniques.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3				2		2	3	3	3	2
CO2	3	3	3	2	3				2		2	3	3	3	2
CO3	3	3	3	2	3				2		2	3	3	3	2
CO4	3	3	3	2	3				2		2	3	3	3	2
CO5	3	3	3	2	3				2		2	3	3	3	2

2. Refrigeration and Air Conditioning (PCC-ME-402)

Course Outcomes:

CO1: Familiarize you with the terminology associated with refrigeration and air-conditioning.

CO2: To cover the basic principle of psychrometric and applied psychrometric.

CO3: Familiarize you with load calculation and duct design.

CO4: Familiarize you with the refrigerants, vapour compression refrigeration system and multi stage vapour compression system.

CO5: Understand the concept of vapour compression refrigeration system and other cooling system.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2		2				2	3	3	3	3
CO2	3	3	3	3	2		2				2	3	3	3	3
CO3	3	3	3	3	2		2				2	3	3	3	3
CO4	3	3	3	3	2		2				2	3	3	3	3
CO5	3	3	3	3	2		2				2	3	3	3	3

3. Engineering Economics (HSMC-401)

Course Outcomes:

CO1: To understand the core economic terms, concepts and theories.

CO2: Identify the key elements of the demand and supply model and use it to critically analyze the real world examples.

CO3: Compare and contrast economic profits with accounting profits

CO4: Identify economic indicators and utilize them to articulate the state of the economy and prescribe monetary and fiscal policy

CO5: To have a conceptual knowledge about the role of government in countries economical changes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	1	1	2			2	2				3	3		2	2
CO2	1	1	2			2	2				3	3		2	2
CO3	1	1	2			2	2				3	3		2	2
CO4	1	1	2			2	2				3	3		2	2
CO5	1	1	2			2	2				3	3		2	2

4. Welding Technology (PCC-ME-401)

Course Outcomes:

CO1: Identify the various materials for manufacturing process for a particular application.

CO2: Analyze gating systems and discuss mechanization procedures in foundries.

CO3: Explain various core making processes and special casting processes.

CO4: Select the various types of Fabrication Process for Mechanical applications.

CO5: To select and apply knowledge, techniques, skills, and modern tools of the Welding Processes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2			3		2				1	3	3	1	3
CO2	3	2			3		2				2	3	3	1	3
CO3	3	2			3		2				2	3	3	1	3
CO4	3	2			3		2				1	3	3	1	3
CO5	3	2			3		2				1	3	3	1	3

5. Non-Conventional Energy Sources (OEC-401)

Course Outcomes:

CO1: Demonstrate the generation of electricity from various non-Conventional sources of energy, have a working knowledge on types of fuel cells.

CO2: Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation.

CO3: Explore the concepts involved in wind energy conversion system by studying its components, types and performance.

CO4: Illustrate ocean energy and explain the operational methods of their utilization.

CO5: Acquire the knowledge on Geothermal energy.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3		1				1	3	3	1	3
CO2	3	2	3	2	3		1				2	3	3	1	3
CO3	3	2	3	2	3		1				2	3	3	1	3
CO4	3	2	3	2	3		1				1	3	3	1	3
CO5	3	2	3	2	3		1				1	3	3	1	3

RAFFLES UNIVERSITY, NEEMRANA

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)

Department of Mechanical Engineering

B.Tech (8th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-404	Power Plant Engineering (Major Core)	3	0	THEORY	3	40	60	100
3	HSMC	HSMC-402	Entrepreneurship Development & Management	3	0		3	40	60	100
3	PCC	PEC-ME-405	CNC Machines and Automation (Skill Enhancement Course)	3	1		4	40	60	100
4	PEC	PEC-ME-404-406	Professional Elective-III	3	0		3	40	60	100
5	PEC	PEC-ME-407-409	Professional Elective-IV	3	0		3	40	60	100
6	OEC	OEC-404-406	Open Elective-IV	3	0		3	40	60	100
	PCC	PCC-ME-407	CNC Machine and Automation Lab (Minor Stream)	0	0	Practical	2	60	40	100
9	PROJ	PROJ-ME-403	Major Project II (Research Project) and Dissertation)	0	0		6	360	240	600
TOTAL				**06**	**02**	**20**	**20**	**560**	**440**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Power Plant Engineering (PCC-ME-404)

Course Outcomes:

CO1: Enable students to understand about different types of power plants and boilers and combined power plant

CO2: Identify elements and their functions and operations of steam power plants.

CO3: Identify elements and their functions and operations of nuclear and hydel power plants

CO4: Identify elements and their functions and operations of diesel and gas turbine power plants

CO5: To illustrate the students to get the exposure of different renewable energy resources and to understand the economics of power plants and pollution control techniques.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	3		2		3	3	3	3	3
CO2	3	3	3	2	2	2	3		2		3	3	3	3	3
CO3	3	3	3	2	2	2	3		2		3	3	3	3	3
CO4	3	3	3	2	2	2	3		2		3	3	3	3	3
CO5	3	3	3	2	2	2	3		2		3	3	3	3	3

2. Entrepreneurship Development & Management (HSMC-402)

CO1: Demonstrate the meaning, functions, types and roles of an entrepreneur and entrepreneurship

CO2: Develop and strengthen entrepreneurial behaviour, quality and motivation.

CO3: Understand and analyse how sales are often conducted by agents and middlemen and to examine the legal liability arising in commercial agency.

CO4: To impart information about the process, procedure and rules and regulations for setting up new projects.

CO5: Apply preventive measures to be followed for effective management of entrepreneurship.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO2	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO3	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO4	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO5	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2

3. CNC Machines and Automation (PEC-ME-405)

Course Outcomes:

CO1: Able to read and measure part drawings and design callouts correctly without any difficulty.

CO2: Able to Understand fundamentals of NC/CNC Machine for producing quality Product of complexity.

CO3: Able to interpret manually program correctly a CNC machine to reduce waste.

CO4: Capable to use conversation of M & G codes by reading the program and knowing what action the machine intends to take thereby confirming the intended Action.

CO5: Able to use NC Programming through CAD/CAM and able to produce as per Design and proper functioning Maintenance and Trouble Shooting of CNC machine tools to maintained market demand in time.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3				1	2	2	3	3	3	3
CO2	3	3	3	3	3				1	2	2	3	3	3	3
CO3	3	3	3	3	3				1	2	2	3	3	3	3
CO4	3	3	3	3	3				1	2	2	3	3	3	3
CO5	3	3	3	3	3				1	2	2	3	3	3	3

4. Rapid Prototyping (PECC-ME-405)

Course Outcomes:

CO1: Describe product development, conceptual design and classify rapid prototyping systems; explain stereo lithography process and applications.

CO2: Identify the process photopolymers, photo polymerization, layering technology, laser and laser scanning.

CO3: Applying of measurement and scaling technique for prototype manufacturing.

CO4: Identify the Rapid Prototyping Data Formats

CO5: Application for powder based rapid prototyping systems

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	3		2		3	3	3	3	3
CO2	3	3	3	2	2	2	3		2		3	3	3	3	3
CO3	3	3	3	2	2	2	3		2		3	3	3	3	3
CO4	3	3	3	2	2	2	3		2		3	3	3	3	3
CO5	3	3	3	2	2	2	3		2		3	3	3	3	3

5. Advanced Manufacturing Process (PEC-ME-409)

Course Outcomes:

CO1: Compare advanced manufacturing machining, classification, material applications in material removal process, the principle and processes of ultrasonic machining and abrasive jet machining

CO2: Understand the principle, working and applications of chemical and thermal metal removal processes.

CO3: Identify the principle, working and applications of advanced casting processes.

CO4: Understanding the principle, working and applications of advanced welding processes.

CO5: Understand the principles, working and applications of metal forming process.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3

CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						2	3	3	3	3
CO5	3	3	3	3	3						2	3	3	3	3

6. Utilization of Electrical Power and Traction (OEC-404)

Course Outcomes:

CO1: Compare advanced manufacturing machining, classification, material applications in material removal process, the principle and processes of ultrasonic machining and abrasive jet machining

CO2: Apply an appropriate measurement and analysis technique of artificial lighting for different specific purposes..

CO3: Describe what happens to the ions in electrolysis and Be able to predict the products of electrolysis of metal halides.

CO4: Able to understand the maintaining stability, provide optimum propulsion at all speeds, and reduce driver workload.

CO5: Able to draw curve between speed time and speed distance to achieve traction motor control.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2						3	3	3	3	3
CO2	3	3	2	3	2						3	3	3	3	3
CO3	3	3	2	3	2						3	3	3	3	3
CO4	3	3	3	3	2						2	3	3	3	3
CO5	3	3	3	3	2						2	3	3	3	3

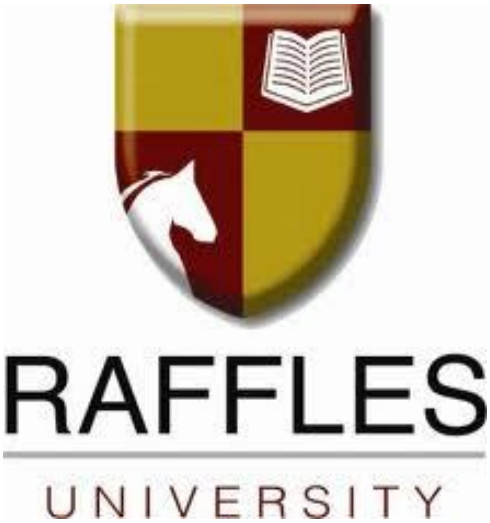
BACHELOR'S DEGREE PROGRAMME (B.Tech)

Choice Based Credit System

Syllabus

Academic Curricula-2022-26

Department Mechanical Engineering



Raffles University, Neemrana, Rajasthan [INDIA]-301705

www.rafflesuniversity.edu.in

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	BSC 101	ENGINEERING PHYSICS-I	BSC

UNIT I

Interference: Coherent sources, conditions for sustained interference, Analytical treatmentof interference, Division of Wave-Front – Fresnel‟s Biprism, Division of Amplitude-Interference by a plane parallel film, Wedge-shaped film, Newton‟s Rings, Michelson Interferometer, applications (Resolution of closely spaced spectral lines, determination of wavelengths).

UNIT II

Diffraction: Difference between interference and diffraction Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a single slit, Plane transmission diffraction grating, absent spectra, dispersive power, resolving power and Rayleigh criterion of resolution.

UNIT III

Polarisation: Polarised and unpolarised light, Uniaxial crystals, optic axis, double refraction, Nicol prism, quarter and half wave plates, Detection and Production of different types of polarized light, Polarimetry; Optical and specific rotation, Biquartz and Laurent‟s half shade polarimeter.

Laser and Fibre Optics: Spontaneous and Stimulated emission, Laser principle, Einstein‟s coefficients, characteristics of laser beam-concept of coherence, spatial and temporal coherence, He-Ne and semiconductor lasers (simple ideas), applications.
Propagation of light in optical fibres, numerical aperture, V-number, single and multimode fibres, Elementary idea of attenuation and dispersion, applications.

UNIT IV

Electrostatics: Dielectric polarization, dielectric relaxation process, types of polarization, relation between E,P and D, Gauss‟s law in the presence of a dielectric, Energy stored in a uniform electric field, dielectric losses and variation with frequency.

Electrodynamics: Maxwell‟s field equations –significance, differential and integral form, Maxwell‟s equations in different media- free space, dielectric and conductor.

UNIT V

Special Theory of Relativity: Inertial and non-inertial frames, Galilean transformations, Michelson‟s Morley Experiment, Postulates of Special Theory of Relativity, Lorentz transformations, Consequences of LT (length contraction and time dilation), addition ofvelocities, variation of mass with velocity, mass energy equivalence.

Text and Reference books:

1. Perspectives of Modern Physics - Arthur Beiser (TMH)
2. Optics – Ajoy Ghatak (TMH)
3. Modern Physics for Engineers – S.P.Taneja (R. Chand)
4. Engineering Physics – Satya Prakash (Pragati Prakashan)
5. Modern Engineering Physics – A.S.Vasudeva (S. Chand)
6. Engineering Physics (Vol-1)- S.L. Gupta (Dhanpat Rai)
7. Fundamentals of Physics – Resnick & Halliday (Asian Book)
8. Introduction to Electrodynamics – D.J. Griffith (Prentice Hall)

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	BSC 102	ENGINEERING MATHEMATICS-I	BSC

UNIT I

Differential Calculus: Asymptotes (Cartesian Coordinates Only), Curvature (Cartesian Coordinates Only), Concavity, Convexity and Point of Inflexion (Cartesian Coordinates Only), Successive differential.

UNIT II

Differential Calculus: Partial Differentiation, Euler‟s Theorem on Homogeneous Functions, Approximate Calculations, Maxima & Minima of Two and More Independent Variables, Lagrange‟s Method of Multipliers.

UNIT III

Integral Calculus: Surface and Volumes of Solids of Revolution, Double Integral, Double Integral by changing into polar form , Areas & Volumes by Double Integration ,Change of Order of Integration, Beta Function and Gamma Function (Simple Properties).

UNIT IV

Differential Equations: Differential Equations of First Order and First Degree - Linear Form, Reducible to Linear form, Exact Form, Reducible to Exact Form, and Linear Differential Equations of Higher Order with Constant Coefficients Only.

UNIT V

Differential Equations: Second Order Ordinary Differential Equations with Variables Coefficients, Homogeneous and Exact Forms, Change of Dependent Variable, Change of Independent Variable, and Method of Variation of Parameters.

Text and Reference books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley 9th Edition.
2. Calculus and Analytical Geometry, Thomas and Finney, Narosa Publishing House. New Delhi.
3. A Text Book of Differential Equations, M.Ray and Chaturvedi, Students Friends & Co. Publisher, Agra

4.Higher Engineering Mathematics, B.V.Ramana, Tata McGraw Hill.

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course

04	**3**	**1**	**0**	**ESC 101**	**COMPUTER FUNDAMENTALS**	**ESC**

UNIT I

Introduction to Computer: Definition of Computer, Evolution of Computer, Generations of Computer, types of Computer, classification of Computer, Input/output Devices, Arithmetic and Logical Unit, Central Processing Unit, Control Unit, Memory, Several Registers. Hardware and Software.

Introduction to Software and Hardware, types of Software, difference between System Software and Application Software, Files, types of Files, Random Access File, Direct Random Access File, Pseudo code.

UNIT-II

Operating System and Memory: Introduction to Operating System, Functions of Operating System, Types of Operating system, Introduction to Linux, Introduction to Memory, Primary Memory, types of Primary Memory, Secondary Memory, types of Secondary Memory, Extended Memory, Flash Memory.

UNIT III

Number System and Arithmetic Core: Binary Number System, Octal Number System, Hexadecimal Number System, BCD Codes, Addition, Subtraction, Multiplication and Division of Binary Number Systems.

Conversions: Conversion of Decimal to Binary, Binary to Decimal, Decimal to Octal,Binary to Octal, Octal to Decimal, Decimal to Hexadecimal, Hexadecimal to Decimal.

UNIT IV

Boolean Algebra And Logic Gates: Basic Boolean functions, Logic Gates, AND, OR, NAND, NOR Gates, Logic Circuits, Converting expression to Logic Circuits, Universal NAND Gate, Universal NOR Gate , Exclusive OR and Equivalence functions, Design of Combinational Circuit, Full and Half Adder, Parallel Binary Adder.

UNIT V

Programming and Languages: Introduction to Programming, Procedural Programming, Structural Programming, Object Oriented Programming, Machine Level Language, Assembly Language, Higher Level Language, Translator, Assembler, Linker, Loader, Advantages and Limitations of Programming Languages, Algorithms and Flow Charts.

Text and Reference books::

1. E Balagurusamy Fundamentals of Computer TMH Publications.

2. Rajaraman, V. (2004). Introduction to Information Technology. PHI.
3. PK Sinha Computer Fundamentals Sixth Edition BPB Publications.
4. Norton, P. (2001). Introduction to computers. TMH
5. Ram, B. (2003). Computer Fundamentals. New Age Publications

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	ESC 102	BASICS OF MECHANICAL ENGINEERING	ESC

UNIT I

Basic Concepts of Thermodynamics: Macroscopic and Microscopic Approaches, Thermodynamic Systems, Surrounding and Boundary, Thermodynamic Properties – Intensive and Extensive, Thermodynamic Equilibrium, State, Path, Process and Cycle, Concept of Thermodynamic Work and Heat, Zeroth Law of Thermodynamics, Energy and First law of Thermodynamics, First law applied to non-flow processes, Internal Energy and Enthalpy. Numerical Problems.

UNIT II

I.C. Engines: Introduction, classification, Constructional details and working of 2 stroke & 4 stroke petrol engine & diesel engine, Otto, diesel and dual cycles, simple problems on Otto & diesel cycles.

Refrigeration, Air-Conditioning: Refrigerants: properties of refrigerants, list of commonly used refrigerants. Refrigeration –Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, unit of Refrigeration. Principle and working of vapor compression refrigeration and vapour absorption refrigeration: Principles and applications of air conditioners, Room air conditioner.

UNIT III

Simple Lifting Machines: Definition of machine, velocity ratio, Mechanical advantage, Efficiency, Laws of machines, Reversibility of machine, Wheel and axle, Differential pulley block, Single, Double and Triple start worm and worm wheel, Simple and compound screwjacks, Problems.

Basics of Power Transmission: Transmission of mechanical power: introduction belt drives, gear drives, their advantages and disadvantages. Introduction to brakes and clutches.

UNIT IV

Stresses and Strains: Introduction, Concept & types of Stresses and Strains, Poisons ratio, stresses and Strains in simple and compound bars under axial loading, Stress– Strain diagrams, Hook's law, Elastic constants and Mechanical Properties of metals like mild steel and cast iron.

UNIT V

Basics of Manufacturing Processes and Measurements: Brief introduction to classification of

different manufacturing processes: Primary shaping processes, metal cutting processes, joining processes, finishing processes and processes bringing change in properties, Working principle, parts and specification of commonly used machine tools in workshop such as Lathe, Shaper and

Milling. Measuring Instruments: introduction to slip gauges, Go and No Go gauges, dial gauges,vernier calliper, micrometer, sine bar, vernier height gauges.

Text and Reference Books:

1. Basics of Mechanical Engineering- R.K Rajput Laxmi Pub, Delhi.

2. Elements of Mechanical Engineering- D.S Kumar, S.K Kataria and Sons.

3. Engineering Thermodynamics- P.K Nag TMH, New Delhi.

4. Workshop Technology Vol I & II –Hazra & Chaudhary, Asian Book Comp., New Delhi.5.Engineering Thermodynamics- C.P Arora, Pub- TMH, New Delhi.

6. Manufacturing Science- Amitabha Ghosh & Ashok Kumar Malik, - East- West Press.

7. Manufacturing Process & Systems- Oswald, Munoz, John Wiley.

8. Workshop Technology Vol I, II & III- Chapman, WAJ, Edward Arnold.

9. Basics of Mechanical Engineering – Vineet Jain, Dhanpat Rai Publications

10. Automobile Engineering by Dr Kirpal Singh, standard Publishers Distributors

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
00	2	0	0	MC-I	ENVIRONMENTAL STUDIES	MC

UNIT I

Multidisciplinary Nature Environmental Studies: Definition, scope and importance. Need for public awareness.

Natural Resources: Renewable and Non-Renewable Resources: Natural resourcesand associated problems:

- Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water.
- Mineral resources: Use and exploitation, environmental effects of extracting and mineral resources, case studies.
- Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems.
- Energy resources: Renewable and non- renewable energy sources, use of alternate energy sources. Case studies.
- Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.

UNIT II

Ecosystems:

Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers anddecomposers.

- Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Nutrient cycling; biogeochemical cycle, N_2 Cycle, H_2O Cycle, Carbon cycle.

  a) Introduction & characteristic features, structure and function of the following ecosystem/ Biomes: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem

  d) Aquatic ecosystems (fresh & Marine)

UNIT III.

Biodiversity and its Conservation:

- Introduction – Definition: genetic, species and ecosystem diversity.

- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic andoption values.
- Bio geographical classification of India.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation. Hot-spots of biodiversity. Endangered and endemic species of India.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT IV

Environmental Pollution:

- Definition, Causes, effects and control measures of: a) Air pollution b) Water pollution c) Soil pollution d) Noise pollution e) Nuclear hazards
- Role of an individual in prevention of pollution.
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Disaster management: floods, earthquake, cyclone and landslides.

UNIT V

Social Issues and the Environment:

- Sustainable development; From Unsustainable to Sustainable development urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns.
- Environmental Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents.
- Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act
- Wildlife Protection Act.
- Public awareness & measures.

Text and Reference books:

1. Perspectives in Environmental Studies by A. Kaushik and C. P. Kaushik, New age international publishers.
2. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi
3. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
4. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela 2008 PHI Learning Pvt Ltd.
5. Environmental Science by Daniel B. Botkin& Edwards A. Keller, Wiley INDIA edition.
6. Fundamentals of Ecology by Odum, E.P., Barrick, M. and Barret, G.W. Thomson

Brooks/Cole Publisher, California, 2005.

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	HSMC 101	COMMUNICATIVE ENGLISH	HSMC

UNIT I

Basic Functional English

1. The English „Alphabet‟ with emphasis on Vowels‟ and their sounds.
2. Introduction to various Parts of Speech – Noun, Verb, Adjective, Adverb, Pronoun, Preposition, Conjunction, Interjection.
3. Simple Present Tense.
4. Introduction to sentence composition – Subject and Predicate, Subject-Verb agreement, construction of Simple Sentences.
5. Articles – Uses and exceptions.
6. Vocabulary – Synonyms, Antonyms, Homonyms.
7. Commonly Mispronounced and misspelled words.
8. Common technical/ scientific/ legal terminologies
9. Question Formation – Close ended, open ended, and tag questions.

UNIT II

Communicative English

1. English in every-day communication – greeting people, introducing oneself, giving public speeches and presentations, public speaking, making an argument, persuading someone, participating in interviews and group discussions, situational role plays, etc.
2. Politeness and etiquette in daily communications – Minding the Ps and Qs (please, quite, kindly, excuse me, pardon me, thank you, bless you, pleasure, etc).
3. *May* and *Can* for permission and possibility; *Could* for permission and possibility in the past; *Could* for politeness in the present.
4. *May* and *Might* for possibility; *Can* and *Be able to* for ability.
5. *Ought, Should, Must, Have to, Had to,* and *Need to* for obligation.

UNIT III

Reading Comprehension

1. Close reading and comprehension.
2. Summary paraphrasing. CV writing, official letters, memo, precise, and reports.
3. Analysis and interpretation of key texts.

UNIT IV

Oral Presentation

1. Oral presentation (with PPTs or PREZI) of reports, arguments, summary and analysis of texts, etc.
2. Extempore, speech delivery, Just a Minute Exercise
3. Group Discussion and PI

UNIT V

Introduction to Business Communication:

Definition, objectives, importance, elements, process, forms, models, levels of analysis of business communication, principles of effective communication, barriers to communication. Types of communication, formal and non-formal, verbal and non-verbal**.**

Text and Reference books:

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma & Binod Mishra, PHILearning Pvt. Ltd.
2. English for Engineers: Made Easy, Aeda Abidi & Ritu Chaudhary, CengageLearning, (New Delhi)
3. A Practical Course for Developing Writing Skills in English, J.K. Gangal, PHI Learning Pvt. Ltd., New Delhi.
4. Intermediate Grammar, Usage and Composition, Tickoo, A. E. Subramaniam & P. R.Subramaniam, Orient Longman (New Delhi)
5. The Written Word , Vandana R. Singh, Oxford University Press (New Delhi)
6. The Great Short Stories edited by D.C. Datta, Ram Narain Lal Publishers (Allahabad)
7. Professional Communication, Kavita Tyagi & Padma Misra, PHI Learning Pvt. Ltd., NewDelhi.
8. "Learn Correct English: Grammar, Usage and Composition" by Shiv K. Kumar &
9. Hemalatha Nagarajan, Pearson (New Delhi).
10. "Current English Grammar and Usage with Composition" by R.P. Sinha, Oxford
11. University Press (New Delhi).
12. "Grammar of the Modern English Language", by Sukhdev Singh & Balbir Singh, (New Delhi).

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
02	0	0	3	ESC 103	WORKSHOP PRACTICE LAB	ESC

Carpentry Shop

1. T – Lap joint
2. Bridle joint

Foundry Shop

1. Mould of any pattern
2. Casting of any simple pattern

Welding Shop

1. Gas welding practice by students on mild steel flat
2. Lap joint by gas welding
3. MMA welding practice by students
4. Square butt joint by MMA welding
5. Lap joint by MMA welding
6. Demonstration of brazing

Machine Shop Practice

1. Job on lathe with one step turning and chamfering operations
2. Job on shaper for finishing two sides of a job
3. Drilling two holes of size 5 and 12 mm diameter on job used / to be used for shaping
4. Grinding a corner of above job on bench grinder

Fitting and Smithy Shop

1. Finishing of two sides of a square piece by filing
2. Tin smithy for making mechanical joint and soldering of joint
3. To cut a square notch using hacksaw and to drill three holes on PCD and tapping

Text and Reference books :

1. Mechanical Workshop Practice, K.C. John, PHI Learning , New Delhi.
2. Elements of Workshop Technology Hajra & Choudhary, Media Promoters & Publisher.
3. Workshop Technology , W.A.J.Chapman, CBS Publisher & Distributor New Delhi.

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	BSC 103	ENGINEERING PHYSICS-I LAB	BSC

List of Experiments:

1. To determine the specific rotation of Glucose (Sugar) solution using a polarimeter.
2. To convert a Galvanometer in to an ammeter of range 1.5 amp. and calibrate it.
3. To convert a Galvanometer in to a voltmeter of range 1.5 volt and calibrate it.
4. To study the variation of a semiconductor resistance with temperature and hence determine the Band Gap of the semiconductor in the form of reverse biased P-N junction diode.
5. To measure the height of a terrestrial objects using Sextant.
6. To find out the horizontal component of earth‟s magnetic field by using tangent galvanometer.
7. To determine the wave length of monochromatic light with the help of Fresnel‟s biprism.

B. Tech. I Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	HSMC 102	LANGUAGE LAB-I	HSMC

List of Experiments:

1. Phonetic Symbols and Transcriptions
2. Word Formation
3. Affixes
4. Listening and speaking Skills.
5. Words often Mis-spelt and Mis- Pronounced
6. One Word for Many.
7. Synonyms and Antonyms.
8. Seminar Presentation.
9. Group Discussion.
10. Job Interview
11.

Text and Reference books:

1. Advanced Manual for Communication Laboratories and Technical Report Writing, D. Sudha Rani, Pearson, (New Delhi)
2. A Course in Phonetics and Spoken English, J. Sethi & P.V. Dhamija, PHI Learning Pvt. Ltd. (New Delhi)
3. English Language Laboratories: A Comprehensive Manual, Nira Konar, PHI Learning Pvt .Ltd. (New Delhi)
4. Communication Skills for Engineers and Scientists, Sangeeta Sharma and Binod Mishra, PHI Learning Pvt. Ltd.(New Delhi).
5. Oxford English Learning Package.(With CDs: Headway Series)
6. Tata McGraw Hills English Learning Package (With CDs) 7. "Oxford Advanced Learners" Dictionary" published by Oxford University Press (New Delhi)

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	BSC 104	ENGINEERING PHYSICS-II	BSC

UNIT I

Electromagnetic Theory (EMT): Motion of Charged Particles in crossed electric & magnetic fields, Velocity Selector & Magnetic focussing, Gauss law, continuity equation, inconsistency in Ampere's Law, Maxwell's equations (differential and integral forms), poynting vector, Poynting Theorem (Statement only), propagation of plane electromagnetic waves in conducting and non- conducting medium.

UNIT II

Quantum Mechanics & Statistical Physics: De-Broglie Hypothesis, Davisson Germer experiment, wave function and its properties, expectation value, Wave Packet, Uncertainity principle. Schrodinger Equation for free Particle, Time Dependent Schrodinger Equation, Particle in a box (1-D), Single step Barrier, Tunneling effect.

Qualitative Features of Maxwell Bollzman, Bose-Einstein and Fermi-Dirac statistics distribution,functions & their comparison (no derivation)

UNIT III

Solid State Physics: Formation of energy bands in metals, semiconductors and insulators; intrinsic and extrinsic semiconductors, Fermi energy levels for doped, undoped semiconductors and pn junction; Tunnel diode, Zener diode.

Superconductivity: Meissner Effect, Type I and Type II Superconductors, BCS theory

(Qualitative only), London's equation, properties of superconductors & applications.

Unit IV

X-Rays: production and properties, Crystalline and Amorphous solids (Brief) Bragg's Law, Applications.

Ultrasonics: Introduction, Production of Ultrasonics (Magentostriction and piezoelectric methods), engineering applications.

Unit V

Nuclear Radiation: Nuclear Detectors, Characteristics of gas filled detectors: general

considerations, Constructions, Working and properties of: Ionization chamber, proportional counter, G. M.Counter and Scintillation Counter.

Text and Reference Books:

1. Concept of Modern Physics: A. BEISER
2. Quantum Physics: Greiner
3. Introduction to Electrodynamics: Griffith
4. Introduction to Superconductivity: Michael Tinkham
5. A Textbook of Nanoscience and Nanotechnology: T Pradeep
6. Electromagnetic waves and Radiating Systems: Jordan & Balmain
7. Solid State Physics: Kittel
8. Solid State Physics: R.L. Singhal
9. Quantum Mechanics: Schiff

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	BSC 105	ENGINEERING MATHEMATICS-II	BSC

Unit I

Coordinate Geometry of Three Dimensions: Equation of a sphere, Intersection of a sphere and a plane, tangent plane, Intersection of two spheres, orthogonality of two spheres, Right circular cone. Right circular cylinder.

Unit II

Matrices: Rank of a matrix, Rank of matrix by reducing to normal forms, Consistency of systems of linear simultaneous equations and its solution, Eigen values and Eigen vectors,Cayley Hamilton theorem (without proof), Diagonalization of matrix.

Unit III

Vector Calculus: Scalar and vector field, differentiation & integration of vector functions, Gradient, Divergence, Curl and Differential Operator, Line, Surface and volume Integrals.

Unit IV

Application of Vector Calculus: Green's Theorem in a Plane, Gauss's and Stoke's Theorem (without proof) and their Applications. Fourier Series: Expansion of simple functions in Fourier Series, half range Fourier sine and cosine series, change of interval. Harmonic Analysis.

Unit V

Differential Equations: Series Solutions of Second Order Linear Differential Equations with Variable Coefficients (Complementary Functions only), Partial Differential Equations of First Order : Lagrange's Form, Standard Forms, Charpit's Method .

Text and Reference books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley 9th Edition.

2. Calculus and Analytical Geometry, Thomas and Finney, Narosa Publishing House N. Delhi.

3. A Text Book of Differential Equations, M.Ray and Chaturvedi, Students Friends & Co.Publisher, Agra.

4. Higher Engineering Mathematics, B.V.Ramana, Tata Mcgraw Hill.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	ESC 105	PROGRAMMING WITH 'C'	ESC

UNIT I

Introduction to Programming: Concept of algorithms, Flow Charts, Data Flow diagrams etc., Introduction to the Editing tools such as vi or MS-VC editors, Concepts of the finite storage, bits bytes, kilo, mega and gigabytes. Concepts of character representation, Number System & BinaryAirthmatic.

UNIT II

Programming using C: The emphasis should be more on programming techniques rather than the language itself. The C Programming language is being chosen mainly because of the availability of the compilers, books and other reference materials.

Example of some simple C program. Concept of variables, program statements and function callsfrom the library (Print f for example)

UNIT III

Operation Using C: C data types, int, char, float etc., C expressions, arithmetic operation, relational and logic operations, C assignment statements, extension of assignment of the operations. C primitive input output using getchar and putchar, exposure to the scanf and printf functions, C Statements, conditional executing using if, else. Optionally switch and break statements may be mentioned.

UNIT IV

Iterations and Subprograms: Concept of loops, example of loops in C using for, while and do-while. Optionally continue maybe mentioned. One dimensional arrays and example of iterative programs using arrays, 2-d arrays Use in matrix computations. Concept of Sub-programming, functions Example of functions. Argument passing mainly for the simple variables.

UNIT V

Pointers and Strings: Pointers, relationship between arrays and pointers Argument passing using pointers Array of pointers. Passing arrays as arguments. Strings and C string library.

Structure and Unions. Defining C structures, passing strings as arguments Programming examples.

Text and Reference Books:

1. Yashwant Kanetkar, "Let us C", BPB Publications, 2nd Edition, 2001.

2. Herbert Schildt, "C:The complete reference", Osbourne Mcgraw Hill, 4th Edition, 2002.

3. Raja Raman, "Computer Programming in C", Prentice Hall of India, 1995.

4. Kernighan & Ritchie, "C Programming Language", The (Ansi C Version), PHI, 2nd Edition.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	ESC 106	BASIC ELECTRICAL ENGINEERING	ESC

UNIT - I

A.C. CIRCUITS: Sinusoidal signal, instantaneous and peak values, RMS and average values, phase angle, polar & rectangular, exponential , R,L and C components, behaviors of these components in A.C. circuits. Concept of complex power, power factor.

SERIES AND PARALLEL A.C. CIRCUITS: Series and parallel A.C. circuits, series andparallel resonance, Q factor, cut-off frequencies and bandwidth.

UNIT -II

DC NETWORK THEOREMS: Thevenin's theorem, Norton's theorem, superposition theorem, maximum power transfer theorem, Star to Delta & Delta to Star transformation. Nodaland Loop methods of analysis

UNIT - III

THREE PHASE CIRCUITS: Phase and line voltages and currents, balanced star and delta circuits, Relation between star and delta quantities, power equation, measurement of power bytwo wattmeter method.

UNIT - IV

1-ϕ TRANSFORMERS: Principle of operation, construction & working of transformer, E.M.F-Equation, Phasor –diagrams, Voltage Regulation, S.C and O.C Test , losses and Efficiency , Auto Transformer.

BASIC INSTRUMENTS: Basics of Moving coil & Moving Iron instruments, Basics of indicating instruments – Wattmeter & Single phase Energy Meter.

UNIT - V

D.C. Machine: Principle of operation, construction, working & applications of D.C machines,Types of Machine.

Induction motor: Principle of operation, construction, working & applications, Types of motors,slip concept.

Synchronous motor: Principle, construction, Types of motors.

TEXT REFERENCE BOOKS:

1. Basic Electrical Engg (2nd Edition) : Kothari & Nagarath, TMH
2. Electrical Technology (Vol-I) : B.L Theraja & A K Theraja, S.Chand
3. **Electrical Engineering Fundamentals : Deltoro, PHI**
3. **Network Analysis :Valkenburg, PHI**

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	ESC 107	ENGINEERING MECHANICS	ESC

UNIT-I

Introduction of Engineering Mechanics: Basic concepts System of Forces- Coplanar Concurrent Forces - Components in Space - Resultant- Moment of Forces and its Application Couples and Resultant of Force System - Equilibrium of System of Forces- Free body diagrams- Equations of Equilibrium of Coplanar Systems and Spatial Systems.

UNIT –II

Friction: Types of friction - Limiting friction - Laws of Friction - static and Dynamic Frictions - Motion of Bodies - Wedge, Screw jack and differential Screw jack.

Transmission of Power: Belt Drivers - Open, Crossed and compound belt drives -length of belt - tensions - tight side - slack side - Power transmitted and condition for maximum power.

UNIT -III

Center of Gravity & Moment of Inertia: Centroids - Theorem of Pappus- Centroids of Composite figures - Centre of Gravity of Bodies - Area moment of Inertia: - polar Moment of Inertia - Transfer - Theorems - Moments of Inertia of Composite Figures - product of Inertia - Transfer Formula for product of Inertia. Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia - Mass moment of inertia of composite bodies.

UNIT -IV

Kinematics: Rectilinear and Curve linear motion - Velocity and Acceleration - Motion of a Rigid Body - Types and their Analysis in Planar Motion.

Kinetics: Analysis as a particles and Analysis as a Rigid Body in Translation - Central Forcesof motion - Equations of Plane Motion - Fixed Axis Rotation - Rolling Bodies - Work-Energy Method - Equation for Translation - Work-Energy application to Particle Motion, Connected System- Fixed axis Rotation and Plane Motion.

UNIT -V

Mechanical Vibrations: Definitions, Concepts - Simple Harmonic motion - free vibrations - Simple and compound pendulums - torsional vibrations.

Shear Force & Bending Moment Diagrams & Trusses: Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple. Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	BSC 106	ENGINEERING CHEMISTRY	BSC

UNIT I

Chemical Bonding: Potential Energy curve for H_2 molecule, co-ordinate bond, Werner's theory,effective atomic numbers, isomerism in co-ordinate compounds. Hydrogen bonding, Vander Waal's forces, hybridization including d-orbitals, Valence shell Electron Repulsion Theory (VSEPR). Discussion of structures of IF_3, $SnCl_2$, CO_3^{2-}, Molecular Orbital theory, Linear combination of atomic orbitals (LCAO) method. Structures of simple heteronuclear diatomic molecules such as CO, NO, HF, HCl.

UNIT II

Gaseous State: Gas laws and Kinetic theory of gases, Distribution of molecular velocities, Meanfree path, Real gases – non ideal behaviour, causes of deviation from ideal behaviour, Vander Waal's equation. Liquefaction of gases. Numericals based on above topics.

Thermo chemistry: Hess's Law, Heat of a reaction, Effect of temperature on heat of reaction at constant pressure (Kirchoff's eq.), heat of dilution, heat of hydration, heat of neutralization and heat of combustion, Flame temperature.

UNIT III

Catalysis: Criteria for catalysis : Homogeneous catalysis – acid-base, Enzymatic catalysis, Catalysis by metal salts, Heterogeneous catalysis, concepts of promoters, inhibitors and poisoning, physiosorption, chemisorption, surface area.

The Phase Rule: Definitions of various terms, Gibb's Phase rule, Application of phase rule to one component system – the water system and Sulphur system. Two component system : Lead – Silver, $FeCl_3$ – water, Na_2SO_4 – water.

UNIT IV

Polymers and Composites: Functionality, Degree of polymerization, concept of molecular weight (number average, weight average & numerical based on them), Linear, branched and cross-linked polymers, Tacticity of polymers, Homo and Copolymers (Classification based on repeat unit), Structure – property relationship of polymers. Industrial applications of important thermoplastic, thermosetting polymers, Elastomers, Natural Polymers.

Conducting Polymers : Properties and applications.

UNIT V

Alkenes: Nomenclature of alkenes, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes and mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydro boration oxidation, oxy mercuration reduction, ozonolysis, hydration, hydroxylation and oxidation with KMnO4.

Text and Reference Books:

1. Inorganic Chemistry (Latest ed.) By J.D. Lee
2. Chemistry in Engineering & Technology (Vol I & II) (Latest ed.) By J.C. Kuriacose & J.Rajaram
3. Principles of Physical Chemistry (Latest ed.) By Puri, Sharma & Pathania
4. Polymer Science (Latest ed.) By V.R. Gowarikar, N.V. Viswanathan & Jayadev Sreedha

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	ESC 108	BASIC ELECTRICAL ENGINEERING LAB	ESC

List of Experiments:

1. To study working principle of Fluorescent Tube Light.
2. To study working of single phase Induction motor & vary its speed by single phaseAuto- Transformer.
3. To prepare connections of Ceiling Fan & vary its speed by regulator.
4. To study working of three phase Induction motor & vary its speed by three phase Auto- Transformer.
5. To study Stair – Case wiring.
6. To study Thevenin & Nortons Theorem
7. To study & verify Superposition Theorem
8. To study & verify Maximum power Transfer Theorem.
9. To study speed control of D.C motor.
10. To study open circuit & short circuit test of single phase Transformer.
11. To study power measurement by two wattmeter method.
12. To study the frequency response of series RLC circuit.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	BSC 107	ENGINEERING PHYSICS-II LAB	BSC

List of Experiments:

1. To study and plot V-I characteristics of PN junction diode.

2. To Study and plot V-I characteristics Zener Diode.

3. To draw common emitter characteristics of a transistor and calculate transistor characteristicsparameters.

4. To draw common base characteristics of a transistor and calculate transistor characteristicsparameters.

5. To plot the waveform of the half wave rectifier and find the ripple factor for H.W.R.

6. To plot the waveform of the full wave bridge rectifier and analyze its output.

7. To study verify the truth table of all the logic gate.

8. To study Cathode Ray Oscilloscope (CRO).

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
02	3	0	3	ESC 109	ENGINEERING DRAWING LAB	ESC

UNIT - I

Introduction: Drawing Instruments and their uses, BIS conventions, Lettering, dimensioning Line conventions and free hand practicing.

UNIT - II

Orthographic Projections: Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straightlines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes. Projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.

UNIT - III

Projections of Solids (First Angle Projection Only): Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.

UNIT - IV

Sections And Development of Lateral Surfaces of Solids: Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.

UNIT - V

Isometric Projection (Using Isometric Scale Only): Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres.

TEXT AND REFERENCE BOOKS:

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-CharotarPublishing House, Gujarat
2. Engineering graphics for degree - K.C. John, 2nd Edition, 2009 – PHI Learning

PrivateLimited.

3. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash PublishersBangalore

4. Engineering Graphics and Drafting :P.S. Gill, Milenium Edition, S.K. Kataria and Sons.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	ESC 110	PROGRAMMING WITH 'C' LAB	ESC

List of Experiments:

1. Write a program to produce ASCII equivalent of given number
2. Write a program to find divisor or factorial of a given number.
3. Write a program to evaluate the following algebraic expressions after readingnecessary values from the user

   (ax+b)/(ax-b)

   2.5 log x-cos 30+|x^2-y^2|+sqrt

   (2xy)(x^5+10x^4+8x^3+4x+2
4. Write a program to find sum of a geometric series
5. Write a program to cipher a string
6. Write a program to check whether a given string follows English capitalization rules
7. Write a program to find sum of the following series1+ 1/2+ 1/3 +___+1/20
8. Write a program to search whether a given substring exist in an input string or not and thendelete this string from input string.
9. Write a recursive program for tower of Hanoi problem
10. The fibonacci sequence of numbers is 1,1,2,3,5,8……. Based on the recurrence relation

    F(n)=F(n-1)+F(n-2)for n>2

    Write a recursive program to print the first m Fibonacci number
11. Write a menu driven program for matrices to do the following operation depending onwhether the operation requires one or two matrices
    a) Addition of two matrices
    b) Subtraction of two matrices
    c) Finding upper and lower triangular matrices
    d) Trace of a matrix
    e) Transpose of a matrix
    f) Check of matrix symmetry
    g) Product of two matrices.
12. Write a program that takes two operands and one operator from the user perform

theoperation and then print the answer

13. Write a program to print the following outputs:



14. Write functions to add, subtract, multiply and divide two complex numbers (x+iy) and (a+ib)Also write the main program.
15. Write a menu driven program for searching an sorting with following options:-
    a) Searching (1) Linear searching
    (2) Binary searching
    b) Sorting (1) Insersection sort
    (2) Selection sorting
16. Write a program to copy one file to other, use command line arguments.
17. Write a program to mask some bit of a number (using bit operations)
18. An array of record contains information of managers and workers of a company. Print allthe data of managers and workers in separate files.

B. Tech. II Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	BSC 108	ENGINEERING CHEMISTRY LAB	ESC

List of Experiments

1. Determine the heat of hydration of $CuSO_4.5H_2O/FeSO_4.7H_2O$.

2. Determine the heat of neutralization of strong Acid (say H_2SO_4/HCl) with strong base (NaOH).

3. Determine the heat of neutralization of Weak Acid with strong base.

4. Determine the molecular weight of a substance by Rast Method.

5. Determine the reaction rate constant for 1^{st} order reaction.

6. Determine the surface tension of a liquid using drop weight method.

7. To determine the viscosity of the given liquid (density to be determined).

8. Preparation of a Polymer.

9. To determine the cell constant of a conductivity cell.

10. Titration of strong acid/strong base conduct metrically.

Text and Reference Books:

1. Practical Physical Chemistry (Latest ed.), By B.D. Khosla, A. Gulati & V.C. Garg

2. Laboratory Manual on Engineering Chemistry (Latest ed.), By S.K. Bhasin and Sudha Rani

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	BSC201	MATHEMATICS-III	BSC

Unit -I

Fourier transform: Discrete and Fast Fourier transform Complex form of Fourier transform and its inverse, Fourier sine and cosine transform and their inversion. Properties of F-transform, Convolution theorem for F-transform, Parse Val's identity of for F-transforms Applications of Fourier transform for the solution of partial differential equations having constant coefficients with special reference to heat equation and wave equation.

Unit -II

Laplace transform, Inverse transform, properties, Transforms of derivatives and integrals, Unit step function, Dirac's delta function, Differentiation and integration of transforms, Applications to differential equations.

Unit -III

Statistical Techniques: Discrete and Continuous random variables–Moments–Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions, Moments, Moment generating functions, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non – linear

Unit -IV

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Unit -V

Cauchy-Riemann equations: Necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions.

Text and Reference books:

1. Chandrika Prasad, Mathematics for Engineers, Prasad Mudralaya
2. Jeffrey, Advanced Engineering Mathematics , ELSEVIER
3. Chandrika Prasad , Advanced Mathematics for Engineers, Prasad Mudralaya
4. Grewal B. S., Higher engineering Mathematics, Khanna Publication, New Delhi
5. Keyszig E., Advanced Engineering Mathematics, Wiley Eastern Publication
6. Peter V. O. Neil, Advanced Engineering mathematics, Thomson Publication

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 201	Strength of Material	PCC

Unit -I

Deformation in solids- Hooke's law, stress and strain- tension, Concept of factor of safety, compression and shear stresses- elastic constants and their relations- volumetric, linear, Equations of static equilibrium, Concept of free body diagram, Composite bars, Thermal stresses and principal stresses and principal planes- Mohr's circle

Unit –II

Beams and types transverse loading on beams- shear force and bend moment diagrams- Types of beam supports, simply supported and over-hanging beams, cantilevers. Theory of bending of beams, bending stress distribution and neutral axis, shear stress distribution, point and distributed loads.

Unit -III

Moment of inertia about an axis and polar moment of inertia, deflection of a beam using double integration method, computation of slopes and deflection in beams, Maxwell's reciprocal theorems.

Unit –IV

Torsion: Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capacity, Strain energy in torsion, Stresses in members subjected to combined axial, bending and torsional loads.

Unit –V

Axial and hoop stresses in cylinders subjected to internal pressure, deformation of thick and thin cylinders, deformation in spherical shells subjected to internal pressure

Columns and struts: Equilibrium, buckling and stability, Short, long and intermediate columns, Euler's formula for crippling load for columns, different end conditions, equivalent length, Eccentric loading Rankine formula and other empirical relations.

Text and Reference books:

1. James M. Gere, Mechanics of Materials, Cengage Learning (Brooks\Cole).
2. Ryder G.H., Strength of Materials, Macmillan India.
3. Sadhu Singh, Strength of Materials, Khanna Publishers.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 202	THERMODYNAMICS	PCC

Unit -I

Definition of thermodynamics, Fundamental concepts and definitions: Dimensions and units, Microscopic and Macroscopic approaches, Systems, Surroundings and Universe, Concept of Continuum, Control system boundary, Control volume, Thermodynamic properties, Thermodynamic Equilibrium types, Thermodynamic state, path, process and cycle, Reversibility and Irreversibility, Quasi static process, Energy and its forms, Work and Heat, Ideal gas, Real gas, Ideal Gas laws, Law of corresponding states, Dalton's law, Amagat's law, Property of mixture of gases.

Zeroth law of thermodynamics: Zeroth law of thermodynamics, Temperature and it's Measurement, Temperature scales.

Unit -II

First law of thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc. First law analysis for closed system (non-flow processes), Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer, Limitations of first law of thermodynamics, PMM-I.

Unit -III

Second law: Devices converting heat to work, Thermal reservoir, Heat engines, Efficiency, Devices converting work to heat, Heat pump, refrigerator, Coefficient of Performance, Reversed heat engine, Kelvin Planck statement of second law of thermodynamics, Clausius statement of second law of thermodynamics, Equivalence of two statements of second law of thermodynamics, Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, thermodynamic temperature scale, PMM-II.

Unit -IV

Entropy : Clausius inequality, Concept of Entropy, Entropy change in different thermodynamic processes, TDS equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

Availability and Irreversibility: Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function.

Unit -V

Properties of steam and thermodynamics cycles: Pure substance, Property of steam, Triplepoint, Critical point, Sub-cooled liquid, Saturation states, Superheated states, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T & P-V diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables &Mollier charts, Use of steam tables and R134a tables; Saturation tables; Superheated tables; Identification of states & determination of properties.

Text and Reference books:

1. Engineering Thermodynamics by P.K.Nag, Tata McGraw Hill Pub.
2. Thermodynamics by J. P. Holman, McGraw Hill.
3. Engineering Thermodynamics by Jones and Dugans, PHI Learning Pvt. Ltd.
4. Fundamentals of Thermodynamics by Sonntag, Wiley India Pvt. Ltd.
5. Fundamentals of Classical Thermodynamics by Van Wylen, John wiley& sons.
6. Engineering Thermodynamics by R.K.Rajput.
7. Engineering Thermodynamic, Moran, M. J. and Shapiro, H. N., 1999, John Wiley and Sons.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
3	3	0	0	PCC-ME 203	Material Science & Engineering	PCC

Unit-I

Crystal Structure: Unit cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress.

Unit - II

Mechanical Property measurement: Tensile, compression and torsion tests; Young's modulus, relations between true and engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness and elastic recovery; Hardness: Rockwell, Brinell and Vickers and their relation to strength.

Unit -III

Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstrctural aspects of ledeburite, austenite, ferrite and cementite, cast iron.

Unit - IV

Heat treatment of Steel: Annealing, tempering, normalising and spheroidising, isothermal transformation diagrams for Fe-C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructures and properties- austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening

UNIT - V

Alloying of steel, properties of stainless steel and tool steels, maraging steels- cast irons; grey, white, malleable and spheroidal cast irons- copper and copper alloys; brass, bronze and cupro-nickel; Aluminium and Al-Cu – Mg alloys- Nickel based superalloys and Titanium alloys

Text and Reference books:

1. W.D. Callister, Jr, - Material Science & Engineering Addition, Wiley Publishing Co.
2. Van Vlash - Elements of Material Science & Engineering, John Wiley & Sons.
3. S. K. Hazra Choudhary– Material Science & Processes, Media Promoters & Publishers
4. VanVlash - Elements of Material Science & Engineering, John Wiley & Sons.
3. V. Raghvan Material Science, Prentice Hall of India

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 204	MANUFACTURING PROCESSES- I	PCC

Unit-I

Metal Casting Processes: Advantages and limitations, sand mold making procedure. Patterns: Pattern materials, pattern allowances, types of pattern, color coding. Molding materials: Molding sand composition, sand preparation, Sand molding processes. Cores: Types of cores, core prints, chaplets, and chills. Gating systems: Gates and risers. Melting practice: Cupola furnace, Defects in castings and their remedies, Precision Investment Casting, Centrifugal Casting, and Continuous Casting.

Unit-II

Metal Forming Processes: Nature of plastic deformation, hot working and cold working .Principles of rolling, roll passes, roll pass sequences. Forging: Forging operations, smith forging, drop forging, press forging, forging defects.

Unit-III

Extrusion and Sheet Metal Operations: Extrusion principle, hot extrusion, cold extrusion, wire drawing, swaging, tube making. Sheet metal operations: Press tools operations, shearing action, drawing dies, spinning, bending, stretch forming, embossing and coining.

Unit-IV

Welding Process: Principles of welding, brazing and soldering, Classification of Welding Processes, gas welding and cutting process, equipment. Arc welding power source and consumables. Resistance welding: Principle and equipments, resistance spot welding, resistance seam welding, electro slag welding, forge welding.

Unit-V

Advance Welding Processes: Tungsten inert gas welding (TIG), metal inert gas welding (MIG), MMAW, electron beam welding, friction welding, and diffusion welding: their working principle, equipments, parameters and applications.

Powder Metallurgy: Powder manufacturing, compaction and sintering processes. Advantages and applications of Powder Metallurgy.

Text and Reference books:

1. Principles of Manufacturing Materials & Processes – Campbell J. S., Publisher – McGraw Hill.

2. Manufacturing Science - Ghosh A; Mallik A.K. Affiliated East-West Press Pvt. Ltd., New Delhi

3. Manufacturing Processes- H S Shan, Cambridge University Press 2nd Edition 2017.

4. Production Technology – P C Sharma –S.Chand publications, New Delhi.

5. Elements of Manufacturing Processes – B.S. NagendraParasher, RK Mittal, PHI N. Delhi

MANDATORY COURSES

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
2	2		0	MC-III	Introduction to Indian Law	MC

Unit – I

Salient features of the Indian constitution. Preamble Definition of State (Art. 12) Doctrines of Ultra-virus, severability, eclipse, waiver (Art, 13)

Unit – II

Right to equality (Art. 14) Prohibition of discrimination, Rights to equality of opport UNITy (Art. 15-16) Right to freedom under Article 19: Freedom of association; Freedom of movement; Freedom of residence; Freedom of assembly; Freedom of association; Freedom of movement; Freedom of residence; Freedom of occupation, trade and business; Right to take out processions; Right of the State to impose reasonable restrictions

Unit – III

Protection in respect of Conviction under Article 20, Ex-post-facto law; Double jeopardy; Self-incrimination; Right of Life and Personal Liberty (Act. 21), Protection in respect of arrest and detention Right to freedom of Religion (Articles 25-28)

Unit – IV

Cultural and Education Rights (Articles 29-30) Enforcement of Fundamental Right, Writ Jurisdiction of the Supreme Court and High Court (Article 32, 226)

Unit – IV

Right to property before and after the Constitution 42nd Amendment Act, 1976 Abolition of Untouchability, Titles (Articles 17-18) Right against exploitation (Articles 23, 24)

Text and Reference Books:

Austin Granville: Constitution of India: Cornerstone of a Nation; and Working A Democratic constitution Narender Kumar: Constitutional Law of India.

Basu D. D: Shorter Constitution of India

Jain, M.P.: Constitutional Law of India,

Seervai, H.M.: Constitutional Law of India, Vols. I-III

Shukla, V.N.: Constitutional of India (ed. M.P. Singh)

Mechanical Engineering (B. Tech.), III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
02	0	0	3	PCC-ME 205	Machine Drawing and Auto CAD Lab	PCC

SECTION A- MACHINE DRAWING

Introduction graphic language classification of drawing, principal of drawing, IS codes for machine drawing, lines, scales, section dimensioning, standard abbreviation, – Limits , fits and Tolerance (Dimensional and Geometrical tolerance) , Surface finish, Gears : Gear terminology, I.S. convention representation of assembly of spur gears, helical gears, bevel gears , worm and worm wheel.

Orthographic projections: principle of first and third angle projection, orthographic views from isometric views of machine parts / components. Drawing of sectional views:- Coupling, Crankshaft, Pulley, Piston and Connecting rod, Cotter and Knuckle joint. Riveted Joint and Welded Joint. Free hand sketching: Need for free hand sketching of standard parts and simple machines components.

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies: Lathe Tail stock, Machine vice, Pedestal bearing

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies Steam stop valve, Stuffing box, Drill jigs and Milling fixture.

SECTION B- Auto CAD

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.

2. Layout drawing of a building using different layer and line colors indicating all Building details. Name the details using text commands, Make a title Block.

3. To Draw Orthographic projection Drawings (Front, Top and side) of boiler safety valve giving name the various components of the valve.

4. Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.

5. Draw quarter sectional isometric view of a cotter joint.

6. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion.

7. Draw 3D models by extruding simple 2D objects, dimension and name the objects.

8. Draw a spiral by extruding a circle.

Text and Reference Books:

1. Machine Drawing - N D Bhatt and V M Panchal, Charotar Publishing House.

2. A Text Book of Machine Drawing - P S Gill Pub.: S K Kataria& Sons.

3. Engineering Graphics with Auto CAD 2002 -JamesD.Bethune, Pearson Education.

4. A Text Book of Machine Drawing LaxmiNarayana and Mathur, M/s. Jain Brothers, New Delhi.

5. Machine drawing by N Sidheshwar, Kannaieh, V S Sastry, TMH., New Delhi.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
1	**0**	**0**	**2**	**PCC-ME 206**	**THERMODYNAMICS LAB**	**PCC**

LIST OF EXPERIMENTS

1. Study of temperature and its measuring devices.
2. Study of determination of Calorific Value of Fuels by using different calorimeters
3. Determinations of exhaust gas analysis by using Orsat Apparatus
4. Study and comparison of SI and CI Engines (Cut Models).
5. To draw valve timing diagram for a single cylinder diesel engine.
6. To perform constant speed load test on a single cylinder diesel engine and to plot performance curves: indicated thermal efficiency, brake thermal efficiency, mechanical efficiency Vs. Brake power.
7. To perform constant speed load test on computerized test rig and to plot performance curves along with pressure-theta diagram.
8. Morse Test: To estimate the Indicated Power, Friction Power and Mechanical Efficiency of a multi-cylinder Petrol Engine.
9. Study of two stage reciprocating compressor.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
1	**0**	**0**	**2**	**PCC-ME 207**	**Manufacturing Science –I lab**	**PCC**

LIST OF EXPERIMENTS

1. To study and observe various stages of casting through demonstration of Sand Casting Process.
2. To prepare a pattern for given object for lost form casting.
3. To study and observe through demonstration the metal forming processes (Rolling, Forging and Sheet metal forming).
4. To manufacture a small object using hot forging technique.
5. To prepare a sheet metal product (square container).
6. To study and observe the welding and brazing techniques through demonstration and practice (Gas, MIG, TIG, Plastic, Brazing)
7. To prepare a butt joint with mild steel strip using GMAW & MMAW technique.
8. To prepare a butt joint with mild steel strips using brazing technique.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
1	**0**	**0**	**2**	**PCC-ME 208**	**STRENGTH OF MATERIAL LAB**	**PCC**

LIST OF EXPERIMENTS

1. To perform Tensile/Compressive/Shear/torsion test on a given material and to determine its various mechanical properties under tensile/compression/Shear/torsional loading
2. To determine Rockwell/Brinell hardness of a given material
3. To study the impact testing machine and perform the impact Tests (Charpy test).
4. To study the impact testing machine and perform the impact Test(Izod test)
5. To perform Bending test and to determine the Young's Modulus of Elasticity via deflection of beam.
6. Creep testing on creep testing machine
7. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.
8. Compression and tensile test on helical springs.

Mechanical Engineering (B. Tech.) III Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
1	**0**	**0**	**2**	**PCC-ME 209**	**Material Science & Engineering Lab**	**PCC**

LIST OF EXPERIMENTS

1. Classification of about 25 specimens of materials/machine parts into

(i) Metals and non-metals
(ii) Metals and alloys
(iii) Ferrous and nonferrous metals
(iv) Ferrous and non-ferrous alloys

2. Study of various crystals structures and defects in crystals through models.(Bravais Lattice structures).
3. Study of brittle and ductile fracture.
4. Metallographic examination /micro structural analysis of materials.
5. Grain Size determination of a given specimen.
6. Comparative study of microstructures of different given specimens (mild steel, gray C.I.)Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.
7. Annealing of Steel -Effect of annealing temperatures and time on hardness.
8. Study of Microstructure and hardness of steel at different rates of cooling. Microstructure examination of white cast iron.
9. Study of Iron-Carbon Equilibrium Diagram and sketch the various structures present at room temperature.
10. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.

Reference and Text Books:

1. Vander Voort, Metallography: Principles and Practice, McGraw-Hill, 1984
2. Prabhudev K.H., Handbook of Heat Treatment of Steels, Tata McGraw-Hill, 2000.
3. Sadhu Singh, Machine Design, Khanna Publishers, New delhi, 1997.
4. Abdul Mubeen, Machine Design, Khanna Publishers 1995.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 210	KINEMATICS OF MACHINES	PCC

Unit -I

Classification of mechanisms- Basic kinematic concepts and definitions- Degree of freedom, mobility- Grashof's law, Kinematic inversions of four bar chain and slider crank chains- Limit positions- Mechanical advantage- Transmission angle- Description of some common mechanisms- Quick return mechanism, straight line generators- Universal Joint- Rocker mechanisms

Unit – II

Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centers, velocity and acceleration analysis using loop closure equations- kinematic analysis of simple mechanisms- slider crank mechanism dynamics Coincident points- Coriolis component of acceleration- introduction to linkage synthesis three position graphical synthesis for motion and path generation

Unit – III

Classification of cams and followers- Terminology and definitions- Displacement diagrams- Uniform velocity, parabolic, simple harmonic and cycloidal motions- derivatives of follower motions- specified contour cams- circular and tangent cams- pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers

Unit – IV

Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting- helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics

Unit – V

Surface contacts- sliding and rolling friction- friction drives- bearings and lubrication friction clutches- belt and rope drives- friction in brakes

Text and Reference Books:

1. Thomas Beven, Theory of Machines, Longman's Green & Co., London.
2. W. G. Green, Theory of Machines, Blackie & Sons, London
3. V. P. Singh, Theory of Machines, DhanpatRai.
4. Gosh and Malik, Theory of Mechanism and Machines, East-west Pvt. Ltd. 1988.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 211	FLUID MECHANICS	PCC

Unit -I

Fluid Properties and Fluid Statics: Definition, Distinction between solid and fluid Modules and dimensions, Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension. Pascal law, absolute, gauge and vacuum pressures, Pressure measurements by manometers and pressure gauges. Archimedes principle, Hydrostatic law, Centre of pressure, stability of floating bodies.

Fluid Kinematics: Flow visualization, Lines of flow, Types of flow, Velocity field and acceleration, Continuity equation (one and three dimensional differential forms), Equation of streamline, Stream function, Velocity potential function, Circulation, Flow net.

Unit -II

Fluid Dynamics: Definition,Equations of motion - Euler's equation along a streamline, Bernoulli's equation and its applications,Venturi-meter, Orifice meter, Pitot tube, Orifices, Mouthpieces, Notches and Weirs, Momentum theorem.

Unit -III

Dimensional Analysis: Dimensionless numbers- Reynolds, Froude, Mach, Weber and Euler, Applications of numbers, Undistorted model, Distorted model, scale effect.

Incompressible Fluid Flow: Viscous flow, Navier-Stoke's equation (Statement only), Shear stress, Pressure gradient relationship, Laminar flow between parallel plates, Laminar flow through circular tubes, Hagen Poiseulle's equation.

Unit -IV

Flow Through Pipes: Friction loss, Darcy-Weisbach Formula, Minor and major losses, Hydraulic and energy grade lines, Flow through pipes in series and in parallel, Power transmission, Water hammer and cavitation.

Turbulent Flow: Variation of friction factor with Reynold number, Moody's diagram, Shear stress in turbulent flow, Prandtl Mixing length theory, Velocity distribution in smooth pipes and rough pipes, Resistance of smooth and rough pipe.

Unit -V

The Boundary Layer: Description of the boundary layer, Boundary Layer thickness, Von-Karman momentum integral equation, Coefficient of drag, Boundary layer separation and control, Flow around a body, Drag and lift, Drag on sphere and cylinder, Development of lift on a circular cylinder, Development of lift on an airfoil.

Text and Reference Books:

1. Yunus A. Cengel and Cimbala, Fluid Mechanics, Tata McGrawHill
2. Frank M. White, Fluid Mechanics, Tata McGraw Hill.
3. Streeter V.L., K.W. Bedford and E.B.Wylie , Fluid Mechanics , Tata McGraw Hill
4. Robert W. Fox and Alan T. McDonald, Introduction to Fluid Mechanics, John Wiley &Sons.
5. Potter, Mechanics of Fluids, Cengage Learning.
6. John F. Douglas, Fluid Mechanics, Pearson Education.
7. Modi and Seth, Fluid Mechanics and Hydraulic Machinery, Standard Book House.
8. Som, S. K., &Biswas, G. Introduction to fluid mechanics and fluid machines, Tata McGraw-Hill.
9. Munson, B. R., Young, D. F., &Okiishi, T. H. Fundamentals of Fluid Mechanics, Wiley
10. Flud mechanics by R.K. B ansal

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 212	Manufacturing Processes-II	PCC

Unit-I

Mechanism of Metal Cutting: Deformation of metal during machining, nomenclature of lathe, milling tools, mechanics of chip formation, built-up edges, mechanics of orthogonal and oblique cutting, Merchant cutting force circle and shear angle relationship in orthogonal cutting, factors affecting tool forces. Cutting speed, feed and depth of cut, surface finish.Temperature distribution at tool chip interface.Numericals on cutting forces and Merchant circle.

Unit-II

Tool Wear and Machinability: Types of tool wear, tool life, factors governing tool life, Machinability: Definition and evaluation. Economics of machining, Numerical on tool life.

Cutting Tool Materials & Cutting Fluids: Characteristics of tool materials, various types of cutting tool materials, coated tools, cutting tool selection, Purpose and types of cutting fluids, basic actions of cutting fluids, effect of cutting fluid on tool life, selections of cutting fluid

Unit-III

Gear Manufacturing: Introduction, methods of manufacture. Gear generation and forming: Gear cutting by milling, single point form tool, gear hobbing and shaping. Gear finishing operations: Gear shaving, gear burnishing, gear grinding, lapping.

Unit-IV

Jigs & Fixtures: Introduction, location and location devices, clamping and clamping devices, Drill Jigs, Milling Fixtures.

Unit-V

Unconventional Machining Processes: introduction, classification of unconventional machining processes, Abrasive jet machining: Principles, advantages, disadvantages and applications. Ultrasonic machining: Principles, advantages, disadvantages and applications. Electro-chemical machining and grinding: Principles of operation, advantages, disadvantages and applications. Electric discharge machining: Principles, advantages, disadvantages and applications. Electron beam machining: principle, advantages, disadvantages and applications. Laser beam machining: Principles and applications.

Text and Reference Books:

1. Manufacturing Technology – Metal cutting and machine Tools: P.N. Rao, T.M.H, New Delhi
2. Workshop Technology -Vol II (Machine Tools) B.S Raghuwanshi, dhanpatRai and Company.
3. Manufacturing Processes- H S Shan, Cambridge University Press 2nd Edition 2017
4. Manufacturing Engg. & Tech, Kalpakian, Serope Addison -Wisly Publishing Co. New York.
5. Modern Machining Processes: P.C. Pandey& H.S. Shan, T.M.H. Company, New Delhi
6. Text Book of Production Engineering: P.C. Sharma, S.Chand& Sons.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 213	I.C. ENGINES	PCC

Unit -I

Introduction to IC Engines: Definition of engine, classification, Application of IC engines, Air Standard Cycle and deviation from air standard actual cycle, Indicator diagram, MEP (mean effective pressure), Shaft power, Indicated power.

Unit – II

Actual working of IC engine: Introduction to fuel air cycles and their significance, Composition of cylinder gases, Variable specific heats, Comparison of air standards & fuel air cycles, Effect of operating variables- compression ratio, fuel air ratio, actual cycles and their analysis, Difference between actual and fuel-air cycle, actual and fuel-air cycles for S.I. and C.I. engines.

Working of 4-stroke petrol & diesel engines and their valve timing diagram, Working of 2-stroke petrol & diesel engines & their valve timing diagrams, Comparison of 2-stroke &4-stroke engines, Actual working of 2 & 4 stroke gas engines and their valve diagram,

Unit – III

Fuel and Combustion: Fuels for SI and CI engine, Important qualities of SI and CI engines fuels, rating of SI engines, CI engines fuels, Dopes, Combustion in CI engines, Ignition delay, Knocking phenomena and its control, Combustion chamber design for CI engines. Combustion in SI engine, Detonation, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas and Alternatives fuels for IC engines.

Unit – IV

Fuel Supply System: Fuel supply system and fuel pumps, Properties of air fuel mixture, Carburettor and its working, Actual air fuel ratio of single jet carburettor, Supercharger, Petrol injection, Fuel injection systems for C.I., Cooling and lubricants of IC engines

Classification of injection systems, Injection pump, Fuel injection systems, Fuel Injector, Nozzle, Injection of S.I. Engines and Fuel filters.

Unit – V

Measurement and Testing: Measurement of shaft power, Indicated power, Measurement of speed, Air consumption, Fuel consumption, Heat carried by cooling water, Heat carried by the exhaust gases, Morse test, Heat balance sheet, Governing of I.C. Engines, Performance characteristics of I.C. Engines, Performance parameters, Performance of S.I. Engines, Performance of C.I. Engine

Text and Reference Books:

1. V. Ganeshan, Internal Combustion Engines, Tata McGraw Hill
2. Damundwar,A Course in Internal Combustion Engines,DhanpathRai& Sons

3. Obert E. F, "Internal Combustion Engines and Air Pollution", Harper and Row Publication Inc. NY, 1973.
4. Heywood J. B, "Internal Combustion Engine Fundamentals", McGraw Hill Book Co. NY,1989

Mechanical Engineering (B. Tech.) IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	**3**	**1**	**0**	**PCC-ME 214**	**INDUSTRIAL ENGINEERING**	**PCC**

Unit-I

Production system and Productivity: Introduction to production systems, Aim of production systems, generalized model of Production systems, Types and characteristics of production systems, Life cycle approach to production management, Product life cycle, Plant location, Plant layout, objectives, types, comparison and application of different types of layouts. Productivity definition, various methods of measurement, Factors effecting productivity, Strategies for improving productivity.

Unit-II

Manufacturing Cost Analysis: Fixed & variable costs, Direct, indirect & overhead costs, & Job costing, Recovery of overheads, Standard costing, Cost control, Cyber Laws And Security Cost variance Analysis - Labour, material, overhead in volume, rate & efficiency, Break even Analysis, Numerical Problems.

Unit-III

Work Study: Definition, Objectives, Method study, Principle of motion economy, Techniques of method study – Various charts, THERBLIGS, Work measurement - various methods, Time Study - PMTS, determining time, Work sampling. Numerical Problems.

Unit-IV

Materials Management : Strategic importance of materials in manufacturing industries, Relevant costs, Inventory control models - Economic order quantity (EOQ), Economic batch quantity (EBQ) with & without shortage, Inventory control systems - P,Q,Ss Systems, determination of order point & safety stock, Selective inventory control - ABC, FSN, SDE, VED,SCM , Numerical Problems.

Forecasting: Importance, Objectives, Forecasting and Prediction, Types, Classification of Forecasting Methods, Forecast Errors, Costs and Accuracy of Forecasts, Numerical Problems.

Unit-V

Production Planning & Control (PPC) : Objectives & variables of PPC, Aggregate planning - Basic Concept, its relations with other decision areas, Decision options - Basic & mixed

strategies, Master production schedule (MPS), Scheduling Operations Various methods for line & intermittent production systems, Gantt chart, Sequencing - Johnson algorithm for n-Jobs- 2 machines, n- Jobs-3 machines, 2 Jobs n-machines, n-Jobs m-machines Various means of measuring effectiveness of PPC, Numerical Problems.

Text and Reference Books:

1. Production & Operations Management – Chary, TMH, New Delhi.
2. Modern Production Management – S.S. Buffa, Pub.John Wiley.
3.Operations Management - Schroeder, McGraw Hill ISE.
4. Operation Management - Monks, McGraw Hill ISE.
5. Production & Operations Management - Martinich, John Wiely SE.
6. Industrial & Systems Engineering - Turner, Mize, Case, Prentice Hall Pub.
7. Industrial Engineering & Operations Management – SK Sharma, Pub-S. K.Kataria
8. Industrial Engineering – Ravi Shankar, Galgotia Pub.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 215	Design of Machine Elements	PCC

Unit -I

Design considerations - limits, fits and standardization, Review of failure theories for static and dynamic loading (including fatigue failure) and Design Against Static Load: Modes of failure, factor of safety, principle stresses, stresses due to bending and torsion, theory of failures.

Unit – II

Cyclic stresses, fatigue and endurance limit, stress concentration factor, stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria.

Unit – III

Riveting methods, materials, types of rivet heads, types of riveted joints, failure of riveted joints, efficiency of riveted joints, design of boiler joints, eccentric loaded riveted joint, Welded joints and Screwed fasteners.

Unit – IV

Cause of failure in shaft, materials for shaft, stress in shaft, and design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, shaft subjected to fatigue loads, design for rigidity.

Design of springs: helical compression, tension, torsional and leaf springs

Unit – V

Design of transmission elements: spur, helical, bevel and worm gears; belt and chain drives.Analysis and applications of power screws and couplings.Analysis of clutches and brakes

Text and Reference Books

1. Design of Machine Elements by V. B. Bhandari, TMH Publishing Co. Ltd., New Delhi
2. Machine Design by Norton, Prentice Hall.
3. Machine Design by Shigley Tata McGraw hill
4. Sharma PC and Aggarwal DK, “Machine Design”, Kataria Publishers (2002)

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 216**	**KINEMATICS OF MACHINES LAB**	**PCC**

LIST OF EXPERIMENTS

1. To study inversions of four bar chain: Coupling Rod, Beam Engine
2. To study Steering Mechanisms; Davis and Ackerman.
3. Study of quick return mechanism and draw velocity and acceleration diagram.
4. Study of inversion of Double slider chain Oldham Coupling, Scotch Yoke and Elliptical Trammel.
5. Study of various cam-follower arrangements.
6. To plot displacement v/s angle of rotation curve for various cams
7. To determine co-efficient of friction using two roller oscillating arrangement.
8. Study of various types of dynamometers, Brakes and Clutches.
9. Study of a lathe gear box.
10. Study of a sliding mesh automobile gear box.
11. Study of various gear trains.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	PCC-ME 217	FLUID MECHANICS LAB	PCC

LIST OF EXPERIMENTS

1. Determination of Metacentre height of a given body.
2. Determination of C_d, C_v & C_c for given orifice.
3. Calibration of contracted Rectangular Notch and / Triangular Notch and determination of flow rate.
4. Determination of velocity of water by Pitot tube.
5. Verification of Bernoulli's theorem.
6. Determination of Coefficient for minor losses in pipes.
7. Calibration and flow rate determination using Venturimeter & Orifice meter and Nozzle meter
8. Determination of head loss in given length of pipe.
9. Determination of the Reynold's number for laminar, turbulent and transient flow in pipe.
10. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
11. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 218**	**Manufacturing processes –II Lab**	**PCC**

LIST OF EXPERIMENTS

1. Produce a rectangular block by face milling and prepare a slot on one face with a slotting cutter / side and face cutter.
2. Gear manufacturing by some indexing device on a milling machine
3. Job on grinding using - Surface grinding - Cylindrical grinding - Centreless grinding
4. Grinding and sharpening of lathe tool, drills.
5. Grinding of surface at 45°, 60°, 75° on tool and cutter grinder.
6. Milling cutter grinding on tool and cutter grinder.
7. Prepare a V-block to ± 0.2 mm accuracy on shaper machine.
8. Exercise on key way cutting and spline cutting.
9. Preparation of job through eccentric turning.
10. Practice of taper turning.
11. Exercise on EDM for preparation of electrodes (male and female).

Mechanical Engineering (B. Tech.), IV Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 219**	**I. C. ENGINES LAB**	**PCC**

LIST OF EXPERIMENTS

1. Study of IC Engine models
2. Study of working of two stroke petrol engine and four stroke petrol engine with the help of cut section models.
3. Study of working of two stroke diesel and four stroke diesel engine with the help of cut section models.
4. Study of fuel supply system of a petrol engine (fuel pump and simple carburettor)
5. Study of complete carburettor
6. Study of Diesel Injection System.
7. Study of fuel supply system of a Diesel engine (fuel pump and fuel injector)
8. Study of Ignition systems of an IC Engine (Battery and Magneto ignition system) and Electronic ignition system.
9. Study of Lubrication system of an IC Engine (mist, splash and pressure lubrication)
10. Study of cooling systems of an IC Engine (air cooling and water cooling)
11. To conduct a performance test on diesel engine to draw heat balance sheet for given load and speed
12. To determine friction power of diesel engine by Willan's line or fuel rate extrapolation method.
13. To conduct a performance test on the variable compression ratio engine and to draw the heat balance sheet for given compression ratio, speed and load and plot the performance curves.
14. To conduct a performance test on a four cylinder four stroke petrol engine and to draw the heat balance sheet and performance curves.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 301	DYNAMICS OF MACHINES	PCC

Unit -I

Force Analysis and Flywheels: Static force analysis of mechanisms, D'Alemberts principle, inertia force and inertia torque, dynamic force analysis, dynamic analysis in reciprocating engines, gas forces, equivalent masses, bearing loads, crank shaft torque, engine shaking forces, turning moment diagrams, flywheels of engines and punch press

Unit -II

Analysis Gear Trains: Force analysis on Simple, compound, reverted and epicyclical gear trains, analytical, tabular, and graphical and vector methods for velocity ratio, gear boxes-sliding and constant mesh for automobile.

Unit -III

Governors: classification of centrifugal governor, Porter, Proell, Hartnell and spring controlled governors, governor effort, power, stability, sensitivity,.

Unit -IV

Gyroscope: Principle of gyroscopic couple, effect of gyroscopic couple and centrifugal force on vehicle taking a turn, stabilization of sea vessels. Inertia force analysis, Velocity and acceleration of slider crank and four bar mechanism, inertia force, piston thrust and forces on connecting rod, turning moment diagram, flywheel.

Unit -V

Dynamometers: absorption and transmission type dynamometers, prony, rope and hydraulic dynamometers braking system of automobiles.

Balancing: Balancing of rotating masses, balancing of reciprocating masses, locomotives, IC Engines, balancing machines.

Text and Reference Books:

1.Theory of Machines and Mechanisms, Uicker, Pennocle and Shigley, Oxford University Press.
2. Mechanism And Machine Theory, Ambekar A. G., Prentice-hall Of India
3. Theory of Mechanisms and Machines, Sharma and Purohit, Prentice-hall Of India
4. Theory of Mechanisms and Machines, Ghosh A., Affiliated East West Press.
5. Theory of Machines, Abdulla Shariff, DhanpatRai Publications.
6. Theory of Machines, S.S. RATAN TATA McGraw Hill

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 302	HYDRAULIC MACHINES	PCC

Unit -I

General Concepts : Euler's turbo machinery equation, Specific speed, impulse and reaction principle, Impulse momentum principle, jet impingement on stationary and moving flat plates and vanes, calculations for force exerted, work done and efficiency of jet. Basic components of a turbo machine and its classification.

Hydraulic Devices: Description, operation and application of hydraulic systems – hydraulic ram, hydraulic jack, hydraulic brake, hydraulic accumulator, hydraulic door closer, hydraulic press, selection of specification of above systems for different applications

Unit – II

Pelton Turbine :Components and operation; velocity triangles, work output; Effective head, available power and efficiency; design aspects such as mean diameter of wheel, jet ratio, number of jets, number of buckets with working proportions

Unit – III

Francis and Kaplan Turbines: Components and operation, velocity triangles and work output; working proportions and design parameters for the runner; Degree of reaction; Draft tubes, its function and types. Function and brief description of commonly used surge tanks

Unit – IV

Centrifugal Pumps : Main elements and their functions; Various types and classification; Pressure changes in a pump, suction, delivery and manometric heads; vane shape and its effect on head-capacity relationships; Departure from Euler's theory and losses; pump output and efficiency; Minimum starting speed and impeller diameters at the inner and outer periphery;

Unit – V

Reciprocating Pumps: Components, working principle; pressure variations due to piston acceleration; acceleration effects in suction and delivery pipes; work done against friction; maximum permissible vacuum during suction stroke; Air vessels

Text and Reference Books:

1. Hydraulic Machines by R. K. Rajput, S. Chand publication.

2. Fluid Mechanics and Fluid Power Engineering by Kumar D S, S K Kataria and Sons, Delhi

3. Hydraulic Machines by JagdishLal, Metropolitan Book Co Pvt. Ltd.

4. Sharma PC and Aggarwal DK, "Machine Design", Kataria Publishers (2002)

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	HSMC301	Principles of Management	HSMC

Unit-I

Introduction To Management And Organizations:

Definition of Management – Science or Art – Manager Vs Entrepreneur – types of managers – managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company-public and private sector enterprises – Organization culture and Environment – Current trends and issues in Management.

Unit- II

Planning:

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

Unit-III

Organising:

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

Unit-IV

Directing:

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT.

Unit-V

Controlling:

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

Text and Reference Books:

1. P C Tripathi and P N Reddy , ‘Principles of management’
2. Davis and H. Olison, ‘Management Information System, Gordan’, McGraw Hill Pub.
3. William Werther and Keith Davis, ‘ Human Resources and Personal Management’
4. V S Ramaswamy and S Namakumari, ‘Marketing Management’
5. High Arnold and Daniel Feldman, ‘Organization Behavior’, McGraw Hill.
6. Stephen A. Robbins & David A. Decenzo& Mary Coulter, “Fundamentals of Management” 7th Edition, Pearson Education, 2011.
7. Robert Kreitner&MamataMohapatra, “ Management”, Biztantra, 2008.
8. Harold Koontz & Heinz Weihrich “Essentials of management” Tata McGraw Hill,1998.
9. Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 1

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 303	HEAT TRANSFER	PCC

Unit -I

Introduction to Heat Transfer Processes: Introduction to three modes of heat transfer, Fourier's law of heat conduction, thermal conductivity, thermal conductivity of solids, liquids and gases, Effect of temperature on thermal conductivity, Newton's law of cooling, Definition of overall heat transfer coefficient, General parameters influence the value of heat transfer coefficient.

Conduction : General 3-Dimensoinal conduction equation in Cartesian, Cylindrical and spherical coordinates, Different kinds of boundary conditions, Nature of differential equations, One-dimensional heat conduction with and without heat generation, Electrical analogy, Heat conduction through composite walls, Critical thickness of insulation.

Unit -II

Heat Transfer from Finned Surfaces: Types of fin, Fin efficiency and effectiveness, Biot number, two dimensional steady state heat conduction using analytical and numerical methods, Periodic heat conduction.

Convection: Review of Navier–Stokes and energy equation, Hydrodynamic and thermal boundary layers, Laminar boundary layer equations, Forced convection appropriate non-dimensional members, Effect of prandtl number, Empirical relations for flow over a flat plate and flow through pipes.

Unit -III

Natural Convection: Dimensional analysis, Grashof number, Boundary layers in external flows (flow over a flat plate only), Boundary layer equations and their solutions, Heat transfer correlations.

Heat Transfer with Change of Phase: Nature of vaporization phenomena, Boiling and Condensation heat transfer, Pool boiling curve, Different regimes of boiling heat transfer, Correlations for saturated liquid vaporization, condensation on flat plates, Correlation of experimental results, Drop wise condensation.

Unit-IV

Heat Exchanger: Different types of heat exchangers, LMTD, Heat transfer coefficient for parallel, Counter and cross flow type heat exchanger, Effectiveness of heat exchanger, N.T.U. method, Fouling factor, Constructional and manufacturing aspects of heat exchangers.

Unit -V

Thermal Radiation: Plank distribution law, Kirchhoff's law, Radiation properties, Diffuse radiations, Lambert's law, Radiation intensity, Heat exchange between two black bodies heat exchanger between gray bodies, Reradiating surfaces heat transfer in presence of radiating surfaces, Shape factor, view factors and the radiosity method.

Text and References Books:

1. Heat Transfer, Holman J.P., Tata McGraw-Hill, New Delhi.
2. Heat and Mass Transfer, Cengel, Tata McGraw-Hill, New Delhi.
3. Heat Transfer, R. S. Khurmi, S. Chand Publication.
4. Heat and Mass Transfer, Kumar D.S., Kataria and Sons.
5. Heat Transfer, Sharma and Lal, Vardhan Publisher Jaipur.
6. Heat and Mass Transfer, Nag P.K., Tata McGraw-Hill, New Delhi.
7. Fundamental of Heat and Mass Transfer, Thirumaleshwar M., Pearson Education.
8. Heat Transfer, Rajput R.K., S. Chand Publication.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 304	Design of Transmission Systems	PCC

Unit –I

Flexible transmission elements- design of flat belts & pulleys, selection of V-belts and pulleys, selection of hoisting wire ropes and pulleys, design of chains and sprockets

Unit – II

Gear transmission- speed ratios and number of teeth, force analysis, tooth stresses, dynamic effects, fatigue strength, factor safety, gear materials; Design of straight tooth spur gear and parallel axis helical gears based on strength and wear considerations, pressure angle in the normal and transverse plane; equivalent number of teeth and forces for helical gears.

Unit – III

Straight bevel gear- tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of a pair of straight bevel gears; Worm gear, merits & demerits, terminology, thermal capacity, materials, forces & stresses, efficiency, estimating the size of worm gear pair. Cross helical gears, terminology, helix angles, sizing of a pair of helical gears.

Unit – IV

Gear box- geometric progression, standard step ratio; Ray diagram, kinematics layout; Design of sliding mesh gear box- Design of multi-seed gear box for machine tool applications; constant mesh gear box, speed reducer unit; Variable speed gear box; Fluid couplings, Torque converters for automotive applications.

Unit – V

Cam design, types: pressure angle and undercutting base circle determination, forces and surface stresses; Design of plate clutches, axial clutches, cone clutches, internal expanding rim clutches; Electromagnetic clutches; Band and Block brakes, external shoe brakes, internal expanding shoe brake.

Text and References Books:

1. Shigley, J. E., Mechanical Engineering Design, 5th ed., McGraw-Hill, 1989.
2. Bhandari, V. B., “Design of Machine Element” Tata McGraw-Hill
3. Shigley J., Mischke C., Budynas R. and Nisbett K., Mechanical Engineering Design, 8th ed., Tata McGraw Hill, 2010.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 305	MEASUREMENT& METROLOGY	PCC

Unit-I

STANDARD AND MEASUREMENTS; Need of standards, classification primary, secondary and tertiary standards traceability of standards, length standard, line and end standards, derivation of end standards from lline standards gauges and their calibration, wave length standards, angle standards, angle, slip gauges , precision polygons and div. circles.

Unit-II

LIMITS, FITS AND TOLERENCES: Concept of interchangeability, type of interchangeability, needs standards system of limits, fits and tolerances, BIS 919,1963standard system, selection of limits and exercise on limit, fits and tolerances, design principle for limit gauges. Taylor's principle, types of gauges , tolerances on limit gauges.

Unit-III

MEASURING AND GAUGING INSTRUMENTS; Design principle of measuring instruments, kinematics design, principle of alignment pivots and bearing , sources of error in measurement, calibration of measuring instruments, mechanical linear and angle measuring instrument, vernier callipers, micrometres, dial gauge, bevel protector, sine bar, spirit level , optical instruments, autocollimator tool room microscope, length measuring machines, comparator magnification principles, types of comparators, mechanical optical pneumatic electrical and electronic comparator.

GEOMETRICAL METROLOGY: Concept of form error, straightness, roundness, squareness and concentricity error and their measurement.

Unit-IV

SCREW THREAD AND GEAR METROLOGY; Element of screw metrology, measurement of major, minor and effective diameters of external and internal screw thread, measurement of pitch and screw thread angel, effect of pitch error , element of gear metrology, measurement of gear tool thickness, gear profile, gear concentricity, pitch and run out for involute gears , gear rolling test. MEASUREMENT OF SURFACE FINISH: Concept of macro and micro errors , scales, surface roughness measures, datum for surface roughness measurement, M and E system,

measurement of surface roughness stylus methods using, mechanical, optical and electrical(talysurf) magnification(Tomlinson testers) (foster)

Unit-V

MACHINE TOOL METROLOGY; alignment tests of machine tools, lathe, drilling machines and milling machine performance test lathe

Text and Reference Books;

1. Metrology by R.K.JAIN,
2. Khanna publication statistical quality control by M. MAHAJAN, Dhanpat Rai publication
3. Statistical quality control by R.S NAGARAJAN
4. Total quality management by dale H. Bester field publication Pearson education
5. Metrology ASTM hand book

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 306**	**HYDRAULIC MACHINES LAB**	**PCC**

LIST OF EXPERIMENTS

1. To Study the Constructional details of Kaplan Turbine and draw Its Fluid Flow Chart.
2. To Study the Constructional details of Francis Turbine and draw Its Fluid Flow Chart
3. To Study the Constructional details of Pelton Turbine and draw Its Fluid Flow Chart
4. To Study the Constructional details of Hydraulic Ram and determine It's Various Efficiencies.
5. To Study the Constructional details of Centrifugal Pump and draw Its Characteristic Curve.
6. To Draw the Following Performance Characteristics of pelton turbine Constant Head, Constant Speed And Constant Efficiency Curve
7. To Draw the Following Performance Characteristics of Francis Turbine Constant Head, Constant Speed and Constant Efficiency Curve.
8. Performance Test on two stage centrifugal pump

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 307**	**DYNAMICS OF MACHINES LAB**	**PCC**

LIST OF EXPERIMENTS

1. To find experimentally the Gyroscopic couple on Motorized Gyroscope and compare with applied couple
2. To plot force vs. radius and lift vs. speed curves for Governors of Proel.
3. To plot force vs. radius and lift vs. speed curves for Governors of Porter.
4. To plot force vs. radius and lift vs. speed curves for Governors of Hartnell.
5. To plot pressure distribution curves on a journal bearing.
6. To perform wheel balancing.
7. To perform static and dynamic balancing on balancing set up.
8. To determine mass moment of inertia of a flywheel.
9. To study the different types of brakes.
10. To study the various types of dynamometers.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	PCC-ME 308	HEAT TRANSFER LAB	PCC

LIST OF EXPERIMENTS

1. To determine thermal conductivity of Insulating Powders.
2. To determine thermal conductivity of a Good Conductor of Heat (Metal Rod).
3. To Measure the thermal conductivity of Liquid.
4. To determine the transfer Rate and Temperature Distribution for a Pin Fin.
5. To Determine Stefan Boltzmann Constant of Radiation Heat Transfer.
6. To Determine Heat Transfer Coefficient For Heated Vertical Cylinder in Natural Convection.
7. Determination of Heat Transfer Coefficient in Drop Wise and Film Wise condensation.
8. To Determine Critical Heat Flux in Saturated Pool Boiling.
9. To Study Performance of Simple Heat Pipes by force convection air flowing through it for different flow rate and heat flow rate.
10. To Study and Compare LMTD and Effectiveness in Parallel and Counter Flow Heat Exchangers.
11. To Find the Heat transfer Coefficient in Forced Convection in a tube. .
12. To find out the thermal conductivity of given slab.
13. To study the rates of heat transfer for different materials and geometries
14. To study the heat transfer through the insulating medium.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 309**	**MEASUREMENT& METROLOGY LAB**	**PCC**

LIST OF EXPERIMENTS

1. Calibration of Pressure Gauge
2. Calibration of Thermocouple
3. Calibration of LVDT
4. Calibration of Load cell
5. Determination of modulus of elasticity of a mild steel specimen using strain gauges.
6. Measurements using Optical Projector / Toolmaker Microscope.
7. Measurement of angle using Sine Center / Sine bar / bevel protractor
8. Measurement of alignment using Autocollimator / Roller set
9. Measurement of Screw threads Parameters using Two wire or Three wire method.
10. Measurements of Surface roughness, Using Tally Surf/Mechanical Comparator
11. Measurement of gear tooth profile using gear tooth vernier / flange micrometer
12. Calibration of Micrometer using slip gauges.
13. Measurement using Optical Flats.
14. Use of dial indicator for measuring taper.
15. Use of combination set, bevel protector and sine bar for measuring taper.
16. Measurement of thread characteristic using vernier and gauges.
17. Use of slip gauge in measurement of centre distance between two pins.
18. Study of tolerance-limit-fit.

Mechanical Engineering (B. Tech.), V Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PROJ-ME 301**	**INDUSTRIAL TRAINING-I**	**PROJ**

Objective of Industrial Training: The objective of industrial training is to provide work experience so that students engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.

Scheme of Studies: Duration 4 weeks in summer break after IV semester, assessment to be done in V semester practical examination .During training students will prepare a first draft of training report in consultation with section in charge. After training they will prepare final draft with the help of Faculty of the concern Department of mechanical engineering. Then they will present a seminar on their training and present it in the institute in front of the committee headed by the HOD/Faculty Member.

Learning through Industrial Training: During industrial training students must observe following to enrich their learning:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/equipment/instrument-their working and specifications.
- Product development procedure and phases.
- Project Planning, monitoring and control.
- Quality control and assurance.
- Maintenance system Costing system Stores and purchase systems.
- Layout of Computer/EDP/MIS centres.
- Problems related to various areas of work etc.
- Students are supposed to acquire the knowledge on above by Direct Observations without disturbing personnel at work.
- Interaction with officials at the workplace in free/ tea time Study of Literature at the workplace (e.g. User Manual, standards, processes, schedules, etc.)
- Hands on" experience Undertaking/assisting project work. Solving problems at the work place.
- Presenting a seminar participating in group meeting/discussion.
- Consulting current technical journals and periodicals in the library.

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 310	AUTOMOBILE ENGINEERING	PCC

UNIT-I

Introduction to Automobiles : Classification, Components, Requirements of Automobile Body; Vehicle Frame, Separate Body & Frame, Unitised Body, Car Body Styles, Bus Body & Commercial Vehicle Body Types; Front Engine Rear Drive & Front Engine Front Drive Vehicles, Four Wheel Drive Vehicles, Safety considerations; Safety features of latest vehicle; Future trends in automobiles.

UNIT-II

Clutches : Requirement of Clutches – Principle of Friction Clutch – Wet Type & Dry Types; Cone Clutch, Single Plate Clutch, Diaphragm Spring Clutch, Multi plate Clutch, Centrifugal Clutches, Electromagnetic Clutch, Over Running Clutch; Clutch Linkages.

Power Transmission : Requirements of transmission system; General Arrangement of Power Transmission system; Object of the Gear Box; Different types of Gear Boxes; Sliding Mesh, Constant Mesh, Synchro- mesh Gear Boxes; Epi-cyclic Gear Box, Freewheel Unit. Overdrive unit-Principle of Overdrive, Advantage of Overdrive, Transaxle, Transfer cases.

UNIT-III

Drive Lines, Universal Joint, Differential and Drive Axles: Effect of driving thrust and torque reactions; Hotchkiss Drive, Torque Tube Drive and radius Rods; Propeller Shaft, Universal Joints, Slip Joint; Constant Velocity Universal Joints; Front Wheel Drive; Principle, Function, Construction & Operation of Differential; Rear Axles, Types of load coming on Rear Axles, Full Floating, Three quarter Floating and Semi Floating Rear Axles.

Suspension Systems: Need of Suspension System, Types of Suspension; factors influencing ride comfort, Suspension Spring; Constructional details and characteristics of leaf springs.

UNIT-IV

Steering System : Front Wheel geometry & Wheel alignment viz. Caster, Camber, King pin Inclination, Toe-in/Toe-out; Conditions for true rolling motions of Wheels during steering; Different types of Steering Gear Boxes; Steering linkages and layout; Power steering – Rack & Pinion Power Steering Gear, Electronics steering.

UNIT-V

Automotive Brakes, Tyres & Wheels : Classification of Brakes; Principle and constructional details of Drum Brakes, Disc Brakes; Brake actuating systems; Mechanical, Hydraulic, Pneumatic Brakes; Factors affecting Brake performance, Power & Power Assisted Brakes; Tyres of Wheels; Types of Tyre & their constructional details, Wheel Balancing, Tyre Rotation; Types of Tyre wear & their causes.

Text and Reference books:

1. Automobile Engineering by Anil Chhikara, SatyaPrakashan, New Delhi.

2. Automobile Engineering by Dr. Kirpal Singh, standard Publishers Distributors.

3. Automobile Engineering by D.S. Kumar, S.K. Kataria and Sons, New DelhiMechanical Engineering

(B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 311	MECHNAICAL VIBRATION	PCC

Unit-I

INTRODUCTION: Study of Vibrations, Mathematical Modelling, Degree of Freedom, Classification of Vibration, Simple Harmonic Motion,

SINGLE DEGREE OF FREEDOM (SDOF) SYSTEMS: Springs, Elastic Elements as Springs, Parallel, Series and General Combination of Springs, Other Sources of Potential Energy, Viscous Damping, Inertia Elements, Equivalent Mass, Inertia Effects of Springs, Free-Body Diagram Method, Small Angle or Displacement Assumption, Equivalent Systems Method

Unit-II

FREE VIBRATIONS OF SDOF SYSTEMS: Standard Form of Differential Equation, Free Vibrations of an Undammed System, Under damped, Critically Damped, over damped Free Vibrations, Coulomb Damping, Hysteretic Damping,

Unit-III

HARMONIC EXCITATION OF SDOF SYSTEMS: Forced Response of a Viscously Damped System Subject to a Single-Frequency Harmonic Excitation, Frequency-Squared Excitations, Rotating Unbalance, Response Due to Harmonic Excitation of Support, Vibration Isolation, Vibration Isolation from Frequency-Squared Excitations, Practical Aspects of Vibration Isolation, Seismic Vibration Measuring Instruments, Seismometers, Accelerometers

Unit-IV

TWO DEGREE-OF-FREEDOM SYSTEMS: Derivation of the Equations of Motion, Natural Frequencies and Mode Shapes, Free Response of Undamped Systems, Free Vibrations of a System with Viscous Damping, Harmonic Response of Two Degree-Of-Freedom Systems, Frequency Response , Dynamic Vibration Absorbers

Unit-V

NOISE: Effects, Ratings and Regulations, Non-auditory effects of noise on people, Auditory Effects of noise, Noise standards and limits in India, Major sources of the noise, Industrial noise sources, Industrial noise control-strategies, Noise control at the source, Noise control along the path, Acoustic barriers, Noise control at the receiver.

SOUND LEVEL AND SUBJECTIVE RESPONSE TO SOUND: Frequency dependent human response to sound, Sound pressure dependent human response, Decibel scale, Decibel addition, subtraction and averaging, Relationship among sound power, sound

intensity and sound pressure level, Sound spectra, Octave band analysis, Loudness.

Text and Reference Books:

1. S. Graham Kelly: Mechanical Vibrations: Theory and Applications
2. Den Hartog, J. P.: Mechanical Vibrations
3. Rao, S. S.: Mechanical Vibrations
4. J. S. Rao, Dr. K. Gupta: Introductory Course on Theory and Practice of Mechanical Vibrations
5. Mechanical Vibrations: G.K. Grover

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 312	OPERATION RESEACH	PCC

Unit-I

Basics of operations research, linear programming, scope, problem formulation, graphical method, simplex methods, primal and dual problem sensitivity analysis.

Unit-II

Transportation and assignment problems, deterministic dynamic programming, multistage decision problems and solution, principle of optimality.

Unit-III

Decision theory, decision under various conditions, game theory, two person zero sum game, solution with/without saddle point, dominance rule, methods like algebraic, graphical, liner programming sequencing basic assumption, *n* jobs through two/three machines, jobs on *m* machines.

Unit-IV

Stochastic inventory models - single and multi-period models with continuous and discrete demands, service level and reorder policy simulations - use, advantages& limitations, Monte-Carlo simulation, application to queuing, inventory and other problems.

Unit-V

Queuing models, characteristics of queuing model, M/M/1 and M/M/S system, cost consideration, project management concepts, rules for drawing the network diagram, Applications of CPM and PERT in project planning and control; crashing of operations; resource allocation.

Text and References Books:

1. Operations Research, Wangner
2. Operations Research, Taha
3. Introduction to Management Science, Hiller & Hiller
4. Operations Research by, Wayne L. Winston

PROFESSIONAL ELECTIVE COURSE (PEC)

Professional Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PEC-ME-301	Applied Thermodynamics	PEC

Unit -I

Steam Boiler: Boilers and their classification, comparison between fire tube and water tube boilers, essentials of a good boiler. Constructional and operational details of Locomotive, Babcock-Wilcox, and Lamont boilers, Boiler mountings and accessories. Natural draft from chimney, height of chimney, maximum draft and chimney efficiency, forced draft and induced draft, Boiler Heat Balance Sheet.

Unit -II

Compressible flow: Basics of compressible flow. Stagnation properties, Isentropic flow of a perfect gas through a nozzle, choked flow, subsonic and supersonic flows- normal shocks- use of ideal gas table for isentropic flow and normal shock flow- Flow of steam and refrigerant through nozzle, super-saturation- compressible flow in diffusers, efficiency of nozzle and diffuser. Reciprocating compressors, staging of reciprocating compressors, optimal stage pressure ratio, effect of inter-cooling, minimum work for multistage reciprocating compressors.

Unit -III

Steam Turbines: Classification, flow through impulse blades, velocity diagram, calculation of power output and efficiency, maximum blade efficiency of single stage impulse turbine, blade friction, compounding of impulse turbine. Flow through impulse reaction blades, degree of reaction, velocity diagram, calculations for power output, efficiency and blade height, comparison of impulse and impulse reaction turbines.

Unit -IV

Efficiency and Governing in Steam Turbines: Losses in steam turbines, stage efficiency overall efficiency and reheat factor. Governing of steam turbines, throttle governing, nozzle control governing and by pass governing. Steam for heating and process work, back pressure turbines and pass out turbines.

Unit -V

Steam Condensers: Elements of a condensing plant, types of condensers, comparison of jet and surface condensers. Condenser vacuum, air leakage and loss of vacuum, vacuum efficiency and condenser efficiency, Dalton's law and air vapour mixture, air pumps.

Pschyrometric chart: Properties of dry and wet air, use of pschyrometric chart, processes involving heating/cooling and humidification/dehumidification, dew point.

Text and Reference books

1. Thermodynamics – An Engineering Approach, Cengel, Y.A., & Boles, M.A, McGraw – Hill Inc.
2. Thermal Engineering, Rajput, R.K., Laxmi Publications.
3. Engineering Thermodynamics by P.K.Nag, Tata McGraw Hill Pub
4. Thermodynamics and Heat Engines, Vol-II, R. Yadav, Central Publishing House.
5. A textbook of Thermal Engineering, R.S.Khurmi, S.Chand& Sons.
6. Thermal Engineering, Bellany, P.L., Khanna Publishers.
7. Applied Thermodynamics for Engineering Technologists, T.D. Eastop & A McConkey, Pearson Education.
8. Heat Engineering, V.P. Vasandani & D.S. Kumar, Metropolitan Book Co. Pvt. Ltd.

Professional Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PEC-ME-302	Tribology	PEC

Unit -I

Introduction to the concept of tribo design: Principles of tribo design, tribological problems in machine design, Plain sliding bearings, Rolling contract bearings, piston rings and cylinder liners.

Unit-II

Elements of Contact mechanics: Introduction, Concentrated and distributed forces on plane surfaces, Contact between two elastic bodies in the form of spheres, Contact between cylinders and between bodies of general shape, Failures of contacting surfaces. Thermal effects in surface contact.

Unit -III

Friction, lubrication and wear in lower kinematic pairs: Introduction, The concept of friction angle, Friction in screws with a square thread, Friction in screws with a triangular thread, , Boundary lubricated sliding bearings.

Unit -IV

Sliding-element bearings : Derivation of the Reynolds equation, Hydrostatic bearings Squeeze-film lubrication bearings, Thrust bearings, Journal bearings, Journal bearings for specialized applications, Gas bearings, Dynamically loaded journal bearings Modern developments in journal bearing design, Selection and design of thrust bearings self-lubricating bearings.

Unit -V

Rolling contact bearings: Introduction, Analysis of friction in rolling-contact bearings, Deformations in rolling contact bearings, Kinematics of rolling-contact bearings, Lubrication of rolling-contact bearings, Acoustic emission in rolling-contact bearings.

Text and Reference books

1. Dudley D.Fulier" Theory and practice of Lubrication for Engineers", New YorkCompany.1998
2. Moore "Principles and applications of Tribology" Pergamon press, 1975
3. Oscar Pinkus, Beno Sternlicht, “Theory of hydrodynamic lubrication”, McGraw-Hill, 1961
7. Tribology in Machine Design by T.A. Stolarski

Professional Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PEC-ME-303	Numerical Methods & Analysis	PEC

Unit-I

Basic concepts: round-off errors, floating point arithmetic, Convergence. Numerical solution of Nonlinear Equations a) Bisection method, fixed-point iteration, Newton's method, Error analysis for Iterative Methods, Computing roots of polynomials.

Unit-II

Interpolation and Polynomial Approximation: LaGrange Polynomial, Divided Differences, Hermite Interpolation

Unit-III

Numerical integration and differentiation: Trapezoidal rule, etc., Gaussian quadrature and Euler-Maclaurin formula. Applied Linear Algebra, Direct methods for solving linear systems, numerical factorizations, Eigenvalue problems.

Unit-IV

IVP problems for ODE: Euler's, Taylor, Runge-Kutta, and multistep methods, Stability, Numerical linear algebra, Directmethods, Iterative methods

Unit-V

Approximation theory : Least square approximation,ApproximatingEigenvalues,Power method, Householder's method , BVP for ODE ,Shooting method

Text and Reference books

[1] J. Stoer and R. Bulirsch, Introduction to Numerical Analysis, Springer-Verlag, ISBN 0-387-90420-4

[2] L.N. Trefethen and D. Bau, Numerical Linear Algebra, Society of Industrial and Applied Mathematics

[3] C.T. Kelley, Iterative methods for linear and nonlinear equations, Society of Industrial and Applied Mathematics

OPEN ELECTIVE COURSE (OEC)

Open Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC301	Instrumentation &Control	OEC

Unit-I

Definition — Basic principles of measurement — Measurement systems, generalized configuration and functional descriptions of measuring instruments — examples.Dynamic performance characteristics — sources of error, Classification and elimination of error.

Measurement of Displacement: Theory and construction of various transducers to measure displacement — Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

Measurement of Temperature: Classification — Ranges — Various Principles of measurement — Expansion, Electrical Resistance — Thermistor — Thermocouple — Pyrometers — Temperature Indicators

Unit-II

Measurement of Pressure: Units — classification — different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows — Diaphragm gauges. Low pressure measurement — Thermal conductivity gauges — ionization pressure gauges, Mcleod pressure gauge.

Measurement of Level: Direct method — Indirect methods — capacitative, ultrasonic, magnetic, cryogenic fuel level indicators — Bubbler level indicators.

Unit-III

Flow Measurement: Rota meter, magnetic, Ultrasonic, Turbine flow meter, Hot — wire anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed: Mechanical Tachometers — Electrical tachometers — Stroboscope, Non- contact type of tachometer.

Measurement of Acceleration and Vibration: Different simple instruments — Principles of Seismic instruments — Vibro meter and accelerator meter using this principle.

Unit-IV

Stress Strain Measurements: Various types of stress and strain measurements — electrical strain gauge — gauge factor — method of usage of resistance strain gauge for bending compressive and tensile strains — usage for measuring torque, Strain gauge Rosettes.

Measurement of Humidity: Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

Measurement Of Force, Torque And Power: Elastic force meters, load cells, Torsion meters, Dynamometers.

Unit-V

Elements of Control Systems: Introduction, Importance — Classification — Open and closed systems Servomechanisms — Examples with block diagrams — Temperature, speed and position control systems.

Text and Reference Books

1. Measurement Systems: Applications & Design I D.S Kumar/Anuradha Agencies.
2. Instrumentation, measurement & analysis IB.C.Nakra&K.K.Choudhary/ TMH.
3. Beckwith Thomas G., "Mechanical Measurements", Narosa Publishing House, New Delhi.
4. Doeblein E. O., "Measurement Systems", Application Design, McGraw Hill, 1990
5. Kumar K. J., "Engineering metrology", MacDonald and Co, 1963
6. Gupta I. C., "Engineering Metrology", DhanpatRai& Sons, New Delhi, 1994.

Open Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-302	Total Quality Management	OEC

UNIT-I

Introduction: Evolution of Quality Management, Philosophy, Concepts of Product and Service Quality, Dimensions of Quality, Quality Guru's, Quality Awards, Quality Cost.

UNIT-II

Quality Assurance: Inspection, Quality control, Quality assurance, Concept and Advantage of quality assurance, Quality rating, Quality survey/audit, Vendor rating, Quality function deployment.

Process Quality Improvement: Introduction to Process Quality, Graphical and statistical techniques for Process Quality Improvement, Graphical tools for data representation, 7QC tools, Process capability analysis, Measurement system analysis.

UNIT-III

Acceptance Sampling: Concept of acceptance sampling, advantage and limitations of sampling inspection, Sampling methods, Operating characteristics curve, producer and consumer risk, Average outgoing quality limits, sampling plans, sampling plans for variables, Problems.

UNIT-IV

Control Charts: Chance and assignable causes of process variation, statistical basis of the control chart, control charts for variables - $\bar{x}$ and R charts, attribute control charts - p, np, c and u-Construction and application, Problems.

UNIT-V

Contemporary Trends in Quality Engineering & Management: Introduction to Quality Management Standards – ISO : 9000, ISO:14000, Reliability, Quality circles, Concept of Six sigma, Basic steps involve in six sigma, National and International bodies for quality aspects, Introduction to Japanese's quality techniques such as 5S, Kaizen, SMED, TQM,TPM.

Text and References Books:

1. Lt. Gen. H.LaI, "Total Quality management", Wiley Eastern Limited, 1990. .
2. Greg Bounds. "Beyond Total Quality Management". McGraw Hill, 1994.

3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

Open Elective-I

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-303	PRODUCT DESIGN AND DEVELOPMENT	OEC

Unit-I

Need for developing products – the importance of engineering design – types of design –the design process – relevance of product lifecycle issues in design –designing to codes and standards- societal considerations in engineering design –generic product development process – various phases of product development-planning for products –establishing markets- market segments- relevance of market research

Unit-II

Identifying customer needs –voice of customer –customer populations- hierarchy of human needs gathering methods – affinity diagrams – needs importance- establishing engineering characteristics-competitive benchmarking- quality function deployment- house of quality-product design specification-case studies

Unit-III

Creative thinking –creativity and problem solving- creative thinking methods- generating design concepts-systematic methods for designing –functional decomposition – physical decomposition – functional representation –morphological methods-TRIZ- axiomatic design

Unit-IV

Decision making –decision theory –utility theory –decision trees –concept evaluation methods – Pugh concept selection method- weighted decision matrix –analytic hierarchy process – introduction to embodiment design –product architecture – types of modular architecture –steps in developing product architecture

Unit-V

Industrial design – human factors design –user friendly design – design for serviceability – design for environment – prototyping and testing – cost evaluation –categories of cost –overhead costs – activity based costing –methods of developing cost estimates – manufacturing cost – value analysis in costing

References Books

1. George E.Dieter, Linda C.Schmidt, "Engineering Design", McGraw-Hill International Edition, 4th Edition, 2009, ISBN 978-007-127189-9

2. Anita Goyal, Karl T Ulrich, Steven D Eppinger, “Product Design and Development “, 4th Edition, 2009, Tata McGraw-Hill Education, ISBN-10-007-14679-9
3. Kevin Otto, Kristin Wood, “Product Design”, Indian Reprint 2004, Pearson Education, ISBN 9788177588217
4. Yousef Haik, T. M. M. Shahin, “Engineering Design Process”, 2nd Edition Reprint, Cengage Learning, 2010, ISBN 0495668141

Open Elective-II

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-304	Cyber Laws And Security	OEC

UNIT-I

History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Laptops Security Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles.

UNIT-II

Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards. Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls, Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges

UNIT-III

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls

UNIT-IV

Design and Implementation Issues, Policies Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN

UNIT-V

Security metrics- Classification and their benefits Information Security & Law, IPR, Patent Law, Copyright Law, Legal Issues in Data mining Security, Building Security into Software Life

Cycle Ethics- Ethical Issues, Issues in Data and Software Privacy Cyber Crime Types & overview of Cyber Crimes

Text and References Books:

1. Godbole,“ Information Systems Security”, Willey

2. Merkov, Breithaupt, “ Information Security”, Pearson Education

3. Yadav, “Foundations of Information Technology”, New Age, Delhi

4. Schou, Shoemaker, “ Information Assurance for the Enterprise”, Tata McGraw Hill

Open Elective-II

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-305	Soft Computing	OEC

Unit-I

Neural Networks: History, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithm 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.

Unit-III

Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

Unit-IV

Fuzzy Arithmetic: Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.

Unit-V

Fuzzy Logic: Classical Logic, Multi valued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges. Uncertainty based Information: Information & Uncertainty, Nonspecificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets. Genetic Algorithms, Scope & application areas, solution of 0-1Knapsack problem using GA

Text and Reference books:

1. “Fuzzy sets and Fuzzy Logic: Theory and applications”,G.J. Klir,B.Yuan, PHI
2. “Introduction to Fuzzy sets and Fuzzy Logic”, M.Ganesh , PHI
3. “An Introduction to Fuzzy Control”, D Driankov, H Hellendoorn, M Reinfrank, Narosa Publishing Company
4. “ Neural Networks: A classroom approach”, Satish Kumar , Tata McGraw Hill
5. Haykin S., “Neural Networks-A Comprehensive Foundations”, Prentice-Hall International, New Jersey, 1999.

Open Elective-II

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-306	Special Electrical Machines	OEC

UNIT 1

Different types of FHP motors and uses in domestic & industrial applications, Single phase Induction motor, Qualitative examination starting and running performance of I-Phase Induction Motors.

UNIT 2

Linear Induction Motors and Actuators and its principle of operation, Linear Levitated machine & applications, Permanent magnet motors, High performance energy efficient machines, Effect of E.M.F injected into secondary circuits, quantitative study, scharge motor.

UNIT 3

Special Induction generations, Special motors and generators associated with Wind, Solar, Tidal, Biogas and other unconventional energy forms and their applications.

UNIT 4

Synchronous motors, Series universal motors, Stepper motor, Servo motor, Typical applications in Computers, Electronics, Communications and Information Technologies.

UNIT 5

Permanent magnet D.C. motor, Permanent magnet AC motors, Switch reluctance motors. Shaded pole motor, brush less D.C motor, Typical applications in Computers, Electronics, Communications and Information Technologies.

Text and References books:

1. Generalized Electrical Machines by P. S. Bhimbra
2 Generations of Electrical Energy by A. E. Fitzgerald/Charles , Kingsley J. R.
3 The Performance &design of A.C Commutator Motor by O.E .Taylor
4 Performance & Design of A.C machines by M.G. Say

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME-313**	**AUTOMOBILE ENGINEERING LAB**	**PCC**

LIST OF EXPERIMENTS

1. Study of cooling system of an automotive vehicle
2. Study of the ignition system, setting of contact breaker points and spark plug gap
3. Demonstration of steering system and measurement of steering geometry angles and their impact on vehicle performance.
4. Model Study of braking system with specific reference to master cylinder, brake shoes, overhauling of system and the adjusting of the system.
5. Model Study of transmission system elements as clutches, gear box assembly and differential.
6. Replacing of ring and studying the method of replacing piston after repair.
7. Model Study of fuel injection system, carburettor.

Mechanical Engineering (B. Tech.), VI Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME-314**	**Mechanical Vibration Lab**	**PCC**

LIST OF EXPERIMENTS

1. To verify relation $T = 2\pi * (l/g)^{1/2}$ for a simple pendulum.
2. To determine radius of gyration of compound pendulum.
3. To determine the radius of gyration of given bar by using bifilar suspension.
4. To determine natural frequency of a spring mass system.
5. To study undammed free vibration of Equivalent spring mass system.
6. To determine natural frequency of free torsional vibrations of single rotor system.
   i. Horizontal rotor
   ii. Vertical rotor
7. To study the damped torsional oscillation and to determine the damping coefficient.
8. To verify the dunker ley's rule Viz.
9. Study the forced vibration of the beam for different damping.
10. Study of Vibration measuring instruments.
11. To study torsional vibration of single rotor system.
12. To study the free vibration of two rotor system and to determine the natural frequency of vibration theoretically and experimentally.

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 401	COMPUTER AIDED DESIGN	PCC

Unit-I

Fundamentals of Computer Graphics- Product cycle, sequential and concurrent engineering, Computer Aided Design, CAD system architecture, computer graphics, Coordinate systems, 2D and 3D transformations, viewing transformation

Unit-II

Geometric Modeling- representation of curves, Hermite curves, Bezier curves, B-spline curves, rational curves, Techniques of surface modelling, surface patch, Coons and bicubic patches, Bezier and B-spline surfaces

Unit -III

Parametric representation of curves, Plane curves - line, circle, ellipse, parabola and hyperbola, , Solid modelling techniques, CSG and B-rep. Visual realism- hidden line-surface-solid removal algorithms, shading, colouring, computer animation

Unit -IV

Scan Conversion, Rendering, Rasterising polygons, Hidden surface removal, Antialiasing, Reflection, shading, generation of character

Computer Hardware: Introduction, Classification, fundamental of computer; Data communication, Design of workstation, Interactive display devices, Input devices, Output devices.

Unit -V

Assembly of parts- assembly modelling, interferences of positions and orientation, tolerance analysis, mass property calculations, mechanism simulation and interference checking CAD standards- Graphical Kernel System (GKS), standards for vexchange images, Open Graphics Library (OpenGL), Data exchange standards- IGES, STEP, CALS etc.,

Communication standards

Text and References Books:

1. Mathematical elements for Computer Graphics, Rogers and Adams, Tata McGraw Hill
2. CAD/CAM: Theory and Practice, Zeid and Sivasubramanian., Tata McGraw Hill
3. Elements of Computer Aided Design and Manufacturing, Pao Y.C., John Wiley and Sons.

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 402	REFRIGERATION & AIR CONDITIONING	PCC

Unit-I

Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect and C.O.P., Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Boot strap refrigeration.

Unit-II

Vapour Compression System, Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P., Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P. of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirements, Inter cooling, Different configuration of multistage system, Cascade system.

Unit-III

Principle of vapour absorption refrigeration system, Comparison between absorption and compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature - concentration diagram and Enthalpy – concentration diagram, Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison. Refrigerants: Classification, nomenclature, properties, Types of refrigerants.

Unit-IV

Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside and outside design conditions, Heat transfer through walls & roofs, Infiltration and ventilation, Internal heat gain, Sensible heat factor, By pass factor, Grand Sensible heat factor, Apparatus dew point.

Unit-V

Refrigeration and air conditioning equipment's: Compressors, Condensers, Evaporators &Expansion devices, Air washers, Cooling towers and humidifying efficiency, Cold storage and food preservation, Freezers, Ice plant, Water coolers, Basic difference between comfort and industrial air conditioning.

Text and Reference Books:

1. R.S. Khurmi and J. K. Gupta, Refrigeration and Air conditioning, S Chand publication.
2. Arora, C.P., Refrigeration and Air conditioning, Tata McGraw Hill, 2nd Edition, 2000.

3. Gosney, W.B, Principles of Refrigeration, Cambridge University Press, 1982.
4. Refrigeration and Air conditioning, Arora and Domkundwar.

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	HSMC 401	Engineering Economics	HSMC

Unit -I

Basic Principles and Methodology of Economics. Demand/Supply – elasticity – Government Policies and Application. Theory of the Firm and Market Structure. Basic Macro-economic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes

Unit –II

Public Sector Economics –Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks & their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve.

Unit -III

Elements of Business/Managerial Economics and forms of organizations. Cost &Cost Control – Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money (present and future worth of cashflows). Business Forecasting – Elementary techniques. Statements – Cash flow, Financial. Case Study Method.

Unit -IV

Indian economy - Brief overview of post-independence period – plans. Post reform Growth, Structure of productive activity. Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment–Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors.

Unit -V

Estimation /Measurements for various items- Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour

costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying.

Text and Reference Books:

1. Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia
2. V. Mote, S. Paul, G. Gupta(2004), Managerial Economics, Tata McGraw Hill
3. Misra, S.K. and Puri (2009), Indian Economy, Himalaya
4. PareekSaroj (2003), Textbook of Business Economics, Sunrise Publishers
5. M Chakravarty, Estimating, Costing Specifications & Valuation

Professional Elective-II

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	4	0	0	PEC-ME-401	Welding Technology	PEC

Unit-1

Electron beam welding, friction stir welding, plasma arc welding and ultrasonic welding, Laser beam welding, types of lasers, equipment, power calculation, applications, dual laser beam welding

Unit-II

Ultrasonic welding, propagation of ultrasonic waves in matter, mode of joint formation, joint types and design of product for ultrasonic welding, details of equipment

Unit-III

Investment casting, shell moulding, squeeze casting, vacuum casting, counter-gravity low - pressure casting, directional and mono-crystal solidification, semisolid metal casting and forging.

Unit-IV

Design of weldment, determination of distortion in weldments, modeling of temperature distribution. Design for casting, determination of hot spots, location of turbulence and other defects, modeling of flow in molds, modeling of heat transfer in castings.

Unit-V

NDT methods for welding, visual inspection, radio graphic, die penetrant, ultrasonic and magnetic particle inspection techniques.

Text and Reference Books:

1. Ravi B, Metal Casting- Computer Aided Design and Analysis, Prentice Hall, 2005.
2. Richard L Little, Welding and Welding Technology, Tata McGraw Hill, 2004.
3. John Campbell, Casting Practice, Elsevier Science Publishing Co., 2004.
4. Larry Jeffus, Welding: Principles and Applications, Delmar Publishers, 2004.
5. John Campbell, Casting, Butterworth Heinemann, 2003.

6. KlasWeman, Welding Processes Handbook, 2003.
7. Howard B Cary, Modern Welding Technology, Prentice Hall, 2002.

Professional Elective-II

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	**3**	**1**	**0**	**PEC-ME-402**	**Advanced strength of material**	**PEC**

Unit-I

Introduction to Cartesian tensors, Strains: Concept of strain, derivation of small strain tensor and compatibility, Stress: Derivation of Cauchy relations and equilibrium and symmetry equations, principal stresses and directions

Unit-II

Constitutive equations: Generalized Hooke's law, Linear elasticity, Material symmetry; Boundary Value Problems: concepts of uniqueness and superposition.

Unit-III

Plane stress and plane strain problems, introduction to governing equations in cylindrical and spherical coordinates, axisymmetric problems.

Unit-IV

Application to thick cylinders, rotating discs, torsion of non-circular cross-sections, stress concentration problems, thermo-elasticity, 2-d contact problems.

Unit-V

Solutions using potentials.Energy methods.Introduction to plasticity.

Text and Reference books

[1] G. T. Mase, R. E. Smelser and G. E. Mase, Continuum Mechanics for Engineers, Third Edition, CRC Press, 2004.
[2] Y. C. Fung, Foundations of Solid Mechanics, Prentice Hall International, 1965.
[3] Lawrence. E. Malvern, Introduction to Mechanics of a Continuous Medium, Prentice Hall international, 1969.

Professional Elective-II

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	4	0	0	PEC-ME-403	Production planning &control	PEC

Unit-I

Introduction to Production Systems: Production Systems: Classification & Characterization, Overview of Production Planning and Control issues, Review of EOQ & inventory control systems.

Unit-II

Just in Time Production Systems: Just-in-Time System: Evolution, Characteristics of JIT Systems, Continuous Improvement, The Kanban System, Strategic Implications of JIT System.

Unit-III

Material Requirement Planning: Dependent Demand & Material Requirement Planning, Structure of MRP system, MRP Calculations, Planning Issues, Implementation Issues.

Unit-IV

Factory Physics: Basic factory dynamics, Variability basics, Push and pull production systems, Lean manufacturing.

Aggregate Planning: Aggregate Planning: Purpose & Methods, Reactive and Aggressive Alternatives, Planning Strategies, Master Production Scheduling.

Unit-V

Issues in PPC: New developments in Planning & Control of Product-focused Systems and Process-focused Systems, Theory of Constraints.

Text and Reference Books:

1. Production & Operations Management – Chary, TMH, New Delhi.

2. Modern Production Management – S.S. Buffa, Pub.John Wiley.

3. Krajewski L.J. and Ritzmen L.P., Operations Management: Strategy and Analysis, 9th Edition, Pearson Education, 2010.

4. Chase, R.B., Jacobs, F.R. and Aquilano, N.J., Operations Management for Competitive Advantage, 11th Edition, Tata McGraw Hill Book Company, New Delhi, 2010.
5. Hopp, WJ and Spearman, ML, Factory Physics: Foundations of Manufacturing Management, McGraw Hill International Edition, Third Edition, 2008.

OPEN ELECTIVE-III

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-401	NON CONVENTIOANL ENERGY SOURCES	OEC

Unit-I

Global and National scenarios, Form and characteristics of renewable energy sources.

Solar Energy: Solar radiation, its measurements and prediction, Solar thermal collectors, flat plate collectors, concentrating collectors, Basic theory of flat plate collectors, solar heating of buildings, solar still, solar water heaters, solar driers, conversion of heat energy in to mechanical energy, solar thermal power generation systems.

Solar Photovoltaic: Principle of photovoltaic conversion of solar energy, types of solar cells and fabrication, **Photovoltaic applications:** battery charger, domestic lighting, street lighting, water pumping, power generation schemes.

Unit -II

Wind Energy: Atmospheric circulations, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS- classification, characteristics and applications.

Unit -III

Ocean Energy: Ocean energy resources, ocean energy routes, Principles of ocean thermal energy conversion systems, ocean thermal power plants, Principles of ocean wave energy conversion and tidal energy conversion.

Unit-IV

Other Sources: Nuclear fission and fusion, Geothermal energy- Origin, types of geothermal energy sites, site selection, geothermal power plants, Magneto-hydro-dynamic (MHD) energy conversion, Formation of biomass, photosynthesis, Biomass resources and their classification, Chemical constituents and physicochemical characteristics of biomass, Biomass conversion processes.

Unit-V

Fuel Cells: Thermodynamics and electrochemical principles, Basic design, types, applications. **Hydrogen Energy:** Economics of hydrogen, Production methods.

Text and References Books:

1. Power Generation through Renewable Source of Energy, Rai and Ram Prasad, Tata McGraw-Hill,
2. Ashok V. Desai,"Nonconventional Energy", New Age Internantional Publishers Ltd.

3. BansalKeemann, Meliss," Renewable energy soucesa and conversion technology", Tata McGraw Hill
4. RaiG.D,"Non-Conventional energy Sources", Khanna Publishers.

OPEN ELECTIVE-III

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC402	Management information system	OEC

Unit-I

Organisation & Types, Decision Making, Data & information, Characteristics & Classification of information, Cost & value of information, Various channels of information & MIS.

Unit-II

Foundation of Information System: Introduction to Information System in Business Fundamentals of Information System, Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria. Tool and Techniques of MIS-dataflow diagram, flow chart etc.

Unit-III

Business application of information technology, electronic commerce, Internet, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage.

Unit-IV

Managing Information Technology, Enterprise & Global Management, Security & Ethical Challenges, Planning & Implementing Change. Reports: Various types of MIS reports, GUI & Other Presentation tools.

Unit-V

Advanced concepts in information system: Enterprise Resource Planning: introduction, various modules like Human Resources, Finance, Accounting, Production & Logistics. Supply Chain Management, CRM, Procurement Management System Object Oriented modeling case studies.

Text and References Books:

1. O.Brian, “Introduction to Information System”, Mc-Graw Hill.
2. O.Brian, “Management Information System”, TMH. Alter,
3. “Information Systems : A Management Perspective”, Addison Wesley.
4. Arora& Bhatia, “Information Systems for Managers”,
5. Excel Bansal, “Information System Analysis & Design”, TMH. Jawadegar,

OPEN ELECTIVE-III

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3		0	OEC403	Soft Skills for Engineers	OEC

UNIT- I

SELF ANALYSIS: SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem.

CREATIVITY: Out of box thinking, Lateral Thinking**.**

UNIT- II

ATTITUDE: Factors influencing Attitude, Challenges and lessons from Attitude, Etiquette.

UNIT- III

MOTIVATION: Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators.

UNIT-IV

GOAL SETTING : Wish List, SMART Goals, Blue print for success, Short Term, Long Term, Life Time Goals.

TIME MANAGEMENT: Value of time, Diagnosing Time Management, Weekly Planner To do list, Prioritizing work

UNIT- V

LEADERSHIP: Skills for a good Leader, Assessment of Leadership Skills, Conflicts in Human Relations – Reasons Case Studies, Approaches to conflict resolution.

DECISION MAKING: Importance and necessity of Decision Making, Process and practical way of Decision Making, Weighing Positives & Negatives.

Text and Reference Books

1. Covey Sean, Seven Habit of Highly Effective Teens, New York, Fireside Publishers, 1998.

2. Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.

3. Thomas A Harris, I am ok, You are ok , New York-Harper and Row, 1972

4. Daniel Coleman, Emotional Intelligence, Bantam Book, 2006

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	**0**	**0**	**2**	**PCC-ME 403**	**REFRIGERATION AND AIR CONDITIONING LAB**	**PCC**

LIST OF EXPERIMENTS

1. Study & Performance test rig and to study vapour compression Refrigeration Cycle
2. To find COP of water cooler.
3. To study and perform experiment on vapour absorption apparatus.
4. To find the performance parameter of experimental water cooling tower.
5. To study various components in room air conditioner.
6. To study different control devices of a refrigeration system.
7. To study various compressors.
8. To find the performance parameters of Ice Plant.
9. To perform the experiment & calculate various Performance parameters on a blower apparatus.
10. To study vapour compression water cooler test rig.

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
02	0	0	2	PROJ-ME 401	Industrial Training-II/ Seminar	PROJ

Objective of Industrial Training: This two credit course is meant to give students practice the objective of undertaking industrial training is to provide work experience so that students engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.

Scheme of Studies: This two credit course is meant to give students of Duration 4 weeks in summer break after VI semester; assessment to be done in VII semester During training students will prepare a first draft of training report in consultation with section in charge. After training they will prepare final draft with the help of Faculty of the concern Department Then they will present a seminar on their training and present it in the institute in front of the committee headed by the HOD/Faculty Member.

Learning through Industrial: Training: During industrial training students must observe following to enrich their learning:

- Industrial environment and work culture.
- Organizational structure and inter personal communication.
- Machines/equipment/instrument-their working and specifications.
- Product development procedure and phases. Project Planning, monitoring and control.
- Quality control and assurance.
- Maintenance system Costing system Stores and purchase systems.
- Layout of Computer/EDP/MIS centers.
- Problems related to various areas of work etc. Students are supposed to acquire the knowledge on above by Direct Observations without disturbing personnel at work.
- Interaction with officials at the workplace in free/ tea time Study of Literature at the workplace (e.g. User Manual, standards, processes, schedules, etc.)
- Hands on" experience Undertaking/assisting project work. Solving problems at the work place. Presenting a seminar participating in group meeting/discussion.
- Consulting current technical journals and periodicals in the library.

Mechanical Engineering (B. Tech.), VII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
06	0	0	6	PROJ- ME 402	PROJECT-I	PROJ

The minor project work can be a design project, experimental fabrication project or software development project on any of the topics of mechanical engineering interest - it can be allotted as a group project with groups consisting of three or four students The assessment of all the minor projects should be done by a committee consisting of three or four faculty members specialized in the various fields of Mechanical Engineering - the students will present their project work and give a seminar on that topic for about thirty minutes - a committee consisting of at least three faculty members (preferably specialized in different fields of mechanical engineering) will assess the presentation of the seminars before the committee - the relative grading and group average marks for the various projects will be fixed by the committee - the guide will award the marks for the individual students in the project maintaining the group average - each group will prepare the project report and submit one copy of a write up of his minor project to the department through the guide - the Head of the Department will certify the copies and keep them in the departmental library

INSTRUCTIONS FOR PROJECT REPORT/ DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of B.E. (Mechanical Engineering).

1. Prepare one spiral Bound Copies of your manuscript

2. Limit your Dissertation report to 50– 60 pages (preferably)

3. The footer must include the following: Institute Name, B.E. (Mechanical) Times New Roman 10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using

a. Letter quality computer printing.

b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.

c. Use 1.5 line spacing.

d. Entire report shall be of 5- 7 chap

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PCC-ME 404	POWER PLANT ENGINEERING	PCC

Unit -I

Introduction To Power Plants & Boilers: Layout of Steam, Hydel, Diesel, MHD, Nuclear and Gas Turbine Power Plants, Combined Power Cycles, Comparison and Selection, Load Duration Curves. Steam Boilers and Cycles, High Pressure and Super Critical Boilers, Fluidised Bed Boilers

Unit – II

Steam Power Plant: Fuel and Ash Handling, Combustion Equipment for burning coal, Mechanical Stokers, Pulveriser, Electrostatic Precipitator, Draught, different types, Surface Condenser Types, Cooling Towers

Unit –III

Nuclear And Hydel Power Plants: Basics of nuclear energy conversion, Layout and subsystems of nuclear power plants, Nuclear Energy, Fission, Fusion Reaction, Types of Reactors, pressurized water reactor, Boiling Water Reactor, Waste Disposal and safety measures for nuclear power plants. Hydel Power Plant, Essential Elements, Selection of Turbines, Governing of Turbines, Micro Hydel developments.

Unit –IV

Diesel And Gas Turbine Power Plant: Types of Diesel Plants, Components, Selection of Engine Type, Applications Gas Turbine Power Plant, Fuels, Gas Turbine Material, Open and Closed Cycles, Reheating, Regeneration and Inter-cooling, Combined Cycle.

Unit –V

Other Power Plants: Hydroelectric power plants, classification, typical layout and components, principles of wind, tidal, solar PV and solar thermal, geothermal, biogas and fuel cell power systems. capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants, Energy Rates, Types of Tariffs, power tariffs and Economics of load sharing, comparison of economics of various power plants.

Text and Reference Books:

1. G. R. Nagpal, “Power Plant Engineering”, Hanna Publishers, 1998.
2. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
3. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	HMSC-402	Entrepreneurship development & Management	HMSC

Unit I: Entrepreneurship

- Theories of Entrepreneurship
- Role and Importance of Entrepreneur in Economic Growth.

Unit II: Entrepreneurial Behaviours

- Entrepreneurial Motivation, Need for Achievement Theory
- Risk Taking Behavior
- Innovation and Entrepreneur

Unit III: Entrepreneurial Traints

- Definitions, Characteristics of Entrepreneurial Types
- Functions of Entrepreneur.

Unit IV: Entrepreneurial Development in India

- History, Objectives, Stages of Growth
- Target Group, Programmes
- Govt. Policy towards SSI's

Unit V: Project Feasibility Analysis

- Business Ideas – Sources, processing; Input requirements, Sources of Financing, Technical Assistance, Marketing Assistance
- Preparation of Feasibility Reports, Legal Formalities and Documentation.

Text and Reference books:

1. McClelland, D.C. & Winter, W.G. : Motivating Economic Achievement, Free Press.
2. Pareek, U &VenkateswaraRao, T : Developing Entrepreneurship – A Handbook on Learning Systems, Learning Systems, New Delhi.

3. Desai, A.N. : Entrepreneur and Environment, Ashish, New Delhi.
4. Druckar, Peter : Innovation and Entrepreneurship, Heinemann.
5. Chakraborty, Tridib : Introducing Entrepreneurship Development, Modern Book Agency

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	3	1	0	PCC-ME 405	CNC Machines & Automation	PCC

Unit-I

Automation Introduction to CAM, Automated Manufacturing system, Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends. Features of NC Machines Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system, Methods for improving Accuracy considering the factors such as tool deflection and chatter and Productivity.

Unit-II

NC Part Programming & Common Problems in CNC Machines Part programming and basic concepts of part programming, NC words, part programming formats, simple programming for rotational components, part programming using canned cycles, subroutines and do loops, tool off sets, cutter radius compensation and wear compensation Manual (word address format) programming, Examples: Drilling, Turning and Milling, Canned cycles, Subroutine and Macro. APT programming, Geometry, Motion and Additional statements, Macro- statement. Common problems in mechanical, electrical, pneumatic, electronic and PC components of CNC machines, diagnostic study of common problems and Remedies , use of on-time fault finding diagnosis tools in CNC machines.

Unit-III

System Devices Introduction to DC motors, stepping motors, feedback devices such as encoder, counting devices, digital to analog converter and vice versa.

Interpolators Digital differential Integrator-Principle of operation, exponential declaration, DDA Hardware Interpolator- Linear, Circular, DDA Software Interpolator

Control of NC Systems Open and closed loops, Control of point to point systems, Incremental open loop control, Incremental close loop, Absolute close loop, Control loop in contouring systems, Adaptive control.

Unit-IV

Computer Integrated Manufacturing system Group Technology, Flexible Manufacturing System, CIM, CAD/CAM, Computer aided process planning Retrieval and Generative, Concept of Mechatronics, Computer aided Inspection.

Unit-V

Robotics and Intelligent Manufacturing Types and generations of Robots, Structure and operation of Robot, Robot applications, Economics, Robot programming methods. Introduction to Artificial Intelligence for Intelligent manufacturing.

Text and Reference Books:

1. Numerical Control and Computer aided Manufacturing, By Kundra, Rao and Tewari.

2. Automation, Production Systems and Computer Integrated Manufacturing by MikellP.Groover.

3. Computer Aided Manufacturing by Kundra and Rao.

4. Computer control of Manufacturing systems by Koren.

5. NC Machine Tools by S.J. Martin.

6. Computer Aided Design and Manufacture by Groover and Zimmer, PHI.

7. Technology of Computer aided Design and Manufacturing by Kumar and Jha, DhanpatRai and Sons

8. CNC Machines –Programming and Applications by M Adithan and BS Pabla, New Age International (P) Ltd., Delhi.

9. Computer Aided Manufacturing by Rao, Kundra and Tiwari; Tata McGraw Hill,New Delhi.

10. Numerical Control of Machines Tools by YoremKorem and IB Uri, KhannaPublishers, New Delhi.

PROFESSIONAL ELECTIVE-III

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PEC-ME 404	MECHATRONICS,	PEC

Unit-I

Introduction about Mechatronics: scope of Mechatronics, application, process control automation and N/c Machines.

Unit-II

Sensors and Transducers: Introduction, classification, specification, characteristics of transducers, type of transducers displacement, strain, vibration pressure, flow, temperature, force and torque, tactile.

Unit-III

Hydraulic Pneumatic and Electrical actuators: Pumps and Compressors, control valves and accessories, actuators, fluid power symbols, fluid power systems, switching devices, solenoids, motors.

Unit-IV

Data Acquisition and Control System: Introduction, Quantitating theory, Analog to Digital Conversion, Digital to Analog (D/A) conversation, transfer function, transient response and frequency response and frequency response, stability criteria

Unit-V

Design of Mechatronic systems: Introduction, Automatic front and book and cutting in steel rolling mill, lift control system, CNC lathe, temperature control of a heat treatment furnace, EOT crane control panel, Grey grain separators, electrode arm control in electric arc furnace.

Text and References Books

1. Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering, Bolton, W., Pearson Education
2. Mechatronics: Principles, Concepts and applications, Mahalik N.P., Tata McGraw Hill.
3. Mechatronics, HMT Hand Book, Tata McGraw Hill.
4. Mechatronics, Singh and Joshi, Prentice Hall of India.

PROFESSIONAL ELECTIVE-III

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	0	0	0	PEC-ME 405	RAPID PROTOTYPING	PEC

Unit-I

Introduction: Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP

Unit-II

CAD Modelling and Data Processing for RP: CAD model preparation, Data Requirements, Data formats (STL, SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP), Data interfacing, Part orientation and support generation, Support structure design, Model Slicing and contour data organization, direct and adaptive slicing, Tool path generation

Unit-III

RP Systems: Photo polymerization Stereo lithography (SL), SL resin curing process, SL scan patterns, Micro stereo lithography, Applications of Photo polymerization Processes. Powder Bed Fusion: Selective laser Sintering (SLS), Powder fusion mechanism and powder handling, SLS Metal and ceramic part creation, Electron Beam melting (EBM), Applications of Powder Bed

Unit-IV

Fusion Processes. Extrusion-Based RP Systems: Fused Deposition Modelling (FDM), Principles, Plotting and path control, Applications of Extrusion-Based Processes. 3D Printing : 3D printing (3DP), Research achievements in printing deposition, Technical challenges in printing, Printing process modelling, Applications of Printing Processes. Sheet Lamination: Laminated Object Manufacturing (LOM), Ultrasonic Consolidation (UC), Gluing, Thermal bonding, LOM and UC applications. Beam Deposition: Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Processing-structure-properties, relationships, Benefits and drawbacks.

Unit-IV

Errors in RP Processes: Pre-processing, processing, post-processing errors, Part building errors in SLA, SLS.

RP Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Text and Reference Books:

1. Chua C K, Leong K F, Chu S L, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific.
2. Gibson D W Rosen, Brent Stucker., Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer.
3. Chua C K, Leong K F, Chu S L, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific.
4. Noorani R, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons.
5. Liou W L, Liou F W, Rapid Prototyping and Engineering applications: A tool box for prototype development, CRC Press

PROFESSIONAL ELECTIVE-III

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
04	4	0	0	PEC-ME 406	Foundry Technology	PEC

UNIT-I

Introduction and types of foundries: Basic steps in the process of metal casting; comparison of casting with metal joining. Pattern and Pattern Making: Patterns: Materials, types and design of Patterns, Pattern, Pattern allowances, Pattern colors

UNIT-II

Mould and Mould Making: Introduction, Moulding Sand – Types and Properties, Moulding Tools and Equipment- Moulding Machines and Hand Moulding tools, Function of Core, Types of Cores, Core Prints, Core Venting and Baking, Core Shifting and Chaplets, Moulding Processes- Bench Moulding, Floor Moulding, Pit Moulding, Stack Moulding, Green Sand Moulding, Dry Sand Moulding, Loam Moulding, Core Moulding, Machine Moulding.

UNIT-III

Foundry Furnaces: Types of Foundry Furnaces- Cupola Furnace, Electric Arc Furnace, Induction Furnace.

Gating Systems: Gating System- types of Gates and Risers, Gating Ratios and chills, Riser location & design in actual casting, Directional Solidification in Casting, Physical Behavior of Metals during Solidification.

Finishing & Heat Treatment Processes: Various Fettling, Finishing and Heat Treatment of Casting

UNIT-IV

Advance Casting Processes: Investment Casting, Centrifugal Casting, Shell Moulding, Gravity die/ permanent mold, casting, Continuous Casting, pressure die casting, Slush Casting, Non - metal Molding /Ceramic Molding.

UNIT-V

Inspection and Testing of Casting: Defects in Casting, its causes and remedies, Inspection and Non destructive Testing of Casting

Modernization and Mechanization of Foundry: Material Handling, Pollution Control in Foundry, Application of Computers in Casting Processes

Text and Reference Books:

1. A Text Book of Foundry Technology by O.P. Khanna& M. Lal, DhanpatRai.

2. Manufacturing Technology Foundry Forming & Welding by P.N. Rao – TMH.

3. Foundry Technology by P.L. Jain.

4. Production Technology by P.C.Sharma – S Chand.

5. Process and Materials of Manufacture By Lindberg – PHI.

6. Casting Technology by Chakravarty – New Age.

7. Metal Casting by Ravi, PHI.

8. Metal Casting by RamaRao- New Age Publication.

9. Principles of Foundry Technology by R.K.Jain.

10. Principle of Metal Casting by Hein

Professional Elective-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PEC-ME 407	Gas Turbine and Gas Power Plant	PEC

Unit-I

Review of Basic Principles and Fundamentals of Rotating Machines: Cycle arrangements-Open cycle and closed cycle arrangements, Basic requirement of the working medium, Properties of various working media, Applications of gas turbine, Comparison of gas turbines with reciprocating engines, Ideal cycles, Simple gas turbine cycle, Heat exchange cycle, Reheat cycle with heat exchange, Intercooled cycle, Intercooled cycle with heat exchanger and reheat, Comparison of various cycles.

Unit -II

Practical Cycles and their Analysis: Effect of variable specific heat, Mechanical losses, Loss due to incomplete combustion, polytrophic efficiency, Performance of actual cycles, Comparison of ideal versus actual cycles and Jet propulsion cycles.

Unit -III

Thermodynamic Cycles: Advantages, disadvantages and performance characteristics of Ram jet engine, pulse jet engine, turbo prop engine, turbo jet engine, turbo fan engine, Calculation of specific thrust and efficiency.

Unit -IV

Combustion Systems: Combustion theory applied to gas turbine combustor, Factors affecting combustion chamber design and performance, Combustion chamber geometry, Fuel injection and ignition, Use of cheap fuels, Impulse and reaction type gas turbines, Velocity triangles and calculation of work done, Efficiency etc.

Unit -V

Advantages of a gas turbine power plant, Comparison with steam, Diesel and hydro power plant, Performance of GT power plant-part load efficiency, Airflow rate, Thermal efficiency, Gas turbine blading and fuels, Gas turbine materials, Free piston engine plant.

Text and Reference Books:

1. Power Generation Handbook, Philip Kiameh, McGraw Hill**.**
2. Gas Turbine Engineering Handbook, Meherwan P. Boyce, Gulf Professional Publication.

Professional Elective-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	PEC-ME 408	AERODYNAMICS & THEIR ANALYSIUS	PEC

Unit -I

Introduction: Lift, drag, moment and related coefficients; Vector operations (review); conservation equations (mass, momentum and energy); Streamlines, streaklines and pathlines; Velocity potential and stream function

Unit -II

Inviscid, Incompressible flow: Bernoulli's equation, low-speed wind tunnel flows; Governing equations and boundary conditions; Elementary flows (uniform, sources, sinks and vortex); ideal lifting flow past a circular cylinder, Kutta-Joukowski theorem and lift generation; source panel method for non-lifting flows; d' Alembert's paradox.

Unit -III

Incompressible flow over airfoils: Introduction; Kutta Condition; Thin airfoil theory (symmetric, cambered); Aerodynamic center; vortex panel method for lifting flows; qualitative picture of viscous flow.

Unit -IV

Finite Wing Theory: Introduction; Downwash and induced drag; Biot-Savart Law and Helmholtz's Theorems; Prandtl's lifting line theory; Numerical lifting-line method; Someractical aspects. Introduction to Compressible flows (Inviscid): Thermodynamics review; Governing equations; Compressibility.

Unit -V

Normal Shock, Oblique Shock and Expansion Waves: Basic relations; flow over wedges and cones; shock interactions; blunt body flow; Prandtl-Meyer expansion waves; qualitative pitcute of shock wave-boundary layer interaction; quasi-one-dimensional flow through nozzles and diffusers.Linearized Theory for Subsonic and Supersonic Flows: Introduction; Velocity potential equation and linearized form; Prandtl-Glauert correction; Improved corrections; Critical Mach number; Drag divergence; Supercritical airfoils and area rule.

Text and Reference Books:

1.Houghton and Carruthers,"Aerodynamics for engineering students",Edward Arnold (1982).
2. McCormick B.W,"Aerodynamics, aeronautics and flight mechanics", John Wiley (1995).
3. Anderson, Jr. J.D "Aircraft performance and design" McGraw Hill International edition (1999).
4. Eshelby ,M.E."Aircraftperformancetheory and practice" , Butterworth-Heinemann, Oxford,U.K.,(2001).
5. Pamadi,B.,"Performance, stability, dynamics and control of an airplane",AIAA (2004).
6. Phillips, W.F."Mechanics of flight" 2nd Edition, John Wiley (2010).

Credits	L	T	P	Course Code	Course Title	Category of Course
03	**3**	**3**	**0**	**PEC-ME 409**	**Advance Manufacturing Processes**	**PEC**

Unit-I

ADVANCE MECHANICAL MACHINING PROCESSES: Classification of AMPs-process selection; Ultrasonic machining; machining setup; mechanics of cutting; parameter analysis; process capability; application. Abrasive water jet machining.

Unit-II

ADVANCE CHEMICAL AND THERMAL MACHINING PROCESSES: Electrochemical machining; electrochemical grinding; electrochemical honing; chemical machining; electric discharge machining; wire cut EDM; electron beam machining; laser beam machining.

Unit-III

ADVANCE CASTING PROCESSES: Metal mold casting: low and high pressure; continuous casting; squeeze casting; vacuum mold casting; evaporative pattern casting; chemical shell casting.

Unit-IV

ADVANCE WELDING PROCESSES: Electron beam welding; laser beam welding; ultrasonic welding

Unit-V

ADVANCE METAL FORMING PROCESSES: High rate energy forming (HERF) processes; electromagnetic forming; explosive forming; electro-hydraulic forming; stretch forming; contour roll forming.

Text and References books:

1. Manufacturing Engineering & Technology, 7th Edition SeropeKalpakjian, Illinois Institute of Technology Steven Schmid, The University of Notre Dame ©2014 |Pearson
2. Non traditional Manufacturing Processes Gary F. Benedict CRC Pres
3. Manufacturing Science by ghosh and mallik ; Prentice hall of India, 8th Edition
4. Shan & Pandey; Non traditional manufacturing

OPEN ELECTIVE-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC404	Utilization of electrical power &traction	OEC

Unit-1

Electric Heating: Different methods of electric heating. Principle of high frequency induction and di-electric heating. Construction, operation, performance and applications of arc furnace and induction furnace.

Electric Welding: Welding process, welding transformer, Classification of Electric Welding: arc welding, resistance welding, welding of various metals.

Unit-2

Illuminations: Definitions, laws of illuminations, polar curves, luminous efficiency, photometer, incandescent lamps: filament materials, halogen lamp. electric discharge lamps: sodium vapour lamp mercury vapour lamp and fluorescent lamp.

Light Calculations: commercial, industrial, street and flood lighting.

Unit-3

Electrolytic Process: Principles and applications of electrolysis, electro-deposition, manufactures of chemicals, anodizing, electro polishing electro-cleaning, electroextraction, electrorefinig, electro-stripping (parting) power supplies for electrolytic process.

Unit-4

Electric Traction & Means of Supplying Power: Systems of Electric Traction: DC & AC Systems, Power Supply for Electric Traction System: Comparison and application of different systems. Sub-station equipment and layout, conductor rail & pantograph.

Unit-5

Traction Methods: Types of services, speed time and speed distance curves, estimation of power and energy requirements, Mechanics of train movement. Co-efficient of adhesion, Adhesive weight, effective weight.

Traction Motor Controls: DC and AC traction motors, Series parallel starting. Methods of electric braking of traction motors.

Text and Reference Books

1. H. Partab,“Art and Science of Electrical Energy” DhanpatRai& Sons
2. H. Partab, “Modern Electric Traction” DhanpatRai& Sons.
3. C.L. Wadhwa – Utilization of Electric Traction Electric Power.
4. G.K.Dubey,“Fundamentals of Electric Drives” Narosa Publishing House
5. Vedam and Subrahmanyam – Concept & Application of Electric Drives (TMH)

OPEN ELECTIVE-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC405	Optimization techniques in Engineering	OEC

Unit-I

Unconstrained Optimization: Optimizing Single-Variable Functions, conditions for Local Minimum and Maximum, Optimizing Multi-Variable Functions.

Unit-II

Optimizing Multivariable Functions with Equality Constraint: Direct Search Method, Lagrange Multipliers Method, Constrained Multivariable Optimization with inequality constrained: Kuhn-Tucker Necessary conditions, Kuhn –Tucker Sufficient Conditions.

Unit-III

Quasi-Newton Methods and line search, least squares optimization, Gauss-Newton, Levenberg-Marquartd, Extensions of LP to Mixed Integer Linear Programming (MILP), Non-Linar Programming, The Newton Algorithm, Non-Linear Least Squares, Sequential Quadratics Programming (SQP), Constrained Optimization, SQP Implementation,

Unit-IV

Multi-Objective Optimization, Branch and Bound Approaches, Genetic Agorthms and Genetic Programming, Singular Based Optimization, On-Line Real Time Optimization, Optimization in Econometrics Approaches – Blue.

Unit-V

The Finite Difference Method for Poisson's Equation in two Dimensions and for the Transient Heat Equation, Eulers Method, The Modified Euler Method and the Runge-Kutta Method for Ordinary Differential Equations, Jacobi's Iteration Method.

Text and Reference Books:

1. Winston W L: Operations Research: Applications and Algorithms
2. Rao S.S., Optimization: Theory and Applications.
3. Walsh G R: M methods of Optimization.
4. Williams H.P.: Model Building in Mathematics Programming.
5. Williams H.P.: Model Solving in Mathematics Programming

3. H.A. Taha,"Operations Research:An Introduction", 5th Edition, Macmillan, New York, 1992. 4. K. Deb,"Optimization for Engineering DesignAlgorithms and Examples",Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.
5. K.SrinivasaRaju and D. Nagesh Kumar, "Multicriterion Analysis in Engineering and Management",PHI Learning Pvt. Ltd., New Delhi, India, ISBN 978-81-203-3976-7, pp.288

OPEN ELECTIVE-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC406	Microprocessor& microcontroller	OEC

Unit-I

Architecture of Microprocessors (6) General definitions of mini computers, microprocessors, micro controllers and digital signal processors.Overview of 8085 microprocessor.Overview of 8086 microprocessor. Signals and pins of 8086 microprocessor

Unit-II

Assembly language of 8086 (6) Description of Instructions.Assembly directives. Assembly software programs with algorithms

Unit-III

Interfacing with 8086 (8) Interfacing with RAMs, ROMs along with the explanation of timing diagrams. Interfacing with peripheral ICs like 8255, 8254, 8279, 8259, 8259 etc.Interfacing with key boards, LEDs, LCDs, ADCs, and DACs etc.

Unit-IV

Coprocessor 8087 (4) Architecture of 8087, interfacing with 8086. Data types, instructions and programming,Architecture of Micro controllers (4) Overview of the architecture of 8051 microcontroller. Overview of the architecture of 8096 16 bit microcontroller.

Unit-V

Assembly language of 8051 (4) Description of Instructions.Assembly directives. Assembly software programs with Algorithms.Interfacing with 8051 (5) Interfacing with keyboards, LEDs, 7 segment LEDs, LCDs, Interfacing with ADCs. Interfacing with DACs, etc. Module 8: High end processors (2) Introduction to 80386 and 80486

Text and Reference Books:

1. N.Senthilkumar, M.Saravanan, S,Jeevanathan, “Microprocessors and Microcontrollers”, Oxford University Press, 2011.
2. Kenneth J Ayala, “The 8086 Microprocessor: Programming and Interfacing the PC”, Cengage Learning, Reprint 2014.
3. 5. Kenneth J Ayala, “The 8051 Microcontroller”, 3rd edition, Cengage Learning, Reprint 2014.

4. 6. Muhammed Ali Mazidi, Janice GillispleMaidi, Rolin.D. McKinlay, “ The 8051 Microcontroller and Embedded Systems, Using Assembly and C”, Second edition, Pearson Prentice Hall, 2015.

OPEN ELECTIVE-IV

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
03	3	0	0	OEC-407	RELIABILITY AND MAINTINENCE ENGINEERING	OEC

Unit-I

Introduction: Maintenance Objectives and Functions, Maintenance Organisation and Administration of Maintenance Systems, Need of planned maintenance, Maintenance policies, Breakdown, time based maintenance, Block replacement, age replacement and periodic replacement policy, Corrective and preventive maintenance, Maintenance planning, Scheduled maintenance, Cost of maintenance versus Cost of equipment and production delays.

Inspection: Inspection intervals, Inspection reports, card history system.

Unit-II

Predictive Maintenance: Equipment wear records, standards, Equipment used inpredictive maintenance. Computerized maintenance, Total Productive Maintenance, Methods of condition monitoring, Non-destructive testing, Liquid Penetrate, Magnetic particles, Ultrasonic testing, and Vibration analysis, Oil analysis, Radiographic testing.

Unit-III

Reliability: Definition, failure data analysis, Mean failure rate, mean time to failure(MTTF), mean time between failures (MTBF), hazard rate, Bathtub curve, Use of Weibull probability chart foe assessing characteristics life, guarantee period etc.

Unit-IV

System Reliability: Series, parallel and mixed configuration, Simple problems.

Reliability Improvement: Techniques, use of Pareto analysis-Design for reliability, redundancy unit and stand by redundancy, Optimization of reliability.

Unit-V

Spare Parts Management: Spare parts, features and categorization of spares, cost considerations, Techniques of cost reduction, Selective controls used in spare parts control, ABC analysis, FSN, XYZ, VED and other approaches, Inventory control of spares.

Text and Reference Books

1. Reliability Engineering, Srinath L.S., Affiliated East West Press.
2. Maintainability Principles and Practices, Blanchand, B.S., McGraw Hill
3. C.E. Ebeling, An Introduction to Reliability and Maintainability Engineering, McGrawHill, 1997.
4. . V. A. Profillidis, Railway management and engineering, 3rd Edition, Burlington, Ashgate Pub. Co., 2006.
5. Bury St Edmunds, Railway rolling stock, organized by the Railway Division of the Institution of Mechanical Engineers (IMechE) and the Institution of Civil Engineers (ICE) for IMechE, 2001

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
01	0	0	2	PCC-ME 407	CNC Machines & Automation Lab	PCC

PART - A

CNC part programming using CAM packages. Simulation of Turning, Drilling, Milling operations. 3 typical simulations to be carried out using simulation packages like Master- CAM, or any equivalent software.

PART - B

(Only for Demo/Viva voce)

1. FMS (Flexible Manufacturing System): Programming of Automatic storage and Retrieval system (ASRS) and linear shuttle conveyor Interfacing CNC lathe, milling with loading unloading arm and ASRS to be carried out on simple components.

2. Robot programming: Using Teach Pendent & Offline programming to perform pick and place, stacking of objects, 2 programs.

PART - C

(Only for Demo/Viva voce)

Pneumatics and Hydraulics, Electro-Pneumatics: 3 typical experiments on Basics of these topics to be conducted.

Mechanical Engineering (B. Tech.), VIII Semester

Credits	L	T	P	Course Code	Course Title	Category of Course
06	**0**	**0**	**6**	**PROJ- ME 403**	**Major Project**	**PROJ**

The major project work can be a Modelling and Simulation, Case study, Design or Experiments in the field of Mechanical Engineering. It can be allotted as a group project with groups consisting of 3 to 4 students. The major project work started in the seventh semester (minor project) may be continued in this semester - the students should complete the project work in this semester and present it before the assessment committee The assessment committee will assess the various projects, fix the relative grading and group average marks - the guides will award the marks for the individual students in a project maintaining the group average - each group should submit three copies of a write up of his major project of the completed project report signed by the department (in the format prescribed by the department) through the guide - the Head of the Department-Dean of School of engineering and Technology will certify the copies and one copy return them to the students - other copy will be kept in the departmental and university library

INSTRUCTIONS FOR PROJECT REPORT/ DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of B.E. (Mechanical Engineering).

1. Prepare Three Hard Bound Copies of your manuscript and if possible publish at least one international journal paper by each group for value addition of your project.

2. Limit your Dissertation report to 80 – 120 pages (preferably)

3. The footer must include the following: Institute Name, B.E. (Mechanical) Times New Roman 10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using

a. Letter quality computer printing.

b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.

c. Use 1.5 line spacing.

d. Entire report shall be of 5- 7 chapters.

6. Use the paper size 8.5‘‘× 11‘‘or A4 (210 × 197 mm).

Margin Location	Paper 8.5‘‘× 11‘‘	Paper A4 (210 × 197 mm)
Top	1‘‘	25.4 mm
Left	1.5‘‘	37 mm
Bottom	1.25‘‘	32 mm
Right	1‘‘	25.4 mm

7. All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin with without any indentation.
8. Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.
9. Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the first letter of each word is to be capitalized).

10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, black and white. Illustrations downloaded from internet are not acceptable.

a. Illustrations should not be more than two per page. One could be ideal
b. Figure No. and Title at bottom with 12 pt
c. Legends below the title in 10 pt
d. Leave proper margin in all sides
e. Illustrations as far as possible should not be photo copied.

11. Photographs if any should of glossy prints

12. Please use SI system of units only.

13. Please number the pages on the front side, centrally below the footer

14. References should be either in order as they appear in the thesis or in alphabetical order by last name of first author

15. Symbols and notations if any should be included in nomenclature section only

16. Following will be the order of report

i. Cover page and Front page as per the specimen on separate sheet
ii. Certificate from the Institute as per the specimen on separate sheet
iii. Acknowledgements
iv. List of Figures
v. List of Tables
vi. Nomenclature vii. Contents
vii. Abstract

(A brief abstract of the report not more than 150 words. The heading of abstract i.e. word ―Abstract‖ should be bold, Times New Roman, 12 pt and should be typed at the centre. The contents of abstract

should be typed on new line without space between heading and contents. Try to include one or two sentences each on motive, method, key-results and conclusions in Abstract

1) Introduction (2-3 pages) (TNR – 14 Bold)
Problem statement (TNR – 12)
1.1 Objectives
1.2 Scope
1.3 Methodology
1.4 Organization of Dissertation
2) Literature Review (20-30 pages) Discuss the work done so far by researchers in the domain area and their significant conclusions. No derivations, figures, tables, graphs are expected.

3)This chapter shall be based on your own simulation work (Analytical/ Numerical/FEM/CFD) (15- 20 pages)
4) Experimental Validation - This chapter shall be based on your own experimental work (15-20 pages)
5) Concluding Remarks and Scope for the Future Work (2-3 pages) References ANNEXURE (if any) (Put all mathematical derivations, Simulation program as Annexure)
17.All section headings and subheadings should be numbered. For sections use numbers 1, 2, 3, ….and for subheadings 1.1, 1.2, …. etc and section subheadings 2.1.1, 2.1.2, …. etc.
18. References should be given in the body of the text and well spread. No verbatim copy or excessive text from only one or two references. If figures and tables are taken from any reference then indicate source of it.

Please follow the following procedure for references / Reference Books/ Patent/ Internet

- Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., Oxford University Press, UK, 1996, pp. 110 – 112.
- 2. Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport properties and surface tension of pure and mixed refrigerants, ASHRAE Trans, 1991, 97 (1), pp. 90 – 98.
- Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillary tubes, Int. Journal of Refrigeration, 1996, 19 (8), pp.497 – 505.
- Papers from Conference Proceedings Colbourne, D. and Ritter, T. J., Quantitative assessment of flammable refrigerants in room air conditioners, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002, pp. 34 – 40.

Reports, Handbooks etc.

- United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent

- Patent no., Country (in parenthesis), date of application, title, year.

Internet

- www.(Site) [Give full length URL

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SCHOOL OF ENGINEERING & TECHNOLOGY (SOET)

RAFFELS UNIVERSITY, NEEMRAN

BTECH (4 Years Degree Program)

2022-23

PROGRAM B. TECH(CSE)

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

Engineering Graduates will be able to:

1) Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.

2) Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

3) Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

4) Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

5) Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6) The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

7) Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9) Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

10) Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

11) Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12) Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change.

Program Educational Objective (PEO)

PEO-1: To train students with practical skills and experimental practices related to core and applied areas of Computer Application to expand their knowledge horizon beyond books.

PEO-2: Graduate will establish himself/herself as effective professionals by solving real world problems using investigative and analytical skills along with the knowledge acquired in the field of Computer Application.

PEO-3: To improve team building, team working and leadership skills of the students with high regard for ethical values and social responsibilities.

PEO- 4: Graduate will embrace professional code of ethics in the profession while deliberately being part of projects which contributes to the society at large without disturbing the ecological balance.

Program Specific Outcomes (PSO)

PSO 1. To collect requirements, analyse, design, implement and test software Systems.

PSO 2. To analyse the errors and debug them within minimal time.

Scheme for B.Tech (3rd Sem)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 201	Data structure & algorithm using C	3	1	0	20	20	60	100	4
2	PCC	PCC-CSE 202	Object oriented programming through C++	3	1	0	20	20	60	100	4
3	PCC	PCC-CSE 203	Database Management System	3	1	0	20	20	60	100	4
4	PCC	PCC-CSE 204	Unix & Shell Programming	3	1	0	20	20	60	100	4
5	BSC	BSC 201	Mathematics –III	3	1	0	20	20	60	100	4
6	HSMC	HSMC 201	Human Values	3	1	0	20	20	60	100	4
7	PCC	PCC-CSE 205	Data structure & algorithm Using C Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 206	Object oriented programming through C++ Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE 207	Database Management System Lab	0	0	2	30	30	40	100	1
10	PCC	PCC-CSE 208	Unix & Shell Programming Lab	0	0	2	30	30	40	100	1
			Total	**18**	**6**	**8**				**1000**	**28**

SUBJECT NAME: -DATA STRUCTURE & ALGORITHM USING C

SUBJECT CODE: -PCC-CSE 201

Course outcomes:

CO1. Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented and used them and their common applications.

CO2. Discuss the efficiency of the sorting and searching algorithms

CO3. Implementation of Trees and Graphs and perform various operations on these data structures.

CO4. Understanding the concept of recursion, application of recursion and its implementation.

CO5. Identify the alternative implementations of data structures with respect to its performance to solve a real-world problem.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	

SUBJECT NAME: -OBJECT ORIENTED PROGRAMMING USING C++

SUBJECT CODE: -PCC-CSE-202

Course outcomes:

CO1. Able to develop programs with reusability.

CO2. Develop programs for file handling.

CO3. Handle exceptions in programming.

CO4. Develop applications for a range of problems using OOP techniques

CO5. Demonstrate the use of various OOPs concepts with the help of programs.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2									3		2
CO2	3	2	2									3		2
CO3	3	3	2									2		3
CO4	3	3	3	2	2	1			2		2	3	2	2
CO5	3											2		2

SUBJECT NAME: -DATABASE MANAGEMENT SYSTEM

SUBJECT CODE: -PCC-CSE-203

Course Outcomes:

CO 1. Describe the fundamental elements of relational database management systems.

CO 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.

CO 3. Design ER-models to represent simple database application scenarios

CO 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

CO 5. Improve the database design by normalization.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3										1	2		
CO2	3	2	3								2	2	3	3
CO3	3	3	3	2	2	1	1		2	1	2	2	2	2
CO4	3	2		1								1		
CO5	3		2									2	1	

SUBJECT NAME: -UNIX & SHELL PROGRAMMING

SUBJECT CODE: - PCC-CSE-204

Course Outcomes:

CO1: Understand the basic concepts of UNIX Architecture and basic Command.

CO2: Understand the commands related to Shell basics, vi editor and regular expression commands.

CO3: Understand the concepts of advance file concepts, commands related to Shell script and filter commands.

CO4: Understand the concepts in Korn Shell and Interactive C Shell.

CO5: Understand different types of Files, File system and basic file system commands.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1									1		2
CO2	3	2	1									1		2
CO3	3	1	1									1		2
CO4	3	1			1							1		2
CO5	3		1									1		2

SUBJECT NAME: -Mathematics III

SUBJECT CODE: - BSC - 201

Course Outcomes:

CO1: To explore the fundamental knowledge of transforms and their types.

CO2: Laplace Transform and their applications.

CO3: Develop knowledge of double integration.

CO4: Explore the distribution in different situations.

CO5: Use Analytic functions

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2

SUBJECT NAME: -HUMAN VALUES

SUBJECT CODE: - HSMC 201

Course outcomes:

CO1. CO1: Understand and analyse the essentials of human values and skills, self-exploration, happiness and prosperity.

CO2: Evaluate coexistence of the “I” with the body.

CO3: Identify and evaluate the role of harmony in family, society and universal order.

CO4: Understand and associate the holistic perception of harmony at all levels of existence.

CO5: Develop appropriate technologies and management patterns to create harmony in professional and personal lives.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

CBCS Scheme for B.Tech (4th Sem)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 209	Digital Electronics	4	1	0	20	20	60	100	5
2	PCC	PCC-CSE 210	Discrete Mathematics	3	1	0	20	20	60	100	4
3	PCC	PCC-CSE 211	Computer Organization & Architecture	3	0	0	20	20	60	100	3
4	PCC	PCC-CSE 212	Design & Analysis of Algorithm	4	0	0	20	20	60	100	4
5	PCC	PCC-CSE 213	Operating Systems	4	0	0	20	20	60	100	4
6	HSMC	HSMC 401	Organizational Behaviour	3	0	0	20	20	60	100	3
7	PCC	PCC-CSE 214	Computer Organization & Architecture Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 215	Operating Systems Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE 216	Design & Analysis of Algorithm Lab	0	0	2	30	30	40	100	1
10	MC	MC-III	Constitutional Law	0	0	0	0	0	100	100	0
			Total	**21**	**2**	**6**				**1000**	**26**

SUBJECT NAME: - Digital Electronics

SUBJECT CODE: - PCC-CSE-209

Course outcomes:

CO1: Identify and enumerate different electronic components.

CO2: Illustrate reduction of logical expressions using boolean algebra and implement the functions using logic gates. Design and analyse synchronous and asynchronous sequential circuits using flip-flops.

CO3: Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.

CO4: Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application.

CO5: Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	2	3		2	2		3		1	1	1	1		
CO3	1	2	2	2	2	2		3		2		2		
CO4		2		2		2		2			1			
CO5	2		1	1	1		2	1	1	1	1	1		2

SUBJECT NAME: -Discrete Mathematics

SUBJECT CODE: - PCC-CSE-210

Course outcomes:

CO1: Explore the knowledge of set theory in relation, function and partially ordered relation.

CO2: define the concepts of truth table and modulus form to explore the universal quantification.

CO3: Develop the knowledge of generating function for recurrence relation.

CO4: Explore the knowledge of prime group, cyclic group and concept of ring.

CO5: Use graph theory to find the shortest path between any to vertices.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	1	2	1		2	2	1	2	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO4	3	3	3	3	3	2	2		2	1	1	1	2	3
CO5	3	2	1	1	3	3	2		1	1	1	2	2	3

SUBJECT NAME: -Computer Organization and Architecture

SUBJECT CODE: - PCC-CSE-211

Course outcomes:

CO1: Understand the theory and architecture of central processing unit.

CO2: Analyze some of the design issues in terms of speed, technology, cost, performance.

CO3: Design a simple CPU with applying the theory concepts.

CO4: Use appropriate tools to design verify and test the CPU architecture.

CO5: Learn the concepts of parallel processing, pipelining and interprocessor communication.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	2	1	1	1								2	2	2
CO3	2	2	2		2							2		
CO4	3	2	2	1	3							3		
CO5	3	1							1	1		2		

SUBJECT NAME: - DESIGN AND ANALYSIS OF ALGORITHM

SUBJECT CODE: - PCC-CSE-212

Course Outcomes:

CO1.Students will be introduced with algorithm.

CO2.Students will learn to design algorithms.

CO3.Students will learn to implement algorithm for coding.

CO4. Argue the correctness of algorithms using inductive proofs and invariants.

CO5. Analyze worst-case running times of algorithms using asymptotic analysis.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1							1	3	1
CO2	2	1	1	1	1							1	1	1
CO3	2	2	2	1	1							1	3	1
CO4	2	2	2	1	1							1	3	1
CO5	2	1	1	1	1							1	1	2

SUBJECT NAME: - OPERATING SYSTEM

SUBJECT CODE: - PCC-CSE-213

Course Outcomes:

CO 1. Identify the role of Operating System. To understand the design of control unit.

CO2. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems.

CO3. Describe the role of paging, segmentation and virtual memory in operating systems.

CO4. Description of protection and security and also the Comparison of UNIX and Windows based OS.

CO5. Defining I/O systems, Device Management Policies and Secondary Storage Structure.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	3	2			2							3	2	2
CO3	3	2										2		
CO4	2				2							2		
CO5	2											1		

SUBJECT NAME: - ORGANIZATIONAL BEHAVIOUR

SUBJECT CODE: - HSMC- 401

Course Outcomes:

CO 1: Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organization behavior.

CO 2: Critically evaluate the potential effects of important developments in the external environment on organizational behavior.

CO 3: Analyze organizational behavioral issues in the context of organizational behavior theories, models, and concepts.

CO 4: Manage conflict in organizational context and deal with stress.

CO 5: Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

Scheme for B.Tech (5th Sem)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 301	Data Communication	4	0	0	20	20	60	100	4
2	PCC	PCC-CSE 302	Software Engineering	4	0	0	20	20	60	100	4
3	PCC	PCC-CSE 303	Formal Language & Automata Theory	3	1	0	20	20	60	100	4
4	PCC	PCC-CSE 304	Java Programming	3	0	0	20	20	60	100	3
5	HSMC	HSMC-CSE-301	Human Resource Management	3	0	0	20	20	60	100	3
6	PEC	PEC-CSE 301-303	Elective – I	4	0	0	20	20	60	100	4
7	PCC	PCC-CSE 305	Software Engineering Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 306	Java Programming Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE 307	Data Communication Lab	0	0	2	30	30	40	100	1
10	PROJ	PROJ-CSE 301	Industrial Training/ Project Seminar	0	0	4	0	0	100	100	2
			Total	**21**	**1**	**10**				**1000**	**27**

SUBJECT NAME: - DATA COMMUNICATION NETWORK

SUBJECT CODE: - PCC-CSE-301

Course Outcomes:

CO1 Student will be able to understand network communication using the layered concept, Open System Interconnect (OSI) and the Internet Model.

CO2 Student will be able to understand various types of transmission media, network devices; and parameters of evaluation of performance for each media and device.

CO3 Student will be able to understand the concept of flow control, error control and LAN protocols; to explain the design of, and algorithms used in, the physical, data link layers

CO 4 Student will understand the working principles of LAN and the concepts behind physical and logical addressing, subnetting and supernetting

CO5 Student shall understand the functions performed by a Network Management System and to analyze connection establishment and congestion control with respect to TCP Protocol.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

SUBJECT NAME: - SOFTWARE ENGINEERING

SUBJECT CODE: - PCC-CSE-302

Course Outcomes:

CO 1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO 2. An ability to work in one or more significant application domains.

CO 3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO 4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO 5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2								3	2	2
CO2	3		1	1								2		
CO3	2	2	3	2	2	1	1		3	2	2	3	3	3
CO4	3				2							2		
CO5	3				3	2	1					2		

SUBJECT NAME: -FORMAL LANGUAGE AND AUTOMATA THEORY

SUBJECT CODE: - PCC-CSE 303

Course Outcomes:

CO 1 Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.

CO 2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics .

CO 3 Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.

CO 4. Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language

CO 5. Attitude- Develop a view on the importance of computational theory.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3	2	3	2								3	2	2
CO3	3	2	3	2								2	2	2
CO4	2	3	3	3								2	2	1
CO5	2											1		

SUBJECT NAME: - Java Programming

SUBJECT CODE: - PCC-CSE 304

Course Outcomes:

CO 1. Learn to apply object-oriented programming features and concepts for solving given problem.

CO2. Learn to use java standard API library to write complex programs

CO 3. Learn implementation of object-oriented programming concepts using java

CO 4. Able to develop interactive programs using applets and swings.

CO 5. Develop advanced skills for programming in Java.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											3		
CO2	2	2	2	2	3				2			2	2	2
CO3	3											2		
CO4	2											2		
CO5	3	2	2	2	2	2			2	2	2	3	2	3

SUBJECT NAME: - EMBEDDED SYSTEM

SUBJECT CODE: - PCC-CSE 304

Course Outcomes:

CO 1. Understand the microprocessor architecture and its components used in embedded systems

CO 2. Write the 8051-assembly language code for specific purposes

CO 3. Implement code for interfacing various devices.

CO 4. Develop simple embedded systems for real time operations

CO 5. Compose simple embedded system with error free software to obtain target system.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

SUBJECT NAME: - HUMAN RESOURCE MANAGEMENT

SUBJECT CODE: - HSMC-CSE-301

Course Outcomes:

CO 1. To develop the understanding of the concept of human resource management and to understand its relevance in organizations.

CO 2. To develop necessary skill set for application of various HR issues.

CO 3. To analyze the strategic issues and strategies required to select and develop manpower resources.

CO 4. To integrate the knowledge of HR concepts to take correct business decisions.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

Scheme for B.Tech (6th Seme)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 308	Compiler Design	3	1	0	20	20	60	100	4
2	PCC	PCC-CSE 309	Data Mining & Ware-housing	3	0	0	20	20	60	100	3
3	PCC	PCC-CSE 310	Computer Network	3	0	0	20	20	60	100	3
4	PEC	PEC-CSE 304-306	Elective-II	4	0	0	20	20	60	100	4
5	PEC	PEC-CSE 307-309	Elective-III	4	0	0	20	20	60	100	4
6	OEC	OEC-CSE 301-303	Open Elec-tive-I	3	0	0	20	20	60	100	3
7	PCC	PCC-CSE 311	Compiler Design Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 312	Computer Network Lab	0	0	2	30	30	40	100	1
9	PROJ	PROJ-CSE 302	Minor Pro-ject- I	0	0	4	50	50	100	200	2
			Total	**20**	**1**	**8**				**1000**	**25**

SUBJECT NAME: - Compiler Design

SUBJECT CODE: - PCC-CSE 308

Course Outcomes:

CO1. To realize basics of compiler design and apply for real time applications.

CO 2. To introduce different translation languages

CO 3. To understand the importance of code optimization

CO 4. To know about compiler generation tools and techniques

CO 5. To learn working of compiler and non-compiler applications and design of compiler for simple programming language.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1									2		
CO2	2											1		
CO3	3	3	2	2	3							2		
CO4	2				3							2		
CO5	3	2	3	2	2							3	3	3

SUBJECT NAME: - Data Mining & Ware-housing

SUBJECT CODE: - PCC-CSE 309

Course Outcomes:

CO 1. Understand the functionality of the various data mining and data warehousing component.

CO 2. Appreciate the strengths and limitations of various data mining and data warehousing models.

CO 3. Explain the analyzing techniques of various data.

CO 4. Describe different methodologies used in data mining and data ware housing.

CO 5. Compare different approaches of data ware housing and data mining with various technologies.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3				2							2		
CO3	2	2										2	2	
CO4	3				3							3		
CO5	2	2		1	2							2	2	

SUBJECT NAME: - Computer Network

SUBJECT CODE: - PCC-CSE 310

Course Outcomes:

CO 1. Students will be aware about computer networking.

CO 2. Students will know about various layers of OSI Model.

CO 3. Students will learn about wired & wireless technologies.

CO 4. Students will learn about the services of different layers.

CO 5. Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3											2		
CO3	3				1					1		2		
CO4	3	2		2	2							3		
CO5	3	3		2	2							2	1	

SUBJECT NAME: - Elective-II (Theory of Computation-305)

SUBJECT CODE: - PEC-CSE 304-306

Course Outcomes:

CO1. Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.

CO2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics - Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.

CO3 Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language

CO4 Attitude- Develop a view on the importance of computational theory.

CO5. Describing the limitations of a computing machine.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3	2	3	2								3	2	2
CO3	3	2	3	2								2	2	2
CO4	2	3	3	3								2	2	1
CO5	2											1		

SUBJECT NAME: - Elective III (Web and Internet Technology-309)

SUBJECT CODE: -PEC-CSE 307-309

Course Outcomes:

CO 1. Students will be familiar with Internet.

CO 2. Students will be familiar with different protocols of internet.

CO 3. Students will learn different services of internet.

CO 4. Analyze a web page and identify its elements and attributes.

CO 5. Students will learn HTML, CSS, JAVA Scripts for web designing.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3	2	2	3	2	3		3	3	
CO2	3											2		
CO3	3											2		
CO4	3				3	2	2	3		3	2	3	3	2
CO5	3				3	3	2	3	2	2		3	3	2

SUBJECT NAME: - Open Elective-I Cyber Laws and Ethics-302)

SUBJECT CODE: - OEC-CSE 301-303

Course Outcomes:

CO 1. Make learner conversant with the social and intellectual property issues emerging from cyberspace.

CO 2. Explore the legal and policy developments in various countries to regulate cyberspace.

CO 3. Develop the understanding of relationship between commerce and cyberspace.

CO 4. Give learners in depth knowledge of information technology act and legal framework of right to privacy, data security and data protection.

CO 5. Make study on various case studies on real time crimes

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					2		3				3		
CO2	3					2		3				3		
CO3	3					3		3				3		
CO4	3					2		3				3		
CO5	3					3		3				3		

Scheme for B.Tech (7th Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 401	Network Security & Cryptography	3	1	0	20	20	60	100	4
2	PEC	PEC-CSE 401-403	Elective- IV	4	0	0	20	20	60	100	4
3	PEC	PEC-CSE 404-406	Elective- V	3	1	0	20	20	60	100	4
4	OEC	OEC-CSE 401-403	Open Elective- II	3	0	0	20	20	60	100	3
5	PCC	PCC-CSE 401	Network Security & Cryptography Lab	0	0	2	30	30	40	100	1
6	PROJ	PROJ-CSE-401	Minor Project-II	0	0	16	50	50	400	500	8
			Total	**13**	**1**	**18**				**1000**	**24**

SUBJECT NAME: - Network Security & Cryptography

SUBJECT CODE: - PCC-CSE-401

Course Outcomes:

CO 1. Understand basic cryptographic algorithms, message and web authentication and security.

CO 2. Identify information system requirements for both of them such as client and server.

CO 3. Understand the current legal issues towards information

CO 4. Distinguish and explain different protocol like SSL, TLS Visà-vis their applications.

CO 5. Comprehend and explain security services and mechanisms.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					3						3		
CO2	2	2				2		2				2	2	
CO3	3					2		3				2		
CO4	3					3						3		
CO5	3				2	3		3				3	3	2

SUBJECT NAME: - Parallel and Distributed Algorithm

SUBJECT CODE: - PEC-CSE-402

Course Outcomes:

CO 1. Understand the requirements for programming parallel systems and how they can be used to facilitate the programming of concurrent systems.

CO 2. To learn and apply knowledge of parallel and distributed computing techniques and methodologies.

CO 3. To learn the architecture and parallel programming in graphics processing units (GPUs).

CO 4. Understand the memory hierarchy and cost-performance tradeoffs.

CO 5. To gain experience in the design, development, and performance analysis of parallel and distributed applications.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3		2	2	2			2	2		1	2	3	2
CO3	3											2		
CO4	2											2		
CO5	3	2	3	2	3	2	2		2	2	2	3	3	3

SUBJECT NAME: -Cloud Computing

SUBJECT CODE: - PEC-CSE-406

Course Outcomes:

CO1. Able to understand basic concepts, principles and paradigm of Cloud Computing

CO2. Able to interpret various Cloud computing models and services.

CO3. Able to identify the significance of implementing virtualization techniques.

CO4. Able to understand the need of security in Cloud computing.

CO5. Understand the concept SOA and cloud based storage in Cloud computing.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1			1	1		1			1	2		
CO2	1	2	1	3	1		1					2		
CO3		1	3	1	2	1		1				3		
CO4	2	1	2	1		2	1					2		
CO5		1	1	2	1	2		1				3		

Scheme for B.Tech (8th Sem)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 403	Advanced Computer Architecture	3	1	0	20	20	60	100	4
2	PCC	PCC-CSE 404	Artificial Intelligence & Expert Systems	3	0	0	20	20	60	100	3
3	PEC	PEC-CSE 407- 409	Elective- VI Optimization Techniques	3	1	0	20	20	60	100	4
4	OEC	OEC-CSE 404-406	Open Elective- III Industrial Relations	3	0	0	20	20	60	100	3
5	PCC	PCC-CSE 405	Artificial Intelligence & Expert Systems Lab	0	0	4	30	30	40	100	2
6	PROJ	PROJ-CSE-402	Major Project	0	0	16	50	150	400	600	8
			Total	**12**	**2**	**20**				**1100**	**24**

SUBJECT NAME: -Advanced Computer Architecture

SUBJECT CODE: - PEC-CSE-403

Course Outcomes:

CO1.Demonstrate concepts of parallelism in hardware/software.

CO2.Discuss memory organization and mapping techniques.

CO3.Describe architectural features of advanced processors.

CO4.Interpret performance of different pipelined processors.

CO5.Explain data flow in arithmetic algorithms.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3											3		
CO3	3											3		
CO4	3	3			2							3	2	
CO5	3											3		

SUBJECT NAME: -Artificial Intelligence & Expert System

SUBJECT CODE: - PEC-CSE-404

Course Outcomes:

CO1 Study the concepts of AI and related searching algorithms.

CO2 Develop the knowledge skills and it's representational structure in AI.

CO3 Study the concepts of natural language processing in AI.

CO4 Study the concepts of supervised/unsupervised machine learning and game technique.

CO5 Study how design the programming skill in PROLOG, and concepts of pattern recognition approaches.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1					3		
CO2	1	2	3	1	2		1					2		
CO3	1	1		1	1		3					2		
CO4	2	1	2	3	1		1					2		
CO5	1	2	3	3	2		1					3	2	2

SUBJECT NAME: -Optimization Technique

SUBJECT CODE: - PEC-CSE 407

Course Outcomes:

CO1: Formulate the engineering problems as an optimization problem.

CO2: Apply necessary and sufficient conditions for a given optimization problem for optimality

CO3: Select appropriate solution methods and strategies for solving an optimization problem and interpret and analyze the solution obtained by optimization algorithms

CO4: Justify and apply the use of modern heuristic algorithms for solving optimization problems

CO5: Solve Engineering Design and Manufacturing related optimization problem using software tools.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	1	1				1	1		1	1	
CO2	1	3	2	1						1			1	
CO3	1	3	2	1	1				2	1				
CO4	2	2	2	2	2				2	1				
CO5	1	3	3	2	3				2	2		1		

SUBJECT NAME: - INDUSTRIAL RELATIONS

SUBJECT CODE: - OEC-CSE – 406

Course Outcomes:

CO 1. Students should able to elaborate the concept of Industrial Relations.

CO 2. The students should able to illustrate the role of trade union in the industrial setup.

CO 3. Students should able to outline the important causes & impact of industrial disputes.

CO 4. Students should able to elaborate Industrial Dispute settlement procedures.

CO 5. Student should be able to summarize the important provisions of Wage Legislations, in reference to Payment of Wages Act 1936, Minimum Wages Act 1948 & Payment of Bonus Act 1965.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1							1		2		2	2		
CO2							1				1	2	2	
CO3							1				2	2		2
CO4							1				2	2		2
CO5							1		1		1	2		

Semester III (Second year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 201	Data structure & algorithm using C	3	1	0	4

Total Hrs:45

Unit I: Arrays, Records and Pointers **(7Hr)**

Introduction to Linear Arrays, Arrays ADT, Representation Linear in Memory, Traversing Array

Inserting and deleting, Sorting; Bubble Sort, Searching; Linear Search, Binary Search, Multidimensional Arrays, Representation of Polynomials Using Arrays, Pointers; Pointer Arrays, Dynamic Memory Management, Records; Record Structures, Representation of Records in Memory; Parallel Arrays, Matrices, Sparse Matrices.

Unit II: Linked List (9Hrs)

Introduction Linked Lists, Representation of Linked Lists in Memory Traversing a Linked List Searching a Linked List, Memory Allocation; Garbage Collection, Insertion into a Linked List, Deletion from a Linked List, Header Linked List, Circularly Linked Lists, Two-Way Lists (or Doubly Linked Lists), Josephus Problem and its Solution, Buddy Systems.

Unit III: Stacks, Queue and Recursion *(9Hrs)*

Introduction Stacks, Array Representation of Stacks, Linked Representation of Stacks, Stack as ADT, Arithmetic Expression; Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of Recursive Procedures by Stacks, Queue, Linked Representation of Queues, Queues as ADT, Circular of Queues, Deques, Priority Queues, Applications of Queues.

Unit IV: Trees (10Hrs)

Introduction Binary Trees ,Representing Binary Tree in Memory ,Traversing Binary Trees, Traversal Algorithms Using Stacks, Header Nodes; Threads, Threaded Binary Trees ,Binary Search Trees ,Searching and Inserting in Binary Search Trees ,Deleting in a Binary Search Tree, Balanced Binary Trees, AVL Search Trees ,Insertion in an AVL Search Tree ,Deletion in an AVL Search Tree, m-way Search Trees ,Searching, Insertion and Deletion in an m-way Search tree, B- Trees ,Searching, Insertion and Deletion in a B-tree, B+-Trees.

Unit V: Graphs and their Applications *(6Hrs)*

Introduction, Graph Theory Terminology, Sequential Representation of Graphs; Adjacency Matrix; Path Matrix, Warshall ‟s Algorithm; Shortest Paths, Linked Representation of a Graph, Operations on Graphs, traversing a Graph, Topological Sorting, Spanning Trees

Unit VI: Sorting and Searching *(4Hrs)*

Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Shell Sort, Radix Sort, Searching and Data Modification, Hashing.

Text Books:

1. Seymour Lipschutz, Schaums Outlines, „Data Structures with C‟,Tata Mc Graw Hill

Reference Books:

1. S. Sahani, „Data Structures in C‟

2. D.Samantha, „Classic Data Structure‟, PHI Publications

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 202	Object oriented programming through C++	3	1	0	4

Total Hrs:45

Unit-I: Principles of Object Oriented Programming (8 Hrs)

Differences between C and C++.A look at procedure Oriented programming, object oriented programming paradigm, basic concepts of OOP, Benefits of OOP, OO languages, A sample program, structure of C++ program. Introduction to OOPS: The origins of C++, What is Object Oriented Programming? Some C++ fundamentals, Headers & Name Spaces, Introducing C++Classes & Object.

Unit-II: Overloading (10Hrs)

Introduction of overloading, Function overloading, Operator overloading, Inheritance, Constructors & Destructors, Function & Operator Overloading constructor functions, Localizing variables, Function overloading & Ambiguity, Finding the address of an overloaded function, this Pointer, References, Using reference to overload a unary operator, overriding**.**

Unit-III: Inheritance, Virtual Functions and polymorphism (7 Hrs)

Inheritance and the access specifies, Constructors and Destructors in derived classes, Multiple Inheritance, Passing parameters to a basic class, Pointers and references to derived types, Virtual Functions, Why virtual functions?, Pure virtual functions and abstract types, Early Vs Latebinding.

Unit-IV: Static & Dynamic memory allocation (10Hrs)

Static & Dynamic allocation using new and delete, static class members, Virtual base classes, const member functions and mutable, volatile member functions, Using the as keyword, linkage specification, The .* and ->* operators, Creating conversion functions, Copy constructors, Granting access, namespaces, Explicit constructors, type name and export.

Unit-V: Exceptions Handling (10 Hrs)

Exception Handling, fundamentals, options the uncaught exception ( ), Applying exception Handling, and RTTI, casting operators, Recent trends in Object Oriented Programming in C++ , Advanced topics & its Application.

Templates : Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters.

Text Books:

1. Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia publications
2. The Complete Reference C++, Herbert Schildt, 4th Edition, TMH

Reference Books:

1. Y. Kanetkar, „Let‟s C++‟, BPB publications
2. E Balagurusamy, „Object oriented programming with C++‟, 4th edition, TMH
3. Sourav Sahay , „Object-Oriented Programming with C++‟ , Oxford University Press, 2006.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 203	Database Management System	3	1	0	4

Total hrs: 45

UNIT – I: Database System Applications: (8 Hrs)

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

Unit-II: Database Design Theory *(9 Hrs)*

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

Unit-III: Physical Database Design and Memory Management in database (9 Hrs)
SQL: Queries, Constraints, Triggers: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases. Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

Unit -IV: Query Optimization and Performance Tuning (9 Hrs)
Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

Unit-V: Transaction Management (10Hrs)

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing,

Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

Text Books:

1. Fundamentals of Database Systems – Emissary ,Navathe & Gupta, Pearson Education
2. Database System Concepts by Henry Korth

Reference Books:

1. Database Systems by S. K. Singh, Pearson Education.
2. Principles of Database Systems – Ullman, Golgotia Publications 1998.
3. Database Systems by Connolly, 3rd edition, Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 204	Unix & Shell Programming	3	1	0	4

Total Hrs:45

Unit-I Introduction (8Hrs)

Introduction to Unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

Unit-II Introduction To File *(7Hrs)*

The File system –The Basics of Files-What's in a File-Directories and File Names-Permissions-I,Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

Unit-III Regular Expressions: *(8Hrs)*

Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

Unit-IV Korn Shell: (7Hrs)

Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

Unit-V Interactive C Shell *(7Hrs)*

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The Read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

Unit-VI File Management *(8Hrs)*

The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control.

Text Book:

1.UNIX and Shell Programming Richard F. Gilberg

Reference Books:

1. Mastering UNIX Shell Scripting: Bash, Bourne, and Korn Shell.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
BSC	BSC 201	Mathematics - III	3	1	0	4

Unit –I (9Hours)

Fourier transform: Discrete and Fast Fourier transform Complex form of Fourier transform and its inverse, Fourier sine and cosine transform and their inversion. Properties of F-transform, Convolution theorem for F-transform, Parse Val‟s identity of for F-transforms Applications of Fourier transform for the solution of partial differential equations having constant coefficients with special reference to heat equation and wave equation.

Unit –II (9Hours)

Laplace transform, Inverse transform, properties, Transforms of derivatives and integrals, Unit step function, Dirac‟s delta function, Differentiation and integration of transforms, Applications to differential equations.

Unit –III (9Hours)

Statistical Techniques: Discrete and Continuous random variables–Moments–Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions, Moments, Moment generating functions, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non –linear

Unit –IV (9Hours)

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Unit –V (9Hours)

Cauchy-Riemann equations: Necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions.

Text and Reference books:

1. Chandrika Prasad, Mathematics for Engineers, Prasad Mudralaya
2. Jeffrey, Advanced Engineering Mathematics , ELSEVIER
3. Chandrika Prasad , Advanced Mathematics for Engineers, Prasad Mudralaya
4. Grewal B. S., Higher engineering Mathematics, Khanna Publication, New Delhi
5. Keyszig E., Advanced Engineering Mathematics, Wiley Eastern Publication
6. Peter V. O. Neil, Advanced Engineering mathematics, Thomson Publication
7. Gerald, C.F., and Wheatley, P.O., Applied Numerical Analysis, Addison Wesley.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
HSMC	HSMC 201	Human Values	3	1	0	4

Total Hrs:45

UNIT-I: Course Introduction *(9Hrs)*

Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self-Exploration - what is it? - its 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. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-II: Harmony in the Human Being *(9Hrs)*

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 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-III: Relationship and Goals **(9Hrs)**

Understanding Harmony in the Family and Society - Harmony in Human - 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. 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-astiva 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-IV: Nature and Values **(9Hrs)**

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-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT-V: Ethics and Ability **(9Hrs)**

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems.

Text books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values andProfessional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart StudentPublications, 3rd Edition.

Reference books:

1. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 205	Data structure & algorithm using C lab	0	0	2	1

Total Hrs: 20

List of Practical's-

1. Write and execute a program in C to implement stack using arrays
2. Write and execute a program in C to implement queue using arrays
3. Write and execute a program in C to implement simple linked list
4. Write and execute a program in C to implement stack using linked list
5. Write and execute a program in C to implement queue using linked list
6. Write and execute a program in C to implement doubly linked list
7. Write and execute a program in C to implement circular linked list.
8. Write and execute a program in C to reverse a singly and doubly linked list
9. Write and execute a program in C to insert a node in a linked list in a sorted fashion 154
10. Write and execute a program in C to implement binary tree, finding the depth of a tree
11. Write and execute a program in C to implement in order, preorder and post order traversals
12. Write and execute a program in C to find if two trees are identical

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 206	Object oriented programming through C++ lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. **Write a C++ program to find the sum of individual digits of a positive integer.**
2. Write a C++ program to generate the first n terms of the sequence
3. Write a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C++ program to find both the largest and smallest number in a list of integers.
5. Write a C++ program to sort a list of numbers in ascending order.
6. Write a Program to illustrate New and Delete Keywords for dynamic memory allocation
7. Write a program Illustrating Class Declarations, Definition, and Accessing Class Members.
8. Program to illustrate default constructor, parameterized constructor and copy constructors
9. Write a Program to Demonstrate the i)Operator Overloading.ii) Function Overloading.
10. Write a Program to Demonstrate Friend Function and Friend Class.
11. Write a Program to Access Members of a STUDENT Class Using Pointer to Object Members.
12. Write a Program to Generate Fibonacci Series use Constructor to Initialize the Data Members.
13. Write C++ programs that illustrate how the following forms of inheritance are supported:
    a. Single inheritance b)Multiple inheritance c)Multi level inheritance d)Hierarchical inheritance
14. Write a C++ program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class.
15. Write a Program to Invoking Derived Class Member Through Base Class Pointer
16. Write a Program Containing a Possible Exception. Use a Try Block to Throw it and a Catch Block to Handle it Properly.
17. Write a Program to Demonstrate the Catching of All Exceptions.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 207	Database Management System Lab	0	0	2	1

Total Hrs: 20

List of Practicals:

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based onconditions.
3. Creation of Views, Synonyms, Sequence, Indexes, save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Study of PL/SQL block.
7. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
8. Write a PL/SQL block that handles all types of exceptions.
9. Creation of Procedures.
10. Creation of database triggers and functions.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 208	Unix & Shell Programming Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. Write a shell script to write your user name as a banner to the front of the file being sent to the printer
2. Write a shell script to print the first five arguments in reverse order
3. Write a shell script to append a line to the file. Both the file name and line have to be specified to the script at the command line. Ensure that it runs the sh shell script. Print the number of lines in the file after you done.
4. Write a shell script that tests and print outs the name of all the files in a directory that are executable. Do not print any other file or directory names. If there are subdirectories, go down recursively. How would you change this script to not go down recursively?
5. Write a shell script that given a person‟s UID, tells you how many times that person is **logged on**
6. Write a shell script called lsdirs which lists just the directories in the current directory
7. Write a shell script called see taking a filename name as argument which uses ls if the file is a directory and more if file is otherwise
8. Write a shell script that asks a user to type w word in, then tells the user how long that word is.
9. In many versions of UNIX there us a –i argument for cp so that you will be prompted for confirmation if you are about to overwrite a file. Write a script called cpi which will prompt if necessary without using the –i argument.
10. Write a shell script that takes a uid as an argument and prints out that person‟s name, **home directory, shell and group number, and other groups that person may belong to.**
11. Sort /etc/passwd using the uid as the key.
12.
    a. Write a program to generate Machine OpCode Table, Symbol Table and Pseudo OpCode table during First Pass Assembler.
    b. Write a program to generate Machine Opcode table using two pass Assembler.

Semester IV (Second year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 209	Digital Electronics	4	1	0	5

Total Hrs:45

Unit –I

Overview of electronics: Electronic Components-Resistor, capacitor and Inductors, Semiconductor devices: Diodes, transistors (BJT and FET). Integrated circuits, Popular IC packages, Analog vs digitalelectronics, Transistor as a switch.
Boolean algebra: Representation of values and complements, De'Morgans theorem-simplifyingexpressions.

Unit –II

Logic gates: AND, OR, NOT, XOR, XNOR, NAND, NOR gates and their truth tables, combining logic circuits for expressions using NAND and NOR gates, Logic circuit families and characteristics, SSI, MSI, LSI and VLSI circuits. Combinational and sequential circuits: (Simple block diagrams, truth tables and IC packages only required).
Adders, decoders, multiplexers, encoder circuits , Flip-flops: RS, clocked RS, JK, D and T flip flops, Master-slave flip flops, edge and level triggering, Multivibrators - A stable, Bistable, Monostable,counters-ripple and decade. Registers, latches and Tristate buffers.

Unit –III

Building blocks of a computer system: Basic building blocks-I/O, memory, ALU, Control and their interconnections, Control unit and its functions- Instruction-word, Instruction execution cycle, organizational sequence of operation of control registers; controlling of arithmetic operations; branch, skip, jump and shift instructions, ALU-its components.

Unit –IV

Addressing techniques and registers: Addressing Techniques-Direct, immediate addressing; paging, relative, Indirect and indexed addressing. Memory buffer register; accumulators; Registers-Indexed, General purpose, Special purpose; overflow, carry, shift, scratch registers; stack pointers; floating point; status information and buffer registers

Unit –V

Memory: Main, RAM, static and Dynamic, ROM, EPROM, EAROM, EEPROM, Cache and Virtual memory. Interconnecting System components: Buses, Interfacing buses, Bus formats-

address, data and control, Interfacing keyboard, display, auxiliary storage devices, and printers. I/O cards in personal computers. Development of Indian Super Computer 'PARAM': History, Characteristics, Strengths, Weakness and basic Architecture.

Text / Reference Books

1. A.S.Tannenbaum : Structured Computer Organization, Pearson
2. Thomas C. Bartee : Digital Computer Fundamentals, McGraw-Hill
3. Duglus V Hall : Microprocessors and Interfacing: programming and Hardware, McGraw-Hill, 1986.
4. Introduction to Computer Architecture, Stone S.Galgotia Publicatons 1996.
5. Microprocessor Architecture Programming & Applications, R. Gaonkar, Wiley Eastern-1987.
6. Computer Architecture and Organization by N.P. Carter, 4th Edition, McGraw-Hill, 2014.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 210	Discrete Mathematics	3	1	0	4

UNIT-I: Set Theory, Relation: Definition, Function: (10Hrs)

Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and count ability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle. Types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation. Definition and types of function, composition of functions, recursively defined functions.

UNIT-II: Propositional logic: (8Hrs)

Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicate logic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.

UNIT-III: Combinatories: (8Hrs)

Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (nth order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)

Unit-IV: Algebraic Structure: (9Hrs)

Binary composition and its properties definition of algebraic structure; Groyas Semi group, Monoid Groups, Abelian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).

UNIT-V: Graphs: (10Hrs)

Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number. Tree: Definition, types of tree(rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder,

postorder). Finite Automata: Basic concepts of Automation theory, Deterministic finite Automation(DFA), transition function, transition table, Non Deterministic Finite Automata (NDFA), Mealy and Moore Machine, Minimization of finite Automation.

Text/Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill, 2002.

2. J.P.Tremblay & R. Manohar, "Discrete Mathematical Structure with Applications toComputer Science" Mc.Graw Hill, 1975.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 211	Computer Organization & Architecture	3	0	0	3

Unit I: Basic Structure of Computers **(7 Hrs)**

Functional Units, Basic operational concepts, Bus structures Addressing modes, subroutines: parameter passing, Instruction formats, expanding op codes method.

Unit II: Basic Processing Unit **(8 Hrs)**

Bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format, Bit slice concept.

Unit III: Arithmetic Unit **(7 Hrs)**

Number representations and their operations, Design of Fast Adders, Signed multiplication, Booth‟s Algorithm, bit pair recoding, Integer Division, Floating point numbers and operations, guard bits and rounding.

Unit IV: The Memory System **(8 Hrs)**

Various technologies used in memory design, higher order memory design, multimodal memories and interleaving, Associative Memory, Cache memory, Virtual Memory.

Unit V: Input /Output Organization **(7Hrs)**

I/O mapped I/O and memory mapped I/O, interrupts and interrupts handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory Access COMPUTER PERIPHERALS: I/O devices such as magnetic disk, magnetic tape, CDROM systems.

Unit VI: RISC **(8 Hrs)**

Pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, influence of pipelining on instruction set design, multiple execution Units, performance considerations, Basic concepts in parallel processing & classification of parallel architectures. Vector Processing0, Array Processors. Recent trends in Computer Architecture & Organization.

Text Books:

1. V.C.Hamacher,Z.G.Vranesic and S.G.Zaky, „Computer Organization", McGraw Hill,5th edition ,2002.

References Books:

1.A.S.Tanenbaum, "Structured Computer Organization" 4th Edition, Pearson Education.

2.M Mano, "Computer System and Architecture", Pearson Education

3.W. Stallings, "Computer Organization & Architecture", Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 212	Design & Analysis of Algorithm	4	0	0	4

Unit – I: Introduction (8 Hrs)

INTRODUCTION: Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation- big (O) notation, omega notation, theta notation and little (o) notation, recurrences, probabilistic analysis, disjoint set operations, union and find algorithms.

Unit – II: Asymptotic notations (8 Hrs)

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: Advanced data structures (9 Hrs)

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: Greedy Method & Dynamic Programming (10Hrs)

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*: Traversal and Search Techniques* *(9 Hrs)*

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 et. al. “Introduction to Algorithms”, Prentice Hall of India.
2. Design & Analysis of Computer Algorithms by Aho,. Horowitz, Sahani, Rajsekharam, Pearsoneducation

Reference Books:

1. “Computer Algorithms”, Galgotia Publications Pvt. Ltd. Brassard, Bratley, “Fundamentals ofAlgorithms”, **Prentice Hall**
2. 2. Computer Algorithms: Introduction to Design and analysis, 3rd Edition, By Sara Baase & A. **V. Gelder Pearson Education.**

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 213	Operating Systems	4	0	0	4

Total Hrs:45

Unit-I: Introduction (6 Hrs)

Evolution of OS, Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation.

Unit-II: File Systems (8Hrs)

File systems: File concept, Access methods, Disk space management and space allocation strategies, directory structures, Recovery, Log-structured File System, disk arm scheduling strategies.

Unit-III: Process and Its Scheduling (7Hrs)

Process concept, process control block, Types of scheduler, context switch, threads, multithreading model, goals of scheduling and different scheduling algorithms.

Unit-IV: Memory Management (8Hrs)

Contiguous allocation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging , Virtual Memory Concepts, page faults and instruction restart , page replacement algorithms , working sets ,Locality of reference, Thrashing, Garbage Collection.

Unit-V: Process management and synchronization

(8Hrs) Concurrency conditions, Critical section problem, software and hardware solution, semaphores,conditional critical regions and monitors, classical inter process communication problems

Unit-VI: Deadlocks detection & avoidance (8Hrs)

Deadlock definitions, Prevention, Avoidance, detection and Recovery, Goals of Protection, access matrix, Deadlock implementation.

Text Books:

1. Operating System concepts – Silberchatz & Galvin, Addison Wesley, 6th Edn.
2. Modern Operating Systems – Tanenbaum, Pearson Edn. 2ndedn.

Reference Books:

1. Operating Systems – S R Sathe, Macmillan Publishers, India, 2008
2. Operating System –Milan Milenkovik, McGraw-Hill, 1987

Category	Code	Course Title	Hours PerWeek			Credit
			L	T	P	
HSMC	HSMC 401	Organizational Behavior	3	0	0	3

Total Hrs: 45

Unit-l: OrganizationalBehavior (9 Hrs)

Definition - Importance - Historical Background - Fundamental concepts of OB - 21st Century corporate - Different models of OB i.e. autocratic, custodial, supportive, collegial and SOBC.

Unit II: Perception Process & Personality & Attitudes (9 Hrs)

Nature & Importance - Perceptual Selectivity - Perceptual Organization - Social Perception – Impression Management Meaning of personality - Development of personality - Nature and dimensions of attitude - Job Satisfaction - Organizational Commitment.

Unit III: Learning & Motivation (9 Hrs)

Process of Learning - Principles of Learning - Organizational Reward Systems - Behavioral Management Motives - Characteristics - Classification of motives - Primary Motives - Secondary motives - Morale - Definition and relationship with productivity - Morale Indicators Theories of Work Motivation - Maslow's theory of need hierarchy - Herzberg's theory of job loading.

Unit IV: Leadership & Organizational Design (9Hrs)

Definition - Importance - Leadership Styles - Models and Theories of Leadership Styles Various organizational structures and their effects on human behaviour - Organizational Climate - Organizational Culture - Organizational Effectiveness.

Unit V: Conflict Management (9 Hrs)

Modern view of conflict - Constructive and Destructive conflict - Conflict Process - Strategies for encouraging constructive conflict - Strategies for resolving destructive conflict. Stress Management - Concept of stress - Sources of stress - Effects of stress on humans - Management of Stress.

Text Books:

1. Organizational Behaviour, 9th Ed. - Stephen Robbins

2. Human Behaviour at work - Davis and Newstorm

3. Organizational Behaviour - Uma Sekaran

Reference Books:

4. Organizational Behaviour - Fred Luthans
5. Organizational Behaviour - K.Aswathappa
6. Human Behaviour at Work - Keith Davis

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 214	Computer Organization & Architecture Lab	0	0	2	1

Total Hrs: 20

List of practicals -

1. Machine and assembly languages (generic)
2. The process of assembly and linking
3. Special assembly language programming issues
4. Parameter passing: assembly language and "external"a.Return addresses and co-routines

b.Traps and interrupts: mechanism and handling

c. Worms and viruses: malicious code and defending against it

5. Special miscellaneous topics
6. Operating system interface: traps and interrupts

a.Access to IO devices: display, keyboard, real-time clocks, DMA

b.Communications (serial and parallel), simple error detection and correction codes (parity,Hamming),

7. Low level programming in C. This includes all sorts of "tricks" that emphasize the power of low-level computing, as an aid to understanding computing systems in depth: Pointers to functions and their applications for self modifying code and applications.
8. Write the working of 8085 simulators GNUsim8085 and basic architecture of 8085 along with small introduction.
9. Study the complete instruction set of CPU and write the instructions in the instruction set of 8085 along with examples.
10. Write an assembly language code in GNUsim8085 to implement data transferinstruction.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 215	Operating Systems Lab	0	0	2	1

Total Hrs:20

List of practical's -

1. Basics of UNIX commands.
2. Shell programming
3. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
5. Implement Semaphores
6. Implement File Organization Techniques
7. Implement Bankers algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement the all page replacement algorithms a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique f memory management.
12. Implement Threading & Synchronization Applications

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 216	Design & Analysis of Algorithm Lab	0	0	2	1

Total Hrs: 20

List of practicals -

1. To find HCF and LCM of two numbers
2. Code and analyses to find median element in an array of integers.
3. Code and analyse to find majority element in an array of integers.
4. Code and analyse to sort an array of integers using merge sort
5. Code and analyse to sort an array of integers using quick sort
6. To implement maximum and minimum problem using divide and conquer strategy
7. To implement binary search using divide and conquer strategy
8. To implement program of Heap Sort.
9. WAP of minimum spanning tree using Kruskal algorithm.
10. WAP of minimum spanning tree using Prim‟s algorithm.
11. WAP to implement matrix chain multiplication
12. Code to find the shortest path in graph using Dijkstra‟s algorithm.
13. Code to find the shortest path using Bellman-Ford algorithm.
14. To implement LCS problem using Dynamic Programming.
15. To implement matrix chain multiplication problem using dynamic programming.
16. Code and analyze to find the minimum spanning tree in a weighted, undirected graph.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	MC-III	Constitutional Law	3	0	0	0

Unit – I (9 Hrs)

Salient features of the Indian constitution. Preamble Definition of State (Art. 12) Doctrines of Ultra-virus, severability, eclipse, waiver (Art, 13)

Unit – II (9 Hrs)

Right to equality (Art. 14) Prohibition of discrimination, Rights to equality of opportUNITy (Art. 15-16) Right to freedom under Article 19: Freedom of association; Freedom of movement; Freedom of residence; Freedom of assembly; Freedom of association; Freedom of movement; Freedom of residence; Freedom of occupation, trade and business; Right to take out processions; Right of the State to impose reasonable restrictions

Unit – III (9 Hrs)

Protection in respect of Conviction under Article 20, Ex-post-facto law; Double jeopardy; Self-incrimination; Right of Life and Personal Liberty (Act. 21), Protection in respect of arrest and detention Right to freedom of Religion (Articles 25-28)

Unit – IV (9 Hrs)

Cultural and Education Rights (Articles 29-30) Enforcement of Fundamental Right, Writ Jurisdiction of the Supreme Court and High Court (Article 32, 226) Right to property before and after the Constitution 42nd Amendment Act, 1976 Abolition of Untouchability, Titles (Articles 17-18) Right against exploitation (Articles 23, 24)

Reference Books:

1. Austin Granville: Constitution of India: Cornerstone of a Nation and Working A Democraticconstitution
2. Narender Kumar : Constitutional Law of India.
3. Basu D. D : Shorter Constitution of India
4. Jain, M.P.: Constitutional Law of India,
5. Seervai, H.M. : Constitutional Law of India, Vols. I-III
6. Shukla, V.N. : Constitutional of India (ed. M.P.Singh)
7. B.R. Sharma : Constitutional Law and judicial Activism

Semester V (Third Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 301	Data Communication	4	0	0	4

Total Hrs: 45

Unit-l: Signals (8Hrs)

ANALOG AND DIGITAL: Analog and digital data, Analog and digital signals; PERIODIC AND APERIODIC SIGNALS, ANALOG SIGNALS: Simple analog signals; TIME AND FREQUENCY
DOMAINS; COMPOSITE SIGNALS: Frequency spectrum and Bandwidth; DIGITAL SIGNALS: Decomposition of digital signal; TRANSMISSION MODES: Serial and Parallel transmission, Asynchronous and Synchronous Transmission, Simplex, Half-Duplex and Full-Duplex communication.

Unit II: Encoding And Modulation (8Hrs)

DIGITAL-TO-DIGITAL CONVERSION: Unipolar, Polar, Bipolar; ANALOG-TO-DIGITAL CONVERSION: Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM), Sampling Rate, How many Bits per Sample? Bit rate; DIGITAL-TO-ANALOG CONVERSION: Aspects of Digital-to-Analog conversion, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase shift Keying (PSK), Quadrature Amplitude modulation (QAM), Bit / Baud comparison; ANALOG-TO-ANALOG CONVERSION: amplitude modulation (AM), Frequency Modulation (FM), Phase Modulation(PM).

Unit III: Interfaces and Modems (8Hrs)

DIGITAL DATA TRANSMISSION: Parallel transmission, Serial Transmission; DTE-DCE INTERFACE: Data Terminal Equipment (DTE), Data Circuit-Terminating Equipment (DEC), Standards, EIA-232 Interface; OTHER INTERFACE STANDARDS: EIA-449, EIA-530.

Unit IV: Communication Media (7Hrs)

GUIDED MEDIA: Twisted pair cable, Coaxial cable, Optical Fiber cable; UNGUIDED MEDIA: Radio frequency allocation, Propagation of Radio waves, Terrestrial microwave, Satellite communication, Cellular Telephony; TRANSMISSION IMPAIRMENTS: Attenuation, Distortion, Noise; PERFORMANCE: Throughput, Propagation Speed, Propagation time.

Unit V: MULTIPLEXING (7Hrs)

FREQUENCY DIVISION MULTIPLEXING (FDM), TIME DIVISION MULTIPLEXING (TDM): Inverse Multiplexing, WAVE-DIVISION MULTIPLEXING, MULTIPLEXING APPLICATIONS: THE TELEPHONE SYSTEM: Common carrier services and hierarchies, Analog services, Digital Services.

Unit VI: Data Compression (7Hrs)

Huffman code, Run-Length Encoding, Relative Encoding, Lempel-Ziv Encoding, Image Compression, PEG, MPEG.

Text Book:

1. Behrouz A. Forouzan , „Data Communications and 161 Networking", 4th edition, Tata McGraw Hill.

Reference Book:

1. William A.Shay,„Understanding Data Communications and Networks", 2nd Edition,Vikas publication

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 302	Software Engineering	4	0	0	4

Total Hrs: 45

Unit-I: Introduction (5 Hrs)

An Introduction to Software Engineering, Software Myths, Software Engineering- A Layered Technology, Software Process Framework, Software Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Process Model, Agile Process Models.

Unit-II: Software Planning (5 Hrs)

Software Engineering Practice An overview, Communication Practices, Planning Practices, Modeling Practices, Construction Practice & Deployment, System Engineering Hierarchy, Business Process Engineering, Product Engineering, System Modeling, Requirements Engineering.

Unit-III : Software Analysis And Design (9 Hrs)

Software Engineering Analysis & Design An overview, Requirements Analysis, Analysis Modeling Approaches, Data Modeling, Object-Oriented Analysis, Scenario Based Modeling, Flow-Oriented Modeling, Class-based Modeling, Behavioral Model. Design Engineering Concepts, DesignModel, Pattern-Based Software Design.

Unit-IV: Software Testing (9 Hrs)

Testing Strategies and Tactics An overview, level of testing: Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging techniques. Software Testing Fundamentals, Black-Box Testing, White-Box Testing.

Unit-V: Software Metrics And Software Quality Management (8 Hrs)

Product Metrics An overview, Software Quality, A Framework for Product Metrics, Metrics for Analysis & Design Models, Metrics for Source Code, Metrics for Testing & Maintenance, Software Project Management An overview, Software Measurements, Metrics for Software Quality, Software Project Estimation Techniques, Project Scheduling, Risk Management, Quality Management, Change Management, Software Reengineering.

Unit-VI: Trends in Software Engineering And Project Management (9 Hrs)

Software project management (PERT/CPM): Developing a network plan, overview of PERT /CPM, basic rules for developing network, basic rules for developing project network. Recent trends in Software Engineering and Project.

Text Book:

1. Software Engineering- A Practitioner‟s Approach (Sixth Edition) - Roger Pressman (TMH)

Reference Books:

1. Software Engineering (Seventh Edition)- Ian Summerville, Pearson Education.
2. Software Engineering Theory and Practice by Pfleeger, Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 303	Formal Language & Automata Theory	3	1	0	4

Total Hrs: 45

Unit-I: Fundamentals (9Hrs)

Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and nondeterministic finite automaton, transition diagrams and Language recognizers.

Unit-II: Finite Automata & Regular Languages (8Hrs)
NFA with Î transitions – Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without Î transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM"s, Finite Automata with output- Moore and Melay machines. Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

Unit-III: Context Free Grammars & Grammar Formalism (9Hrs)
Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted).Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings.

UNIT-IV: Push Down Automata & Turing Machine (9Hrs)
Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA. Turing Machine: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church"s hypothesis, counter machine, types of Turing machines (proofs not required).

UNIT-V: Computability Theory (10Hrs)
Chomsky hierarchy of languages, linear bounded automata and context sensitive language,LR(0) grammar, decidability of, problems, Universal Turing Machine, undecidability of posts. Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

***Text Book**:*

1. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.

Reference Book:

1. Introduction to languages and the Theory of Computation ,John C Martin, TMH

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 304	Java Programming	3	0	0	3

Total Hrs: 45

UNIT-I: (9Hrs)

Introduction to OOP, procedural programming language and object-oriented language, principles of OOP, applications of OOP, history of java, java features, JVM, program structure. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting, flow of control.

UNIT-II:
(8Hrs)

Classes and objects, class declaration, creating objects, methods, constructors and constructor overloading, garbage collector, the importance of static keyword and examples, this keyword, arrays, command line arguments, nested classes.

UNIT-III: (8Hrs)

Inheritance, types of inheritance, super keyword, final keyword, overriding an abstract class. Interfaces, creating the packages, using packages, the importance of CLASSPATH and java.lang package. Exception handling, the importance of try, catch, throw throws and finally block, user-defined exceptions, Assertions.

UNIT-IV: (8Hrs)

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. Reading data from files and writing data to files, random access file,

UNIT-V: (6Hrs)

Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

UNIT-VI: (6Hrs)

AWT: introduction, components and containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Container class, Layouts, Menu and Scrollbar.

TEXT BOOK:

1. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.

REFERENCES Books:

1. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.
2. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
HSMC	HSMC-CSE-301	Human Resource Management	3	0	0	3

Total Hrs: 45

Unit-I:Introduction (9Hrs)

Overview of Human Resources, Historical evolution, Integrated HR function, Corporate and HR environment, Strategic environment, Strategic Management

Unit-Ii: Planning (9Hrs)

HR planning at Enterprise level, Need for systematic planning, Planning process, Operating Environment- Internal & External, Job description, Models & techniques of Manpower demand and Supplyforecasting. Retention-Redeployment and Exit strategies

Unit-Iii:Skilles Development (9hrs)

Career management-Recruitment and Selection, Employee Induction Programme, Employee training, Training needs & objective setting, Methods of training, Development & Development needs, Human Resource Development, Development process

Unit-Iv: Performance Planning (9hrs)

Performance Planning – Performance Appraisal, Measures of appraisal, System components appraisal methods, Ethics of appraisal, Problems & issues

Unit-V: Human Resource (9hrs)

Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level

Text Book:

1. Praveen Durai (2010), Human Resource Management, Pearson Education, South Asia

Reference Books

1. John Storey, Graeme Salaman, Christopher Mabey(1998): Strategic Human Resource Management: A
   Reader, SAGE Publications, 1998
2. Christopher Mabey, Rosemary Thomson (2011): Developing Human

Resources,Routledge, Taylor and francis group, New York, USA.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 301	Soft Computing	4	0	0	4

Total Hrs: 45

Unit-I: Neural Networks (9 Hours)

Fundamentals of Neural Networks – History- Architectures- Learning methods XOR problem-Delta rule-derivation-Back propagation- applications- parameters in BPN- Associative memory – Hetero associative- BAM-energy function problems-applications of associative memories-ART1-ART2- applications of adaptive networks.

Unit-Ii: Fuzzy Logic (9 Hours)

Fuzzy set theory – crisp sets – fuzzy sets – crisp relations – Fuzzy relations – Fuzzy systems-Crisp logic – predicate logic – fuzzy logic- fuzzy based systems Defuzzification methods – applications.

Unit-Iii: Genetic Algorithms (9 Hours)

Fundamentals Of Ga – Creation Of Offspring‟S – Encoding – Fitness Function Reproduction – crossover- insertioo & deletion- mutation- bitwise operators – applications.

Unit-Iv: Hybrid Systems (9 Hours)

Hybrid Systems – Neuro Fuzzy – Neuro Genetic – Fuzzy Genetic Hybrids- GA Based Weight determination and applications- fuzzy BPN – simplified fuzzy ARTMAP.

Unit-V: Programming Using Matlab (9 Hours)

Using Neural Network toolbox – Using Fuzzy Logic toolbox- Using Genetic Algorithm & directedsearch toolbox.

TEXT BOOKS:

1. Rajasekaran S. and VijayalakshmiPai G.A, “Neural Networks, Fuzzy Logic and GeneticAlgorithms”, PHI, 2011.

2. Timothy J.Ross, “Fuzzy Logic with Engineering applications”, John Wiley and Sons, 2010.

REFERENCES

1. Jang J.S.R, Sun C.T, Mizutani E, “Neuro fuzzy and Soft Computing”, PHI Learning Pvt. Ltd.,

2012.

2. Davis E. Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y.,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 302	Image Processing	4	0	0	4

Total Hrs: 45

Unit-I: Introduction (8Hrs)

Origins of digital image processing, Various Imaging techniques, components of an image processing system, Image sensing and acquisition, Image sampling and quantization, neighbors of a pixel, Adjacency, Connectivity, Regions and boundaries.

Unit-II: Filtering (8Hrs)

Basic intensity transformation and spatial filtering, Image negatives, log transforms power-law transformations, median filtering, Histogram equalization, Histogram matching spatial correlation and convolutions

Unit-III: Transformation (8Hrs)

Two-dimensional orthogonal and Unitary Transforms, properties of unitary transforms 2D-DFT, Cosine transforms, Sine transforms, Hadamard transform, Haar transforms, Slant transforms.

Unit-IV: Image Degradation /Restoration Process

(7Hrs) Model of image Degradation/Restorations process, Noise models, Restoration in the presence of noise only, periodic noise reduction by Frequency domain filtering, Image reconstructionfrom Projections, Image compression models, Huffman coding, LZW coding, Run length coding,Bit-plane coding.

Unit-V: Image Morphology (7Hrs)

Some basic algorithms, Boundary extraction, convex hull, thinning, morphological Reconstruction. Color image color models. skeletons, morphological processing, color models, RGB color models, CMY and CMYK color models the HIS.

Unit-VI: Image Segmentation (7Hrs)

Image segmentation, Fundamentals, Point, Line and edge detection, of segmentation, Thresholding, Regionbased segmentation, watershed segmentation algorithm Applications of segmentation.

Text Book:

1. Digital image processing by Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson PHIPublication.

Reference Books:

1. Fundamental of Digital Image Processing by A. K. Jain, P. H. I. Publication.
2. Digital image processing by S. Jayaraman, S. Esakkirajan, T. Virakumar, McGraw Hill.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 303	Embedded System	4	0	0	4

Total Hrs: 45

Unit- I: Microcontrollers (10Hrs)

Microprocessors and Micro-controllers, Types of Microcontrollers, External memory, Processor Architecture – Harvard v/s Van Neumann; CISC v/s RISC, Microcontroller, Memory types, Software development tools like assembler, cross- compiler, emulator, and 173 simulator, 8051 controller, Block Diagram &Architecture.

Unit-II: Device and Communication Bus for Devices Network (10Hrs)IO

Types and examples, Serial communication devices, Parallel Device ports, Sophisticated Interfacing Feature in Devices Ports, Wireless Devices, Timer and Counting Devices, Watch dog timer, Real time clock, Network Embedded Systems, Serial Bus Communication Protocols, parallel Bus Devices protocol Parallel communication Network using ISA, PCI, PCI-X and advanced buses, Internet Enabled Systems- Network protocols, Wireless and mobile system protocol.

Unit-III: Device Drivers and Interrupt Services Mechanism (10Hrs)

Programmed-I/O Busy-wait Approach without Interrupt Services Mechanism, ISR Concept, Interrupt Sources, Interrupt Servicing (Handling) Mechanism, Multiple Interrupts, Context and the Periods for Context Switching, Interrupt Latency and Deadline, Classification of Processor Interrupt Service Mechanism from Context-Saving Angle, Direct Memory Access, Device Driver Programming.

Unit-IV: Inter process Communication and Synchronization (8Hrs)

Multiple process in an application, Multiple Threads in an application, Task and Task state, Task and Data, Clear-cut Distinction between Functions, ISRS and Tasks by their Characteristics, Concept of Semaphores, Shared Data, Inter process Communication, Signal Function, Semaphore Functions, Message Queue Functions, Mailbox Functions, Pipe Functions, Socket Functions, RPC Functions.

Unit-V: Interfacing Buses (7Hrs)

Industrial Interfacing Buses (10 Hrs) PCI, ESA, EISA, I2C, USB, RS232. Advance topics on embedded system.

Text Book

1. Myke Predko, “Programming and Customizing The 8051 Micro-controller”, Tata McGrawHill edition.

2. John B. Peatman, “Design with PIC Microcontrollers”, Low Price Edition, Pearson Education Asia.

Reference Books:

1. Embedded System :Architecture, programming and design by Rajkamal,TMH

2. ARM Assembly Language: Fundamentals and Techniques, William Hohl, CRC Press

3. ARM Architecture Reference Manual / Edition 2, by David Seal.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 305	Software Engineering lab	0	0	2	1

List of Practical's-

1. Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements. For a set of about 20 sample problems
2. Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem(Use of a CASE tool required). (1 class)
3. Develop structured design for the DFD model developed. (1 class)
4. Develop UML Use case model for a problem (Use of a CASE tool any of Rational rose,Argo UML, or Visual Paradigm etc. is required)
5. Develop Sequence Diagrams
6. Develop Class diagrams.
7. Develop code for the developed class model using Java
8. Use testing tool such as Joint.
9. Use configuration management tool
10. Use any one project management tool such as Microsoft Project or Gantt Project, etc.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 306	Java Programming Lab	0	0	2	1

Total Hrs:20

List of Practical's:

1. Create a java program to implement stack and queue concept.
2. Write a java package to show dynamic polymorphism and interfaces.
3. Write a java program to show multithreaded producer and consumer application.
4. Create a customized exception and also make use of all the exception keywords.
5. Convert the content of a given file into the uppercase content of the same file.
6. Develop an analog clock using applet.
7. Develop a scientific calculator using swings.
8. Create an editor like MS-word using swings.
9. Create a servlet that uses Cookies to store the number of times a user has visited your servlet.
10. Create a simple java bean having bound and constrained properties.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 307	Data Communication Lab	0	0	2	1

Total Hrs: 20

List of Practical's:

1. Study of basic data communication system.
2. Demonstrate Analog and digital signals.
3. To Convert Analog signal into digital signal.
4. To Convert digital signal into Analog signal.
5. Study of Amplitude modulation.
6. Study of Frequency modulation.
7. Study of Phase modulation.
8. Study of Amplitude shift keying.
9. Study of Frequency shift keying.
10. Study of Binary Phase shift keying.
11. Study of Quadrature amplitude shift keying.
12. Study of Frequency division Multiplexing (FDM)
13. Study of Time division Multiplexing (TDM)
14. Study of various interface standards.
15. Study of Twisted pair cable, Coaxial cable and Optical Fiber cable

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ- CSE 301	Industrial Training/ Project Seminar	0	0	2	2

Objective of Industrial Training: The objective of industrial training is to provide work experience so that students engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineeringproblem and possibly an industry guide for their Major Project in final semester.

Scheme of Studies: Duration 4 weeks in summer break after IV semester, assessment to be done in V semester practical examination. During training students will prepare a first draft of training report in consultation with section in charge. After training they will prepare final draft with the help of Faculty of the concern Department of mechanical engineering. Then they will present a seminar on their training and present it in the institute in front of the committee headed by the HOD/Faculty Member.

Learning through Industrial Training: During industrial training students must observe followingto enrich their learning:

- Industrial environment and work culture.
- Organizational structure and inter personal communication. Hardware
- / Software configuration knowledge and specifications.Project
- Planning, development and maintenance.
- Problems related to various areas of work etc.
- Students are supposed to acquire the knowledge on above by Direct Observations without disturbing personnel at work.
- Interaction with officials at the workplace in free/ tea time Study of Literature at the workplace (e.g. User Manual, standards, processes, schedules, etc.)
- Hands on" experience Undertaking/assisting project work. Solving problems at the work place.
- Presenting a seminar participating in group meeting/discussion.
- Consulting current technical journals and periodicals in the library.

Semester VI (Third Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 308	Compiler Design	3	1	0	4

Total Hrs: 45

Unit-I: Introduction To Compilers (8hrs)

Translators-Compilation and Interpretation-Language processors -The Phases of Compiler-Errors Encountered in Different Phases-The Grouping of Phases-Compiler Construction Tools - Programming Languagebasics.

Unit-Ii: Lexical Analysis (8hrs)

Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language.

Unit-Iii: Syntax Analysis (10hrs)

Need and Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies-Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item-Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language .

Unit-Iv: Syntax Directed Translation & Run Time Environment (10hrs)

Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator - Type Systems-Specification of a simple type checker-Equivalence of Type Expressions-Type Conversions. RUN-TIME ENVIRONMENT: Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables- Dynamic Storage Allocation-Storage Allocation in FORTAN.

Unit-V: Code Optimization And Code Generation (9hrs)

Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis- Efficient Data Flow Algorithms-Issues in Design of a Code Generator - A Simple Code Generator Algorithm.

Text Book:

1. A Retarget able C Compiler: Design and Implementation Fraser and Hansen, Benjamin-Cummings, 1995.

References Books:

1. Advanced Compiler Design and Implementation, Much nick, Morgan and Kaufmann,1998.
2. Crafting a Compiler, Fischer and LeBlanc, Benjamin-Cummings, 1988.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 309	Data Mining & Warehousing	3	4	0	3

Total Hrs: 45

UNIT-I **(9Hrs)**

Data warehouse: Introduction to Data warehouse, Difference between operational database systems and data warehouses, Data warehouse Characteristics, Data warehouse Architecture and its Components, Extraction-Transformation-Loading, Logical(Multi-Dimensional), Data Modeling, Schema Design, Star and Snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non Addictive Measures; Fact-Less-Facts, Dimension Table Characteristics; OLAP Cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

UNIT-II

(9Hrs)Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration &Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT-III

(9Hrs)Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set-Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT-IV (9Hrs)

Classification: Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers , Classification techniques, Decision Trees-Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction ; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbor classification-Algorithm and Characteristics. Prediction: Accuracy and Error measures, Evaluating the accuracy of classifier or a predictor, Ensemble methods.

UNIT-V (9Hrs)

Clustering: Clustering Overview, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, , Partitioning Clustering-K-Means Algorithm, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Key Issues in Hierarchical Clustering, Strengths and Weakness, Outlier Detection.

Text Book:

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 310	Computer Network	3	0	0	3

Total Hrs:45

UNIT – I (9Hrs)

INTRODUCTION: Network applications, network hardware, network software, reference models: OSI, TCP/IP, Internet, Connection oriented network - X.25, frame relay. THE PHYSICAL LAYER: Theoretical basis for communication, guided transmission media, wireless transmission, the public switched telephone networks, mobile telephone system.

UNIT – II (9Hrs)

THE DATA LINK LAYER: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. THE MEDIUM ACCESS SUBLAYER: Channel allocations problem, multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless Bluetooth.

UNIT – III (9Hrs)

THE NETWORK LAYER: Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.

UNIT – IV (9Hrs)

THE TRANSPORT LAYER: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP.

UNIT – V (9Hrs)

THE APPLICATION LAYER: Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet..

Text Books:

1. Data Communication & Networking by Behrouz A. Forouzan McGraw Hill

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 304	Distributed System	4	0	0	4

Total Hrs:45

UNIT – I (9Hrs)

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models -Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication, Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT – II (9Hrs)

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture.

UNIT – III (9Hrs)

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, Ocean Store.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 – IV (9Hrs)

Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT – V (9Hrs)

Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, Consistency models.

Text Books:

1. Singhal&Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill

2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill

Reference Books:

1. Vijay K.Garg Elements of Distributed Compuitng , Wiley

2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson **Education**

3. Tenanuanbaum, Steen," Distributed Systems", PHI.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 305	Theory of computation	4	0	0	4

Total Hrs:45

Unit I: Mathematicalpreliminaries (7Hrs)

Sets, operations, relations, strings, transitive closure, count ability and diagonalisation, induction and proof methods-pigeon-hole principle and simple applications – concept of language – grammars and production rules –Chomsky hierarchy.

Unit II: Finite automata & regular expressions (8Hrs

) Finite State machine, regular languages, deterministic finite automata, conversion to deterministic automata, E-closures – regular expressions, finite automata, and minimization of automata, Moore and Mealy machine and their equivalence.

Unit III: Regular grammar & context free grammar

(9Hrs) Pumping lemma for regular sets- closure properties of regular sets- decision properties forregular sets, equivalence between regular language and regular grammar. Context – freelanguages – parse trees and ambiguity, reduction of CFGS ,Chomsky and Griebach normal forms.

Unit IV: Push – down Automata (PDA) (9Hrs)

Non Determinism – acceptance by two methods and their equivalence, conversion of PDA to CFG CFLs and PDAs-closure and decision properties of CFLs.

Unit V: Turing machines (12Hrs)

Variants – recursively enumerable (r.e.) set – recursive sets ,TM as computer of function – decidability and solvability – Halting Problem – reductions – Post correspondence Problem (PCP) and un solvability of ambiguity problem of CFGs, Church‟s hypothesis, Introduction to recursive function theory – primitive recursive and partial recursive functions.

Text Books

1. Introduction Of Automata Theory, Languages and computation- J.E. Hopcroft , J.D.Ulman, Pearson education.

Reference Books

1. John Martin, „Introduction Of Automata Theory, Languages and computation“
2. Peter Linz , „Introduction to formal languages and automata“,Norasa,2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 306	Speech and Natural Language Processing	4	0	0	4

Total Hrs: 45

Unit-I: Introduction (9Hrs)

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

Unit-Ii: Word Level Analysis (9Hrs)

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

Unit-Iii: Syntactic Analysis (9Hrs)

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures,Unification of feature structures.

Unit-Iv: Semantics And Pragmatics (9Hrs)

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

Unit-V: Discourse Analysis And Lexical Resources (9Hrs)

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Co reference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill‟s Tagger, WorldNet, Prop Bank, Frame Net, Brown Corpus, British National Corpus (BNC).

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction toNatural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition,
OReilly Media, 2009.

REFERENCES:

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java, OReilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford
University Press,
2008.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 307	Advance Operating System	4	0	0	4

Total Hrs: 45

Unit-I: Fundamentals Of Operating Systems (9 Hrs)

Overview – Synchronization Mechanisms – Processes And Threads - Process Scheduling – Deadlocks: Detection, Prevention And Recovery – Models Of Resources – Memory Management Techniques.

Unit-Ii: Distributed Operating System (9 Hrs)

Issues In Distributed Operating System – Architecture – Communication Primitives –Lamport‟S Logical Clocks – Causal Ordering Of Messages – Distributed Mutual Exclusion Algorithms – Centralized And Distributed Deadlock Detection Algorithms – Agreement Protocols.

Unit-Iii: Distributed Resource Management (9 Hrs)

Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms For Implementing Distributed Shared Memory–Issues In Load Distributing – Scheduling Algorithms –Synchronous And Asynchronous Check Pointing And Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol – Security And Protection.

Unit-Iv: Real Time And Mobile Operating Systems (9 Hrs)

Basic Model Of Real Time Systems - Characteristics- Applications Of Real Time Systems –Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes And Threads - Memory Management - File System.

Unit-V: Case Studies (9 Hrs)

Linux System: Design Principles - Kernel Modules - Process Management Scheduling -Memory Management - Input-Output Management - File System - Interprocess Communication. Ios And Android: Architecture And Sdk Framework - Media Layer -Services Layer - Core Os Layer - File System.

REFERENCES BOOKS:

1. Mukesh Singhal and Niranjan G. Shivaratri, “Advanced Concepts in Operating SystemsDistributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 308	Real Time Operating System	4	0	0	4

Total Hrs:45

Unit-I: Introduction (9Hrs)

Real-time Versus Conventional Software, Computer Hardware for Monitoring and Control, Software Engineering Issues. SOFTWARE ARCHITECTURES: Process and State-based Systems model, Periodic and Sporadic Process, Cyclic Executives, CE definitions and Properties, Foreground-Background Organizations, Standard OS and Concurrency, Systems Objects and Object-Oriented Structures, Abstract Data Types, General Object Classes.

Unit-II: Requirements And Design Specifications (9Hrs)

Classification of Notations, Data Flow Diagrams, Tabular Languages, State Machine, Communicating Real Time State Machine- Basic features, Timing and clocks, Semantics Tools and Extensions, State chartsConcepts and Graphical Syntax, Semantics and Tools.

Unit-III: Declarative Specifications And Deterministic Scheduling (9Hrs)

DECLARATIVE SPECIFICATIONS Regular Expressions and Extensions, Traditional Logics-Propositional Logic, Predicates, Temporal logic, Real time Logic. DETERMINISTIC SCHEDULING Assumptions and Candidate Algorithms, Basic RM and EDF Results, Process Interactions-Priority Inversion and Inheritance.

Unit-IV: Execution Time Specification (9Hrs)

Measurement of Software by software, Program Analysis with Timing Schema, Schema Concepts, Basic Blocks, Statements and Control, Schema Practice, Prediction by optimization, System Interference and Architectural Complexities Timer Application, Prosperities of Real and ideal clocks, Clock Servers – Lamport "s Logical clocks, Monotonic Clock service, A software Clock server, Clock Synchronization Centralized Synchronization, Distributed Synchronization.

Unit-V: Programming Language (9Hrs)

PROGRAMMING LANGUAGES: Real Time Language Features, Ada-Core Language, Annex Mechanism for Real Time Programming, Ada and Software Fault Tolerance, Java and Real-time Extensions, CSP and Occam.

Text Book:

Real – Time Systems and software by Alan C. Shaw ; John Wiley & Sons Inc, 2001.

Reference Book:

1. Real-Time Systems, Jane W.S. Liu, Prentice Hall, 2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 309	Web and Internet	4	0	0	4

Total Hrs: 45

UNIT I: (9Hrs)

Web Basics and Overview: Introduction to Internet, World Wide Web, Web Browsers, URL, MIME, HTTP, Web Programmers Toolbox. HTML Common tags: List, Tables, images, forms, frames, Cascading Style Sheets (CSS) & its Types. Introduction to Java Script, Declaring variables, functions, Event handlers (onclick, on submit, etc.,) and Form Validation.

UNIT II: (9Hrs)

Introduction to XML: Document type definition, XML Schemas, Presenting XML , Introduction to XHTML, Using XML Processors: DOM and SAX. PHP: Declaring Variables, Data types, Operators, Control structures, Functions.

UNIT III: (9Hrs)

Web Servers and Servlets: Introduction to Servlets, Lifecycle of a Servlet, JSDK, Deploying Servlet, The Servlet API, The javax. Servlet Package, Reading Servlet parameters, Reading Initialization parameters. The javax. servlet HTTP package, Handling Http Request & Responses, Cookies and Session Tracking.

UNIT IV: (9Hrs)

Database Access: Database Programming using JDBC, JDBC drivers, Studying Javax.sql.* package, Connecting to database in PHP, Execute Simple Queries, Accessing a Database from a Servlet. Introduction to struts frameworks.

UNIT V: (9Hrs)

JSP Application Development: The Anatomy of a JSP Page, JSP Processing. JSP Application Design and JSP Environment, JSP Declarations, Directives, Expressions, Scripting Elements, implicit objects. Java Beans: Introduction to Beans, Deploying java Beans in a JSP page.

Reference Book

1. Greenlaw R and Hepp E "Fundamentals of Internet and www" 2nd EL, Tata McGrawHill,2007.

2. Ivan Bayross, "HTML, DHTML, JavaScript, Perl CGI", 3rd Edition, BPB Publications.

3.D. Comer, "The Internet Book", Pearson Education, 2009.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 301	Management & employee performance	3	0	0	3

Total Hrs: 45

Unit I: Performance Management (PM) Conceptual FrameWork (9 Hrs)

Introduction to Performance Management, Definition, nature, scope, importance, Business and sub functional Performance Management, Performance Management as a management Tool, Performance objectives and standards, Standards of Performance. Performance Domains and dimensions.

Unit II: Performance Planning (9 Hrs)

Performance Planning Process, Contents of Performance Plan, 8 Step Model, Individual and Group Performance Planning, Role clarity and Job description, Meaning of Performance appraisal, methods and approaches to performance appraisal, Obstacles in appraisal, Designing appraisal for better results, Performance Appraisal Interview, Potential Appraisal.

Unit III: Performance Appraisal (9 Hrs)

Introduction, Definition, Purpose and Role of appraisal in Performance Management, Methods and Steps in Performance Appraisal. Why Appraisal Fail, Types of Appraisal, Approaches and Design, MBO, 360*, Potential Appraisal, Performance Review, Performance counseling/ Mentoring. Team Performance Appraisal.

Unit IV: Performance Management System (9Hrs)

Introduction to PMS, Importance, Features, Process of Building PMS, PMS Dimensions, Conceptual Framework. 4 pillars of PMS, PMS Prism, Strategic Performance Management, Performance and Strategy linkage, Components of SPM, SPM- Balanced Score Card, SPM and Metrix, SPM Environment teatre and Risks.

Unit V: Latest trends in Performance Management (9 Hrs)

Competency Based Performance Management System, Performance Measurement, Performance Measurement through BSC, Performance and Succession Plan/ Career Development, International Performance Management, Performance Audit, Human Resource Valuation accounting andAudit.

***Text Book**:*

D. K. Bhattacharya, Performance Management Systems and Strategies- Text book, Pearson.

Reference Books:

- Aquinis, Performance Management, Pearson.
- Chadha, Performance Management, Macmillan.
- Armstrong, Michael, Baron, Jaico, Performance Management.
- Cardy, Performance Management, PHI.
- Kohli, Deb, Performance Management, Oxford.
- D Sharma, Performance Management, HPH.
- R.K. Sahu, Performance Management System, EB.
- TV Rao, Performance Management and Appraisal, Sage.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 302	Cyber law & ethics	3	0	0	3

Total Hrs:45

Unit-I: Introduction (9 Hrs)

Concepts of Technology and Law Understanding Technology, Basic Concepts of Technology and Law Understanding the Technology of Internet, Scope of Cyber Laws, Cyber Jurisprudence.

Unit-II: Law of Digital Contracts (9 Hrs)

The Essence of Digital Contracts, the System of Digital Signatures, The Role and Function of Certifying Authorities, The Science of Cryptography.

Unit-III: Intellectual Property Issues in Cyber Space (9 Hrs)

Domain Names and Related issues, Copyright in the Digital Media, Patents in the Cyber World, Rights of Netizens and E-Governance ,Privacy and Freedom Issues in the Cyber World, E-Governance E-Governance, Cyber Crimes and Cyber Laws.

Unit-IV: International Scenario in Cyber Laws (9Hrs)

Data Protection Laws in EU and USA ,Child Abuse Protection Laws in EU and USA, Cyber Laws - the Malaysian Approach.

Unit-V: Cyber law Issues For Management (9Hrs)

Cyber Law Issues in E-Business Management, Major issues in Cyber Evidence Management ,Cyber Law Compliancy Audit

Text Book:

1. “The Law of the Internet” by J. Rosenoer, Cyber Law (Springer Verlag).

Reference Books:

1. "Cyber Laws in India.. ITA-2000 and Beyond" by Navvi
2. “Handbook of Cyber Laws” By Sharma Vakul.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 303	Non- Conventional Energy Sources	3	0	0	3

Total Hours: 45

Unit-I (9 Hrs)

Global and National scenarios, Form and characteristics of renewable energy sources.
Solar Energy: Solar radiation, its measurements and prediction, Solar thermal collectors, flat plate collectors, concentrating collectors, Basic theory of flat plate collectors, solar heating of buildings, solar still, solar water heaters, solar driers, conversion of heat energy in to mechanical energy, solar thermal power generation systems.

Solar Photovoltaic: Principle of photovoltaic conversion of solar energy, types of solar cells and fabrication, Photovoltaic applications: battery charger, domestic lighting, street lighting, water pumping, power generation schemes.

Unit-II (9 Hrs)

Wind Energy: Atmospheric circulations, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS- classification, characteristics and applications.

Unit-III (9 Hrs)

Ocean Energy: Ocean energy resources, ocean energy routes, Principles of ocean thermal energy conversion systems, ocean thermal power plants, Principles of ocean wave energy conversion and tidal energy conversion.

Unit-IV (9 Hrs)

Other Sources: Nuclear fission and fusion, Geothermal energy- Origin, types of geothermal energy sites, site selection, geothermal power plants, Magneto-hydro-dynamic (MHD) energy conversion, Formation of biomass, photosynthesis, Biomass resources and their classification, Chemical constituents and physicochemical characteristics of biomass, Biomass conversion processes.

Unit-V (9 Hrs)

Fuel Cells: Thermodynamics and electrochemical principles, Basic design, types, applications.

References Books:

1. Power Generation through Renewable Source of Energy, Rai and Ram Prasad, Tata McGraw-Hill,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 311	Compiler Design Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1 & 2 implement a lexical analyzer in "C".

3. Use LEX tool to implement a lexical analyzer.

4. Implement a recursive descent parser for an expression grammar that generates arithmetic expressions with digits, + and *.

5. Use YACC and LEX to implement a parser for the same grammar as given in problem

6. Write semantic rules to the YACC program in problem 5 and implement a calculator that takes an expression with digits, + and * and computes and prints its value.

7 & 8. Implement the front end of a compiler that generates the three address code for a simple language with: one data type integer, arithmetic operators, relational operators, variable declaration statement, one conditional construct, one iterative construct and assignment statement.

9 &10. Implement the back end of the compiler which takes the three address code generatedin problems 7 and 8, and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assemblies instructions can be simple move, add, sub, and jump. Also simple addressing modes are used.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 312	Computer Network Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. To demonstrate the operation of the Ethernet – network using OPNET IT Guru
2. To demonstrate the implementation of the token ring network using OPNET IT Guru
3. To demonstrate the implementation of the Switched local area network using OPNET IT Guru
4. To demonstrate the basics of designing a network using OPNET IT Guru
5. To examine the effect of ATM adaptation layers and service classes on the performance of network using OPNET IT Guru.
6. To Configure & analyze the performance of routing information protocol (RIP) model using OPNET IT Guru
7. To configure & analyze the performance of open shortest path first (OSPF) routing protocol using OPNET IT Guru
8. To demonstrate the congestion control algorithm implemented by the TCP using OPNET ITGuru
9. To create a network cable using RJ-45 connectors. 10. To install a network interface card
10. Simulation of Dijkstra Algorithm in C
11. Simulation of Spanning tree algorithm in C
12. To configure a Wireless access point in a local network
13. To install and configure wireless LAN card in the computer
14. To understand the working of layer-3 switch for address sub netting in the network.

Semester VII (Fourth Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE401	Cyber Security & Cryptography	3	1	0	4

Total Hrs: 45

UNIT– I: Security Concepts (9 Hrs)

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, steganography, key range and key size, possible types of attacks.

UNIT– II: Symmetric key Ciphers (9 Hrs)

Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT– III: Cryptographic Hash Functions (9 Hrs)

Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastruct ure

UNIT – IV: Transport-level Security (9 Hrs)

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 (9 Hrs)

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, Crosssite Scripting Vulnerability.

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practice: William Stallings, PearsonEducation, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, WileyIndia, 1st Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3rdEdition.

Categor	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE401	Data Analytics	4	0	0	4

Total Hrs: 4

UNIT-I: INTRODUCTION TO BIG DATA [9 Hours]

Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis v/s reporting – Modern data analytic tools, Statical concepts: Sampling distributions, re-sampling, statistical inference, prediction error.

Unit-Ii: Data Analysis [9 hours]

Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics – Rule induction – Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

Unit-Iii: Mining Data Streams [9 hours]

Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications – case studies – real time sentiment analysis, stock market predictions.

Unit-Iv :Frequent Itemsets And Clustering [9 hours]

Mining Frequent item sets – Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means

– Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.

Unit-V: Frameworks And Visualization [9 hours]

Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed file systems –

Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications:

TEXT BOOKS:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets,CambridgeUniversity Press, 2012.

REFERENCES:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streamswith advanced analystics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big DataGlossary,
   O‟Reilly, 2011.
3. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier,
   Reprinted 2008.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE402	Parallel and Distributed Algorithm	4	0	0	4

Total Hrs: 45

Unit - I: Fundamentals: (9 Hrs)

Introduction to distributed systems, synchronous / asynchronous network models, leader election problem in ring and general networks; Type of faults, fail safe systems, Byzantine faults, distributed consensus with link and process failures.

Unit- ll: The PRAM Model: (9 Hrs)

Balancing, divide and conquer, parallel prefix computation, pointer jumping, symmetry breaking, list ranking, sorting and searching, graph algorithms, parallel complexity and complexity classes, lower bounds.

Unit - lll: Interconnection Networks: (9 Hrs)

Topologies (arrays and mesh networks, trees, systolic networks, hyper cubes, butterfly) and fundamental algorithms, matrix algorithms, sorting, graph algorithms, routing, and relationship with PRAM models; Asynchronous Parallel Computation; Distributed Models and Algorithms.

Unit- IV: Concepts of Distributed Computation: (9Hrs)

Termination; Failure tolerance; Network topology. Distributed Search: Algorithms for BFS, DFS,shortest paths and spanning trees in distributed systems.

Unit - V: Distributed Networks: (9 Hrs)

Broadcasting; Robust distributed networks. Processor organizations such as mesh and hypercube, embedding of problem graphs into processor graphs.

REFERENCES BOOK:

1. V. Kumar, A. Grama, A. Gupta, G. Kaarypis, Introduction to Parallel Computing, AddisonWesley Press

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE403	Neural Networks and Deep Learning	4	0	0	4

Total Hrs: 45

Unit - I: Introduction: Neuro Computing andNeuroscience (9 Hrs)

Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

Unit - II: Data processing (9 Hrs)

Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, Eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit - III: Multilayered network architecture (9 Hrs)

Back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation propertiesof RBF networks and comparison with multilayer perceptron.

Unit - IV: Deep Learning (9 Hrs)

Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network. Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing.

Unit - V: Deep Learning Search and tools (9 Hrs)

Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques. Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network. Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing.Deep Learning Tools: Caffe, Theano,Torch.

Reference Books:

1.J.A. Anderson, An Introduction to Neural Networks, MIT

2.Hagen Demuth Beale, Neural Network Design, Cengage Learning

Text Books:

T1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.T2. Bishop, C.,M., Pattern Recognition and Machine Learning, Springer, 2006

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 404	Multi-agent Intelligent	3	0	0	3

Total Hrs: 45

Unit - Introduction to Agents (9 Hrs)

Agents and Environment; Performance measure; Nature of Environment; Abstract and Concrete Architecture for intelligent agents; Problem solving and planning: Result sharing, Task sharing and Distributed planning

Unit - II: The design of Intelligent Agents (9 Hrs)

Deductive reasoning agents: AgentO, Practical Reasoning Agents: HOMER architecture; Reactive agents: Subsumption architecture; Hybrid agents: Touring Machines, InteRRaP.

Unit - III: Agent Communication and Interaction Protocols (9 Hrs)

Agent Communications: Knowledge Query and manipulation Language (KQML), Knowledge Interchange Format (KIF), Ontology, Coordination protocols, Cooperation Protocols, Contract Net, Blackboard Systems, Negotiation, Multi-agent Belief Maintenance, Market Mechanisms.

Unit - IV: Multi-Agent System Interactions & Agreements (9 Hrs)

Classifying multi-agent interactions: Multi-agent Encounters - Dominant Strategies and Nash Equilibria - Competitive and zero-sum and other interactions; Cooperation: the Prisoner's dilemma and Axelrod's experiments; Reaching Agreements: Interactions between self-interested agentsauctions & voting systems – negotiation - Argumentation; Interactions between benevolent agents: Cooperative Distributed Problem Solving (CDPS), partial global planning; coherence and coordination

Unit -V: Multi-agent Methodologies and Applications (9 Hrs)

Agent Methodologies- Mobile agents; Typical application areas of agent systems: Business Process Management, Distributed Sensing, Information Retrieval and Management, Electronic Commerce, Human-Computer Interfaces, Social Simulation etc.

***Reference Books*:**

1.M. Wooldridge, An Introduction to Multiagent Systems; John Wiley & Sons, New York, NY, 2002.

2.J.M. Vidal, Fundamentals of Multiagent Systems with NetLogo Examples; Lecture Notes, University of South Car olina, Columbia, SC, 2007.

3.St. Preitl, R.-E. Precup, Regulatoare pentru servosisteme: metode de proiectare; Editura Orizonturi Universitare, T imisoara, 2007 (in Romanian + slides in English).

Text Books:

1.K.-H. Dietsche, M. Klingebiel, Automotive Handbook; Robert Bosch Gmbh, Plochingen, 2007.

2.N.P. Padhy, Artificial Intelligence And Intelligent Systems; Oxford University Press, Oxford,2005.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE405	Internet of Things	3	0	0	3

Total Hrs: 45

Unit-I: Fundamentals Of Iot (9hrs)

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

Unit- ll: Iot Protocols (9hrs)

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e,

1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks –
Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application
Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

Unit-lll: Design And Development (9hrs)

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.

Unit-IV: Data Analytics And Supporting Services (9 Hrs)

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning
– No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics
– Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

Unit-V: Case Studies/Industrial Applications (9hrs)

Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide EthernetModel (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart TrafficControl Analyze applications of IoT in real time scenario.

Textbook:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton And Jerome Henry, ―Iot Fundamentals:
   Networking Technologies, Protocols And Use Cases For Internet Of Things, Cisco Press,2017

References:

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach,Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Keyapplications and Protocols, Wiley, 2012 (for Unit 2).

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 406	Cloud Computing	3	0	0	3

Total Hrs: 45

Unit-l: Introduction to Cloud Computing (9Hrs)

Virtualization Concepts, Cloud Computing Fundamental: Overview of Computing Paradigm, Evolution of cloud computing, Defining cloud computing, Components of a computing cloud, Essential Characteristics of Cloud Computing, Cloud Taxonomy.

Unit-II: Cloud Computing Architectural Framework (10Hrs)

Cloud architectural principles, Role of Networks in Cloud computing, Role of Web services, Benefits and challenges to Cloud architecture, Cloud Service Models, cloud computing vendors. Cloud Services Management, Performance and scalability of services, tools and technologies used to manage cloud services deployment.

Unit-III: Exploiting Cloud Services (9Hrs)

Software as a Service(SaaS): Introduction to SaaS, Inspecting SaaS technologies, Implementing web services, Deploying Infrastructure as a Service(IaaS): Introduction to IaaS, Scalable server clusters, Machine Image, Virtual Machine (VM). Elastic storage devices, Data storage in cloud computing, Delivering Platform as a Service(PaaS): Introduction to PaaS, Service Oriented Architecture (SOA), Cloud Platform and Management, Hardware-as-a-service: HaaS.

Unit-IV: Cloud Application Development (9 Hrs)

Role of business analyst, Technical architecture considerations, Service creation environments to develop cloud based applications, Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages, Cloud Economics.

Unit-V: Cloud Security and Risk Management (9Hrs)

Cloud Security: Understanding cloud based security issues and threats, Data security and Storage, Identity & Access Management, Risk Management in cloud, Governance and Enterprise Risk Management.

Text Books:

1. Distributed and Cloud Computing: Clusters, Grids, Clouds, and the Future Internet by KaiHwang, Jack Dongarra & Geoffrey C. Fox., Morgan Kaufmann Publishers, 2012.

2. Cloud Computing Bible, Barrie Sosinsky, WileyIndia, 2010

3. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011

4. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, LeeGillam, Springer, 2012

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 401	Economics Policy in India	3	0	0	3

Total Hrs: 45

Unit – I: Economic Development and its Determinants (9 Hrs)

Approaches to economic development and its measurement – sustainable development; Role of State, market and other institutions; Indicators of development – PQLI, Human Development Index (HDI), gender development indices.

Unit-II: Planning in India (9 Hrs)

Objectives and strategy of planning; Failures and achievements of Plans; Developing grass-root organizations for development – Panchayats, NGOs and pressure groups.Demographic Features, Poverty and Inequality. Broad demographic features of Indian population; rural-urbanmigration; Urbanization and civic amenities; Poverty and

Unit-III: Inequality (9 Hrs)

Resource Base and Infrastructure. Energy; social infrastructure – education and health; Environment; Regional imbalance; Issues and policies in financing

Unit-IV: Infrastructure development and Polices (9 Hrs)

The Agricultural Sector, Institutional Structure – land reforms in India; Technological change in agriculture – pricing of agricultural inputs and output; industry; Agricultural finance policy; Agricultural Marketing and Warehousing; Issues Terms of trade between agriculture and in food security – policies for sustainable agriculture. Industrial policy; Public Sector enterprises and their performance; Problem of sick units in India; Privatization and policy – issues in labour market reforms; approaches for employment generation.

Unit-V: Public Finances (9 Hrs)

Fiscal federalism – Centre-State financial relations; Finances of central government; Finances of state governments; Parallel economy; Problems relating to fiscal policy; Fiscal sector reforms in India. Money, Banking and Prices. Analysis of price behavior in India; Financial sector reforms; Interest rate policy; Review of monetary policy of RBI; Money and capital markets; Working of SEBI in India. External Sector Structure and direction of foreign trade; Balance of payments; Issues in export-import policy and FEMA; Exchange rate.

Reference Books:

1. Ahluwalia, I. J. and I. M. D Little (Eds.) (1999), India's Economic Reforms and Development (Essays in honour of Manmohan Singh), Oxford University Press, NewDelhi.
2. Bardhan, P. K. (9th Edition) (1999), The Political Economy of Development in India,Oxford University Press, New Delhi.
3. Bawa, R. s. and P. S. Raikhy (Ed.) (1997), Structural Changes in Indian Economy, GuruNanak Dev University Press.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 402	Reliability & Maintenance engineering	3	0	0	3

Total Hrs: 45

Unit-I Introduction: (9Hrs)

Maintenance Objectives and Functions, Maintenance Systems, Need of planned maintenance, Maintenance policies, Breakdown, time based maintenance, Block replacement, age replacement and periodic replacement policy, Corrective and preventive maintenance, Maintenance planning, Scheduled maintenance, Cost of maintenance versus Cost of equipment and production delays.

Inspection: Inspection intervals, Inspection reports, card history system.

Unit-II Predictive Maintenance: (9Hrs)

Equipment wear records, standards, Equipment used in predictive maintenance. Computerized maintenance, Total Productive Maintenance, Methods of condition monitoring, Non-destructive testing, Liquid Penetrate, Magnetic particles, Ultrasonic testing, and Vibration analysis, Oil analysis, Radiographic testing.

Unit-III Reliability: (9Hrs)

Definition, failure data analysis, Mean failure rate, mean time to failure(MTTF), mean time between failures (MTBF), hazard rate, Bathtub curve, Use of Weibull probability chart foe assessing characteristics life, guarantee period etc.

Unit-IV System Reliability Improvement: (9Hrs)

Series, parallel and mixed configuration, Simple problems. Techniques, use of Pareto analysis-Design for reliability, redundancy unit and stand by redundancy, Optimization of reliability.

Unit-V Spare Parts Management: (9Hrs)

Spare parts, features and categorization of spares, cost considerations, Techniques of cost reduction, Selective controls used in spare parts control, ABC analysis, FSN, XYZ, VED and other approaches, Inventory control of spares.

Reference Books:

1. Reliability Engineering, Srinath L.S., Affiliated East West Press.
2. Maintainability Principles and Practices, Blanchand, B.S., McGraw Hill

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 403	Management training & development	3	0	0	3

Total Hours: 45

Unit-I: Training (9 Hrs)

Training: Introduction - Conceptual framework of training - approaches on training – Difference between Training and Development - Training and applied psychology - principles of training - Learning and skills acquisition - Transfer and retention of skills.

Unit-II: Need for Training (9 Hrs)

Methods of Identification of Training needs - Training policy - Planning and organizing the training programmes - Methods of Training - – on the job training – off the job training – choosing optimum method – the lecture –panel discussion – behavior modeling – interactive demonstrations – brain storming – case studies, incident process, in- transactional analysis, exception analysis.

Unit-III: Management Development (9 Hrs)

Management Development (MD) and Organizational Development (OD) - Difference between MD and OD - Aims and objectives of MD and OD - Methods of MD -OD interventions – Succession Planning and Career development.

Unit-IV: Evaluation of training (9 Hrs)

Evaluation of training-need for evaluation, Principles of evaluation, Criterion and Approaches: Return on investment in training, Process of calculating ROI in training; emerging trends in training and development; new perspectives on training- Cross culture training.

Unit-V: Technology in training (9 Hrs)

Technology in training: CBT, Multimedia training, e-learning/Online learning,Distance learn.

Text Book:

1. B.L.Gupta(2011), Management Training and Development, Vrinda Publication, New Delhi.

Refrence Books:

1. Alan M. Saks, Robert R. Haccoun (2010): Managing Performance Through Training andDevelopment, 5e, Nelson Education ltd. USA.
2. Craig Eric Schneier, Craig J. Russell (1994): The Training and Development Sourcebook
3. 2e, Human Resource Development Press Inc, USA.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE-402	Network Security & Cryptography lab	0	0	2	1

Total Hrs: 20

List of Practical's-

1. Write a program to implement the Caesar Cipher
2. Write a program to implement the Play air Cipher
3. Write a program to implement the Hill Cipher
4. Write a program to implement the Vigenere Cipher
5. Write a program to implement the Rail fence row & Column Transformation
6. Write a program to implement the DES algorithms
7. Write a program to implement the RSA Algorithm
8. Write a program to implement the Diffiee-Hellman algorithms
9. Write a program to implement the MD5 algorithms
10. Write a program to implement the SHA-1 algorithms
11. Implement the SIGNATURE SCHEME -Digital Signature Standard
12. Demonstrate how to provide secure data storage, secure data transmission

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ-CSE-401	Minor Project	0	0	16	8

The minor project work can be a design project, experimental fabrication project or software development project on any of the topics of mechanical engineering interest - it can be allotted as a group project with groups consisting of three or four students The assessment of all the minor projects should be done by a committee consisting of three or four faculty members specialized in the various fields of Mechanical Engineering - the students will present their project work and give a seminar on that topic for about thirty minutes - a committee consisting of at least three faculty members (preferably specialized in different fields of mechanical engineering) will assess the presentation of the seminars before the committee - the relative grading and group average marks for the various projects will be fixed by the committee - the guide will award the marks for the individual students in the project maintaining the group average - each group will prepare the project report and submit one copy of a write up of his minor project to the department through the guide - the Head of the Department will certify the copies and keep them in the departmental library

Instructions For Project Report/ Dissertation Writing

It is important that the procedures listed below be carefully followed by all the students of B.E. (Computer Science engineering).

1. Prepare one spiral Bound Copies of your manuscript
2. Limit your Dissertation report to 50– 60 pages (preferably)
3. The footer must include the following: Institute Name, B.E. (CSE) Times New Roman 10 pt.and centrally aligned.
4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.
5. Print the manuscript using
   I. Letter quality computer printing.
   II. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.
   III. Use 1.5 line spacing.

Semester VIII (Fourth Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE-403	Advanced Computer Architecture	3	1	0	4

Total Hrs: 45

Unit-I: Fundamentals Of Computer Design [9 Hours]

Review of Fundamentals of CPU, Memory and IO – Trends in technology, power, energy and cost, Dependability – Performance Evaluation

Unit-II : Instruction Level Parallelism [9 Hours]

ILP concepts – Pipelining overview – Compiler Techniques for Exposing ILP – Dynamic Branch Prediction – Dynamic Scheduling – Multiple instruction Issue – Hardware Based Speculation – Static scheduling – Multi-threading – Limitations of ILP – Case Studies.

Unit- III : Data-Level Parallelism [9 Hours]

Vector architecture – SIMD extensions- Graphics Processing units – Loop level parallelism

Unit-IV : Thread Level Parallelism [9 Hours]

Symmetric and Distributed Shared Memory Architectures – Performance Issues –Synchronization –

Models of Memory Consistency – Case studies: Intel i7 Processor, SMT & CMP Processors.

Unit-V : Memory And I/O [9 Hours]

Cache Performance – Reducing Cache Miss Penalty and Miss Rate – Reducing Hit Time – Main Memory and Performance – Memory Technology. Types of Storage Devices – Buses – RAID – Reliability, Availability and Dependability – I/O Performance Measures.

Text Book:

John L Hennessey and David A Patterson, “Computer Architecture A Quantitative Approach”, Morgan Kaufmann/ Elsevier, Fifth Edition, 2012.

References:

Kai Hwang and Faye Briggs, “Computer Architecture and Parallel Processing”, Mc Graw-Hill International Edition, 2000.

Sima D, Fountain T and Kacsuk P, ”Advanced Computer Architectures: A Design Space Approach”, Addison Wesley, 2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 404	Artificial Intelligence & Expert System	3	0	0	3

Total Hrs:45

Unit-I: Introduction (9Hrs)

Introduction: Aim and objective of AI, AI problems, AI technique, Production system Characteristics, Basics of problem solving: problem representation paradigms defining problem as a state space representation. Intelligent Agents, Performance Measure, Rationality, Structure of Agents, Problem solving agents, Problem Formulation.

Unit-II: Search Techniques (9Hrs)

Search Techniques: Uninformed Search Strategies Problem size, complexity, approximation and search; depth, breadth and best search; Informed Heuristic Based Search: Informed (Heuristic) Search and Exploration, Greedy best first search, Memory bounded heuristic search, Heuristic functions, inventing admissible heuristic functions, Hill climbing, best-first search, branch and bound And OR Graph: A* algorithm and AO* Algorithm. Simulated Annealing, Online search.

Unit-III: A.I Problems (9Hrs)

Constraint Satisfaction Problems, Backtracking Search, variable and value ordering, constraint propagation, intelligent backtracking, local search for CSPs, Adversarial Search, Games, The minimax algorithm, Alpha-Beta pruning, Imperfect Real-Time Decisions, Games that include an Element of Chance

Unit-IV Structured Knowledge Representation (9Hrs)

Structured Knowledge Representation: Semantic Nets, Frames, and Scripts. Learning: Block architecture of learning system, Types of learning, performance Measures First order logic, Unification, and Resolution in Predicate Logic Uncertainty Treatment: formal and empirical approaches including Exact and Approximate inference in Bayesian Networks, Bayesian theory, belief functions, certainty factors

Unit-V: Inference Techniques (9Hrs)

Inference Techniques: Types of reasoning deductive, inductive, abductive, analogical, common-sense and non-monotonic, types of inference forward and backward chaining, inference using full joint distributions, fuzzy logic. Recent advances in Artificial Intelligence, Algorithms for artificial intelligence, Genetic algorithms. Tools for development of Artificial Intelligence: Open Neural network library. Applications of artificial Intelligence.

Text Books:

1. Artificial Intelligence a Modern Approach: Russel and Norvig , Pearson Education, 2nd
2. 2. Artificial Intelligence – A Practical Approach: Patterson, Tata McGraw Hill, 3rd

Reference Books:

1. Maus, R. and Keyes, J., "Handbook of Expert Systems in Manufacturing", McGraw Hill, 1991
2. Robert Levine, "A comprehensive guide to artificial intelligence and expert systems",
3. Elain Rich ,"Artificial Intelligence", PHI Publication
4. Introduction to Artifitial Intelligence by E.Charniack and D. Mcdermott, Pearson Education.
5. Artifitial Intelligence structures and strategies for complex problem solving, 4 th edition, Pearson education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE407	Optimization Techniques	3	1	0	4

Total Hours: 40

Unit- I: Linear Programming (10 Hrs)

Introduction – formulation of linear programming model-Graphical solution–solving LPP usingsimplex algorithm – Revised Simplex Method.

Unit- II: Advances In Lpp (10 Hrs)

Duality theory- Dual simplex method – Sensitivity analysis–-Transportation problems Assignment problems-Traveling sales man problem -Data Envelopment Analysis.

Unit- III: Non Linear Programming (10 Hrs)

Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tuckerconditions– Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.

UNIT- IV: DYNAMIC PROGRAMMING (10 Hrs)

Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the principle of optimality–Formulation of Dynamic programming–Backward and Forward recursion–Computational procedure– Conversion offinal value problem in to Initial value problem.

Text Books:

1.Hillier and Lieberman “Introduction to Operations Research”, TMH, 2000.

2.R.Panneerselvam, “Operations Research”, PHI, 2006

3.Hamdy ATaha, “Operations Research –An Introduction”, Prentice Hall India, 2003.

References:

1. Philips, Ravindran and Solberg, “Operations Research”, John Wiley, 2002.

2. Ronald L.Rardin, “Optimization in Operation Research” Pearson Education Pvt. Ltd. New Delhi, 2005.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE408	Human Computer Interaction	3	1	0	4

Total Hours:45

Unit- I: Foundations Of Hci (9hrs)

The Human: I/O Channels – Memory – Reasoning And Problem Solving; The Computer: Devices – Memory – Processing And Networks; Interaction: Models – Frameworks – Ergonomics – Styles – Elements – Interactivity-Paradigms.

Unit- II: Design & Software Process (9hrs)

Interactive Design Basics – Process – Scenarios – Navigation – Screen Design – Iteration And Prototyping. Hci In Software Process – Software Life Cycle – Usability Engineering – Prototyping In Practice – Design Rationale. Design Rules – Principles, Standards, Guidelines, Rules. Evaluation Techniques – Universal Design.

Unit- III: Models And Theories (9hrs)

Cognitive Models –Socio-Organizational Issues And Stake Holder Requirements – Communication And Collaboration Models-Hypertext, Multimedia And Www.

Unit- IV: Mobile HCI (9hrs)

Mobile Ecosystem: Platforms, Application Frameworks- Types Of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements Of MobileDesign, Tools.

Unit- V: Web Interface Design (9hrs)

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays And Virtual Pages, Process Flow. Case Studies.

Text Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition,
   Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009 (UNIT –IV)

3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O‘Reilly, 2009.(UNIT-V)

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE409	Digital Signal Processing	3	1	0	4

Total Hours: 45

Unit-I: Signals And Systems (9 Hrs)

Basic elements of DSP – concepts of frequency in Analog and Digital Signals – sampling theorem – Discrete – time signals, systems – Analysis of discrete time LTI systems – Z transform – Convolution – Correlation.

Unit – II: Frequency Transformations (9 Hrs)

Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms - Decimation – in – time Algorithms, Decimation – in – frequency Algorithms – Use of FFT in Linear Filtering – DCT – Use and Application of DCT.

Unit – III: Iir Filter Design (9 Hrs)

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF,BPF, BRF) filter design using frequency translation.

Unit – IV: Fir Filter Design (9 Hrs)

Structures of FIR – Linear phase FIR filter – Fourier series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques.

Unit-V: Finite Word Length Effects In Digital Filters (9 Hrs)

Binary fixed point and floating point number representations – Comparison - Quantization noise – truncation and rounding – quantization noise power- input quantization error- coefficient quantization error – limit cycle oscillations-dead band- Overflow error-signal scaling.

Refrences:

1. Emmanuel C..Ifeachor, & Barrie.W.Jervis, “Digital Signal Processing”, Second Edition, Pearson
   Education / Prentice Hall, 2002.

2. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata Mc Graw Hill, 2007.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE404	Human Resources Management	3	0	0	3

Total Hours: 45

Unit-I: Overview (9 Hours)

Overview of Human Resources, Historical evolution, Integrated HR function, Corporate and HR environment, Strategic environment, Strategic Management

Unit-II: Planning (9 Hours)

HR planning at Enterprise level, Need for systematic planning, Planning process, Operating Environment- Internal & External, Job description, Models & techniques of Manpower demand and Supplyforecasting. Retention-Redeployment and Exit strategies

Unit-III: Career management (9 Hours)

Career management-Recruitment and Selection, Employee Induction Programme, Employee training, Training needs & objective setting, Methods of training, Development & Development needs, Human Resource Development, Development process

Unit-IV: Performance Policies (9 Hours)

Performance planning – Performance appraisal, Measures of appraisal, System components appraisal methods, Ethics of appraisal, Problems & issues

Unit-V: Human Resource Information System (9 Hours)

Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level

Text Book:

1. Praveen Durai (2010), Human Resource Management, Pearson Education, South Asia

Reference Books

1. John Storey, Graeme Salaman, Christopher Mabey(1998): Strategic Human Resource Management: A Reader, SAGE Publications, 1998
2. Christopher Mabey, Rosemary Thomson (2011): Developing Human Resources,Routledge, Taylor and francis group, New York, USA.
3. Dessler & Varkkey, (2010): Human Resource Management 11e, India, Prentice Hall
4. Richard D. Johnson, Michael J. Kavanagh, Mohan Thite (2011): Human ResourceInformation System 2e, SAGE Publications, 2011.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE405	Total Quality Management	3	0	0	3

Total Hours:45

Unit-I (9 Hours)

Quality Concepts Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.
Control on Purchased Product Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.
Manufacturing Quality Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

Unit-II (9 Hours)

Quality Management Organization structure and design, Quality function, decentralization, Designing and fitting

organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.
Human Factor in Quality Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

Unit-III (9 Hours)

Control Charts Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.
Attributes of Control Charts Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

Unit-IV (9 Hours)

Defects Diagnosis and Prevention Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

Unit-V (9 Hours)

IS0-9000 and its concept of Quality Management: ISO 9000 series, Taguchi method, JIT in some details.

Text and References Books:

1. Lt. Gen. H.LaI, "Total Quality management", Wiley Eastern Limited, 1990. .

2. Greg Bounds. “Beyond Total Quality Management”. McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE406	Industrial Relations	3	0	0	3

Total Hours:45

Unit - I: Industrial Relations (9 Hours)

Industrial Relations- Concept and scope, Stake holders; Approaches to Industrial Relations; Labor Market, Demand and Supply of Labor, Nature and composition of Indian labor, Employment and Unemployment Scenarios.

Unit - II: History (9 Hours)

History: Evolution of Industrial Relations UK), Emergence of Industrial relations/ Trade Union movement in India, Government initiatives, Industrial relations machineries, ILO and its impact on Indian IR scenarios.

Unit - III: Industrial Disputes resolutions (9 Hours)

Industrial Disputes resolutions: Sources – Wages, service conditions and discipline, Concept of wages, Wage theories, wage differentials, Regulations for protection of wages, service conditions and Work discipline. Law of natural justice and domestic enquiries; Workers participation in Management, Works committees, Joint Councils.

Unit - IV: Industrial Conflict (9 Hours)

Industrial Conflict: Negotiation, Mediation/ Conciliation, Arbitration, Adjudication- Labor court, Industrial Tribunal, National Tribunal; Special reference to Pay Commissions.

Unit - V: Trends (9 Hours)

Trends: Globalization and its impact on Industrial Relations, Employee Engagement practices, current trends in Industrial Relations in India, Industrial Relations bill- ifs and buts, Ethics, governance and Industrial Relations.

Text Books:

1. P. N. Singh, Neeraj Kumar, Employee Relations Management, Pearson.
2. Personnel Management and Industrial Relations, P.C. Tripathi, Sultan chand and sons.

Reference Books:

1. Arun Monappa, Industrial Relations, Tata Mc Graw Hill.
2. Michael V P, HRM and Human Relations, Himalaya publications.
3. Mamoria and Mamoria, Dynamics of Industrial Relations in India, Himalaya publications.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 405	Artificial Intelligence & Expert system Lab	0	0	4	2

Total Hours: 20

List of Practical's-

1. Study of facts, objects, predicates and variables in PROLOG
2. Study of Rules and Unification in PROLOG
3. Study of "cut" and "fail" predicate in PROLOG
4. Study of arithmetic operators, simple input/output and compound goals in PROLOG
5. Study of recursion in PROLOG. 6 Study of Lists in PROLOG
6. Study of dynamic database in PROLOG
7. Implement string operations like substring, string position, palindrome etc.)
8. Write a prolog program to maintain family tree.
9. Write a prolog program to implement all set operations (Union, intersection, complement etc.)
10. Write a prolog program to solve "Water Jug Problem".

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ-CSE-402	Major Project	0	0	16	8

The major project work can be a Modeling and Simulation, Case study, Design or Experiments in the field of Mechanical Engineering. It can be allotted as a group project with groups consisting of 3 to 4 students. The major project work started in the seventh semester (minor project) may be continued in this semester - the students should complete the project work in this semester and present it before the assessment committee The assessment committee will assess the various projects, fix the relative grading and group average marks - the guides will award the marks for the individual students in a project maintaining the group average - each group should submit three copies of a write up of his major project of the completed project report signed by the department (in the format prescribed by the department) through the guide - the Head of the Department-Dean of School of engineering and Technology will certify the copies and one copy return them to the students - other copy will be kept in the departmental and university library

INSTRUCTIONS FOR PROJECT REPORT/ DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of B.E. (Mechanical Engineering).

1. Prepare Three Hard Bound Copies of your manuscript and if possible publish at least one international journal paper by each group for value addition of your project.

2. Limit your Dissertation report to 80 – 120 pages (preferably)

3. The footer must include the following: Institute Name, B.E. (Mechanical) Times New Roman10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using

a. Letter quality computer printing.

b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.

c. Use 1.5 line spacing.

d. Entire report shall be of 5- 7 chapters.

6.Use the paper size 8.5„„× 11„„or A4 (210 × 197 mm).

Margin Location	Paper 8.5„„× 11„„	Paper A4 (210 × 197 mm)
Top	1„„	25.4 mm
Left	1.5„„	37 mm
Bottom	1.25„„	32 mm
Right	1„„	25.4mm

7.All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin with without any indentation.

8.Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.

9.Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the first letter of each word is to be capitalized).

10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, black and white. Illustrations downloaded from internet are not acceptable.

1. Illustrations should not be more than two per page. One could be ideal
2. Figure No. and Title at bottom with 12 pt
3. Legends below the title in 10 pt
4. Leave proper margin in all sides
5. Illustrations as far as possible should not be photo copied.

11. Photographs if any should of glossy prints

12. Please use SI system of units only.

13. Please number the pages on the front side, centrally below the footer

14. References should be either in order as they appear in the thesis or in alphabetical order bylast name of first author

15. Symbols and notations if any should be included in nomenclature section only

16. Following will be the order of report

i. Cover page and Front page as per the specimen on separate sheet
ii. Certificate from the Institute as per the specimen on separate sheet
iii. Acknowledgements
iv. List of Figures
v. List of Tables
vi. Nomenclature vii. Contents
vii. Abstract

(A brief abstract of the report not more than 150 words. The heading of abstract i.e. word ―Abstract‖ should be bold, Times New Roman, 12 pt and should be typed at the centre. The contents of abstract should be typed on new line without space between heading and contents.

Try to include one or two sentences each on motive, method, key-results and conclusions in bstract

1) Introduction (2-3 pages) (TNR – 14 Bold) Problem statement (TNR – 12)
1.1 Objectives
1.2 Scope
1.3 Methodology
1.4 Organization of Dissertation

2) Literature Review (20-30 pages) Discuss the work done so far by researchers in the domain area and their significant conclusions. No derivations, figures, tables, graphs are expected.

3)This chapter shall be based on your own simulation work (Analytical/ Numerical/FEM/CFD)(15- 20 pages)
4) Experimental Validation - This chapter shall be based on your own experimental work (15-20 pages)
5) Concluding Remarks and Scope for the Future Work (2-3 pages) References ANNEXURE (ifany) (Put all mathematical derivations, Simulation program as Annexure)

17. All section headings and subheadings should be numbered. For sections use numbers 1, 2, 3, …. and for subheadings 1.1, 1.2, …. etc and section subheadings 2.1.1, 2.1.2, …. etc.

18. References should be given in the body of the text and well spread. No verbatim copy orexcessive text from only one or two references. If figures and tables are taken from any reference then indicate source of it.

Please follow the following procedure for references / Reference Books/ Patent/ Internet

- Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., OxfordUniversity Press, UK, 1996, pp. 110 – 112.
- 2. Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport

properties and surface tension of pure and mixed refrigerants, ASHRAE Trans, 1991, 97 (1), pp. 90 – 98.

- Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillarytubes, Int. Journal of Refrigeration, 1996, 19 (8), pp.497 – 505.
- Papers from Conference Proceedings Colbourne, D. and Ritter, T. J., Quantitative assessment of flammable refrigerants in room air conditioners, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002,pp. 34 – 40.

Reports, Handbooks etc.

- United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent

- Patent no., Country (in parenthesis), date of application, title, year.

Internet

- www.(Site) [Give full length URL]

DEPARTMENT OF ELECTRICAL ENGINEERING

ABOUT THE PROGRAMMME

Raffles University, Neemrana established in 2011, to produce highly practical oriented personnel in fields of engineering to meet specific manpower requirements of industries. Electrical Engineering Department was started in 2011 and has been conducting B.Tech Course in Electrical Engineering of 4-Years duration since 2011. Students are admitted through university entrance or direct counselling nominated by university management in 1st Year and 2nd year through lateral entry entrance test. The total intake for the programme is 60. The Electrical Engineering Department has been well known for its track record of employment of the pass out students since its inception. The Department has well managed class rooms andfully equipped laboratories and Conference Room. It has excellent and distinguished faculty. The syllabi of programme in Electrical Engineering Department, has been prepared by subject experts with active participation from Industry. The Department is organizing number of expert lectures from industry experts for students in every semester. Summer training/ Industry Internship is mandatory for every student after completion of second year and third year (Two times in 4 years). Emphasis has been given on project work, workshop and Lab Course for skill enhancement of students. Choice based credit system allows students to study the subjects of his/her choice from a number of elective courses /audit courses.

PROGRAMMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: To train students with practical skills and experimental practices related to core and

applied areas of Electrical Engineering to expand their knowledge horizon beyond books.

PEO-2: To enable students to design, develop and maintain Electrical equipments which are useful for the society.

PEO-3: To improve team building, team working and leadership skills of the students with high regard for ethical values and social responsibilities.

PEO- 4: To enable students to communicate effectively and demonstrate the knowledge of project management and independent research.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

1) Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and Electrical engineering to the solution of engineering problems.

2) Problem Analysis: Identify, formulate, review literature and analyse Electrical engineering problems to design, conduct experiments, analyse data and interpret data.

3) Design /Development of Solutions: Design solution for Electrical engineering problems and design system component of processes that meet the desired needs with appropriate consideration for the public health and safety, and the cultural, societal and the environmental considerations.

4) Conduct Investigations of Complex Problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions in Electrical engineering.

5) Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to mechanical engineering activities with an understanding of the limitations.

6) The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to Electrical engineering practice.

7) Environment and Sustainability: Understand the impact of the Electrical engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Electrical engineering practice.

9) Individual and Team Work: Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in Electrical engineering.

10) Communication: Communicate effectively on complex engineering activities with the engineering committee and with society at large, such as, being able to comprehend and write affective reports and design documentation, make effective presentations in Electrical engineering.

11) Project Management and Finance: Demonstrate knowledge & understanding of the Electrical engineering principles and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments in Electrical engineering.

12) Life - Long Learning: Recognize the need for, and the preparation and ability to engage in independent research and lifelong learning in the broadest contest of technological changes in Electrical engineering.

PROGRAM SPECIFIC OUTCOMES (PSOs):

1) To apply practical skills, knowledge of engineering fundamentals and Electrical engineering, to industries and institutions.

2) To explore, create and develop innovations in various aspects of engineering. The student will be ready to take-up career or to pursue higher studies with high regard to ethical values and social responsibilities.

B.TECH ELCTRICAL ENGINEERING SCHEME CREDITS CALCULATION

S.No.	Category of Course	Abbreviation Used	Credits
1.	Humanities and Social Sciences including Management Courses	HSMC	13
2.	Basic Sciences Courses	BSC	26
3.	Engineering Sciences Courses including workshop, Drawing, Basics of Electrical/ Mechanical/ Computer etc.	ESC	26
4.	Professional Core Courses	PCC	98
5.	Professional Elective C ourses relevant to chosen specialization/ branch	PEC	13
6.	Open Subjects- Electives from other technical and /or emerging subjects	OEC	12
7.	Project Work, Seminar and internship in industry or elsewhere	PROJ	16
8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
Total			**204**

Abbreviations Used:

L -Lectuer

T - Tutorial

P - Practical

IA - Internal Assessment

EA - External Assessment

TA - Teacher's Assessment

MTA - Mid Tern Assessment

ETA - End Term Assessment

PROGRAMMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: To train students with practical skills and experimental practices related to core and applied areas of Electrical Engineering to expand their knowledge horizon beyond books.

PEO-2: To enable students to design, develop and maintain Electrical equipments which are useful for the society.

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Engineering Graduates will be able to:

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5) Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to mechanical engineering activities with an understanding of the limitations.

6) The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to Electrical engineering practice.

7) Environment and Sustainability: Understand the impact of the Electrical engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

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10) Communication: Communicate effectively on complex engineering activities with the engineering committee and with society at large, such as, being able to comprehend and write affective reports and design documentation, make effective presentations in Electrical engineering.

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12) Life - Long Learning: Recognize the need for, and the preparation and ability to engage in independent research and lifelong learning in the broadest contest of technological changes in Electrical engineering.

PROGRAM SPECIFIC OUTCOMES (PSOs):

1) To apply practical skills, knowledge of engineering fundamentals and Electrical engineering, to industries and institutions.

2) To explore, create and develop innovations in various aspects of engineering.

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1.	Humanities and Social Sciences including Management Courses	HSMC	13
2.	Basic Sciences Courses	BSC	26
3.	Engineering Sciences Courses including workshop, Drawing, Basics of Electrical/ Mechanical/ Computer etc.	ESC	26
4.	Professional Core Courses	PCC	98
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8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
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Abbreviations Used:

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T - Tutorial

P - Practical

IA - Internal Assessment

EA - External Assessment

TA - Teacher's Assessment

MTA - Mid Tern Assessment

ETA - End Term Assessment

1	PCC-EE	PCC-EE-201	**Electrical Circuit Analysis**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1. Apply network theorems for the analysis of electrical circuits

CO2. Obtain the transient and steady-state response of electrical circuits

CO3. Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
CO4.Analyze two port circuit behavior

CO5. Synthesize networks and filters

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	**PCC-EE**	**PCC-EE-203**	**Analog Electronics**

UNIT	**CONTENT**

Course Outcomes

At the end of this course, students will demonstrate the ability to:

CO1. Understand the working principle of PN junction diode and its applications.

CO2. Understand the working of BJT and its applications.

CO3. Understand the working of JFET and MOSFET

CO4. Analysis and design of Differential, multi-stage and operational amplifiers

CO5. Analysis and design of Linear applications of op-amp. Analysis and design of Nonlinear applications of op-amp.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-205	**Electrical Machines – I**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1. Understand the concepts of magnetic circuits

CO2. Understand the operation of DC machines

CO3. Analyse the differences in operation of different DC machine configurations

CO4. Analyse single phase transformers circuits.

CO5. Analyse three phase transformers circuits.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-207	**Electromagnetic Fields**

UNIT	CONTENT

Course Outcomes:

At the end of the course, students will demonstrate the ability:

CO1. To understand the basic laws of electromagnetism

CO2. To obtain the electric and magnetic fields for simple configurations under static conditions

CO3. To analyse time varying electric and magnetic fields

CO4. To understand Maxwell's equation in different forms and different media.

CO5. Investigate behavior of EM waves in different medias and to calculate average power density radiated.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

6	ESC	ESC- 201	Engineering Mechanics
UNIT	CONTENT		

9	MC	MC-I	Indian Constitution

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Understand the concepts of co-ordinate systems

CO2. Analyse the three-dimensional motion

CO3. Understand the concepts of rigid bodies

CO4. Explain and solve numerical problems on kinematics of particles and rigid bodies

CO5. Explain and apply work-energy principle, impulse-moment principle to solve numerical problems on linear and angular motion and collision.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Syllabus**for B.Tech (Batch 2022-26)**

4th Semester

1	PCC-EE	PCC-EE202	Digital Electronics
UNIT	**CONTENT**		

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1- Understand number systems, basic logic gates, Boolean algebra and derive digital logic circuits
CO2- Classify various minimization techniques and choose the best for designing logic circuit.
CO3- Define characteristics of logic families and calculate their parameters
CO4- Design combinational logic circuits such as adder, subtractor, multiplexer, decoder.

S No.	Category	Code	Course Title	Hours Per				Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
C 1	PCC-EE	PCC-EE202	Digital Electronics	3	0	0	3	40	60	100
2	PCC-EE	PCC-EE-204	Electrical Machines – II	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-206	Power Electronics	3	1	0	4	40	60	100
4	PCC-EE	PCC-EE-208	Signals and Systems	3	0	0	3	40	60	100
5	BSC	BSC -201	Mathematics–III	3	0	0	3	40	60	100
6	BSC	BSC -202	Biology-medical instrumentation	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE-210	Digital Electronics Laboratory	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-212	Electrical Machines Laboratory – II	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-214	Power Electronics Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

O5. Classify the different types of flip flops and design counters, registers using flip flops.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-204	**Electrical Machines – II**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Understand the construction and working of AC machines .

CO2- Understand the generation of rotating magnetic field in AC machines.

CO3- Solve the performance parameters of AC machines.

CO4- Interpret the behavior of AC machines using phasors, equivalent circuits and its characteristics.

CO5- Examine the performance behavior of AC machines under different loading condition.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-206	Power Electronics

UNIT	**CONTENT**

Course Outcomes:

At the end of this course students will demonstrate the ability to:

CO1-Understand the differences between signal level and power level devices

CO2-Analyse controlled rectifier circuits

CO3-Analyse the operation of DC-DC choppers

CO4-Analyse the operation of voltage source inverters

CO5- Interpret the speed control of DC motors using converters and choppers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-208	Signals and Systems
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1-Understand the concepts of continuous time and discrete time systems.

CO2-Analyse systems in complex frequency domain

CO3-Understand sampling theorem and its implications

CO4- Understand mathematical tools to be able to apply in state variable modeling

CO5- Analyze signal and system properties like stability and causality using Laplace and Z transforms.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	BSC	BSC -201	Advance Mathematics
UNIT	**CONTENT**		

Course Objectives: The objective of this course is to familiarize the student with statistical techniques. It aims to equip he students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline

Course Outcomes: At the end of the course, the student will be able to

CO1-Have basics knowledge about measure of central tendency, kurtosis and moments and their applications in engineering fields.

CO2-Familiarize the student with expectations of discrete and continuous random variable

CO3-Familiarize probability techniques and random variables and detailed knowledge of probability distribution with so as to use it with any date of engineering problem formulation

CO4-Have basic idea about statistics including correlation, regression and then up to advanced level with testing of large samples that is important in solving problems related to engineering

CO5- **Use Z-transform and its applications to solve difference equations**

	PO 1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3											2
CO2	3	3	3											2
CO3	3	3	3											2
CO4	3	3	3											2
CO5	3	3	3											2

6	BSC	BSC -202	Bio-medical instrumentation

UNIT	CONTENT

Course Outcomes

At the end of this course students will demonstrate the ability to

CO 1. understand basic Biomedical Instruments and their functioning

CO2. describe Microelectrodes, Electro conduction systems

CO3. explain ECG, EEG, EMG, ERG, etc.

CO4. understand Ventilators and other important Clinical Instruments

CO5- Outline medical imaging techniques and equipment for certain diagnosis and therapies.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2021-25)

5th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PCC-EE	PCC-EE-301	Power Systems – I	3	1	0	4	40	60	100
2	PCC-EE	PCC-EE-303	Control Systems	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-305	Microprocessors	3	0	0	3	40	60	100
4	PEC-EE	PEC-EE-301	Program Elective - 1	3	0	0	3	40	60	100
5	OEC-EE	OEC-EE-301	Open Elective-1	3	0	0	3	40	60	100
6	HSMC	HSMC-301	Engineering Economics	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE307	Power Systems Laboratory - I	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-309	Control Systems Laboratory	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-311	Microprocessors Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

1	PCC-EE	PCC-EE-301	Power Systems – I

UNIT	CONTENT	No. Of Hrs.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the concepts of power systems.

CO 2 Understand the various power system components.

CO 3 Evaluate fault currents for different types of faults.

CO 4 Understand the generation of over-voltages and insulation coordination.

CO 5 Understand basic protection schemes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-303	Control Systems

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the modelling of linear-time-invariant systems using transfer function and state-space representations.

CO 2 Understand the concept of stability and its assessment for linear-time invariant systems. Design simple feedback controllers.

CO3- Formulate different types of analysis in frequency domain to explain the nature of stability of the system.

CO4- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system

CO5- Design simple Lag, Lead, Lag- Lead network & PID controllers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2

CO4	3	3	3	2	2						2	3	2
CO5	3	3	3	2	2						2	3	2

	PCC-EE	PCC-EE-305	Microprocessors
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Study of 8085 and 8086 Microprocessors.

CO 2 Do assembly language programming.

CO 3 Do interfacing design of peripherals like 8255, 8253,8279,8251 etc

CO4: Acquire the knowledge of synchronous and asynchronous communication and interfacing to protocols like blue-tooth, etc.

CO5: Design electrical circuitry to the microcontroller I/O ports in order to interface the processor to exter

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 a	Wind and solar Energy Systems

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1-Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.

CO2- Understand the basic physics of wind and solar power generation.

CO3- Understand the power electronic interfaces for wind and solar generation.

CO4- Understand the issues related to the solar technologies and wind topologies.

CO5: Demonstrate the Solar Thermal and PV applications along with its storage systems.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2

CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 b	**Line Commutated and Active PWM Rectifiers**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1-Analyse controlled rectifier circuits.

CO2- Understand the operation of line-commutated rectifiers – 6 pulse and multi-pulse configurations.

CO3- Understand the operation of PWM rectifiers –.

CO4- operation in rectification and regeneration modes and lagging, leading and unity power factor mode

CO5-

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 c	Electrical Drives

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

(i) Understand the characteristics of dc motors and induction motors.

(ii) Understand the principles of speed-control of dc motors and induction motors.

(iii) Apply the knowledge of power electronics to understand the working of dc-dc converters.

(iv) Apply the knowledge of control system for the speed control of electrical machines.

CO5- Illustrate control of slip ring induction motor (SLIM).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

CO5	3	3	3	2	2							2	3	2	

5	OEC-EE	OEC-EE-301a	Electronic Devices

UNIT	CONTENT

Course Outcomes

At the end of this course students will demonstrate the ability to:

1. Understand physics of semiconductors and behavior of charge carriers within semiconductors 2. Understand the working of semiconductor diodes supported with mathematical explanation. 3. Understand the working of BJT and MOSFET with their equivalent small signal models.

4. Understand the chemical processes used in fabrication of integrated circuits.

5	OEC-EE	OEC-EE-301b	Data Structures and Algorithms

UNIT	CONTENT

Course outcomes

Student will be able to:

CO 1. Understand operations like searching, insertion, deletion, traversing on linear Data Structures and to determine their computational complexities

CO2. Understand operations like searching, insertion, deletion, traversing on various non linear Data Structures and to determine their computational complexities

CO3. Write algorithms for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.

CO4. Apply appropriate Data Structure as per specific problem definition
CO5-Identify, model, solve and develop algorithms for real-life problems like shortest path and MST using graph theory.

	PO 1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2

CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-301c	Analog and Digital Communication
UNIT	**CONTENT**		

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth

CO2. Analyze the behavior of a communication system in presence of noise

CO3. Investigate pulsed modulation system and analyze their system performance

CO4. Analyze different digital modulation schemes and can compute the bit error performance

CO5-Apply time division multiplexing concepts in different pulse modulation techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

6	HSMC	HSMC-301	Engineering Economics

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Understand the basic principles, scope and the applications of Engineering Economics

CO2. Understand and apply the knowledge of elasticity of demand and supply on price determination.

CO 3. Apply the knowledge of demand forecasting to make effective demand forecast.

CO4. Understand the complexity of uncertain market structure and be able to take decisions of price determinations.

CO 5. Understand the various management concepts and thoughts and using for better resource management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

1	PCC-EE	PCC-EE-302	Power Systems – II

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Use numerical methods to analyze a power system in steady state.

CO2- Understand stability constraints in a synchronous grid.

CO3- Understand methods to control the voltage, frequency and power flow.

CO4-Understand the monitoring and control of a power system

CO5- Acquire knowledge about the Regulatory framework, ancillary services, power system economics and power management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-304	**Measurements and Instrumentation**

Course Outcomes

After completion of this course, students will be able to –
CO1-Identify various types instrument suitable for specific measurement.
CO2- Classify various errors present in measuring instruments.
CO3- Understand construction, working principle and types of oscilloscopes.
CO4-Comprehend different types of signal generators and analyzers, their construction and operation.
CO5-Describe the working principle, selection criteria and applications of various transducers used in measurem systems.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 a	**Electrical Engineering Materials**

UNIT	**CONTENT**

Course Outcomes:
CO 1 To Understand the basic concepts of materials.
CO 2 To use simplified materials selection concepts for design purposes.
CO 3 To Understand the properties of Materials.

CO4 Acquire knowledge of Conductivity of metals Ohm's law and relaxation time of electrons, collision time and mean free path, electron scattering and resistivity of metals.
CO5: Acquire knowledge of Classification of semiconductors, semiconductor conductivity, temperature dependence, Carrier density and energy gap, Trends in materials used in Electrical Equipment.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 b	**Electrical Machine Design**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the construction and performance characteristics of electrical machines.

CO 2 Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines

CO 3 Understand the principles of electrical machine design and carry out a basic design of an ac machine.

CO 4 Use software tools to do design calculation

CO5 Identify the limitations (assumptions) of traditional designs and need for CAD analysis, synthesis and hybrid models.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 c	**Power System Protection**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand power system protection.

CO 2 Understand the main components used in power system protection for electric machines, transformers.

CO 3 Understand the bus bars, overhead and underground feeders.

CO 4 Understand the earthing protection.

CO5 Explain the simulation of protection schemes by using Electro-Magnetic Transients (EMT) programs.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 b	**Renewable Energy Sources**

UNIT	CONTENT

Course Outcomes:

CO 1 To Understand the Need, importance and scope of non-conventional and alternate energy resources.

CO 2 To understand role significance of solar energy and wind energy

CO 3 To understand the role of ocean energy in the Energy Generation.

CO 4 To get the utilization of Biogas plants and geothermal energy

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 c	**High Voltage Engineering**

UNIT	CONTENT

Course outcomes:

At the end of the course, the student will demonstrate

CO1-Understand the basic physics related to various breakdown processes in solid, liquid, and gaseous insulating materials.

CO2- Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.

CO3- Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.

CO4- Knowledge of how over-voltages arise in a power system, and protection against these over-voltages.

CO5- Study and understand the nature of faults happening on both the AC and DC sides of the converters and formulate protection schemes for the same.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 a	**Computer Networks**

UNIT	CONTENT

Course Outcomes: The student will be able to:

CO1: Explain the functions of the different layer of the OSI Protocol;

CO2:. Describe the function of each block of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs);

CO3: Develop the network programming for a given problem related TCP/IP protocol; &

CO4: Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available

CO5 ***Analyze*** the features and operations of various application layer protocols such as HTTP, DNS and SMTP.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 b	Embedded System

Course Outcomes

After completion of this course, students will be able to –
CO1-Define basic operations of embedded microcontroller cores, processors and memories.
CO2-Describe the concept of Embedded System and its design for real life applications.
CO3-Explain the technological aspects of embedded systems through analog and digital blocks, sub systems user interfacing.
CO4-Examine design metrics, design tradeoffs and software aspects of embedded systems.
CO5- Illustrate Real Time Programming Languages and Real Time operating systems.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

CO4	3	3	3	2	2							2	3	2	

5	OEC-EE	OEC-EE-302 c	VLSI Circuits

UNIT	CONTENT

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. understand the process of VLSI fabrication

2. Investigate the Oxidation processes for VLSI/ULSI device fabrication

3. Learn about the environment for VLSI/ULSI technology

4. Understand Lithography and deposition processes

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

6	HSMC	HSMC-302	Personality Development Programme

UNIT	CONTENT

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

7th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PEC-EE	PEC-EE404	Program Elective -4	3	0	0	3	40	60	100
2	PEC-EE	PEC-EE-405	Program Elective -5	3	1	0	4	40	60	100
3	OEC-EE	OEC-EE-403	Open Elective -3	3	0	0	3	40	60	100
4	OEC-EE	OEC-EE-404	Open Elective -4	3	0	0	3	40	60	100
5	PROJ-EE	PROJ-EE01	Project Stage-I	0	0	2	2	180	120	300
6	SI	EE-SI	Summer Internship	0	0	2	2	120	80	200
			Total	**12**	**1**	**4**	**17**			**900**

1	PEC-EE	PEC-EE304a	**Electrical Energy Conservation and Auditing**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the current energy scenario and importance of energy conservation. Understand the concepts of energy management.

CO 2 Understand the methods of improving energy efficiency in different electrical systems.

CO 3 Understand the concepts of different energy efficient devices.

CO4: To analyze, calculate and improve the energy efficiency and performance of electrical and industrial utilities.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304b	**Industrial Electrical Systems**

UNIT	CONTENT

Course Outcomes:

CO1-At the end of this course, students will demonstrate the ability to

CO2- Understand the electrical wiring systems for residential, commercial, and industrial consumers, representing the systems with standard symbols and drawings, SLD.

CO3- Understand various components of industrial electrical systems.

CO4- Analyze and select the proper size of various electrical system components.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304c	**Power System Dynamics and**

			Control

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1- Understand the problem of power system stability and its impact on the system.

CO2- Analyse linear dynamical systems and use of numerical integration methods.

CO3-Model different power system components for the study of stability.

CO4-Understand the need and plan the methods to improve stability.

CO5: Design a mini project on having 2-3 generation sources having 3 generation sources and perform the process of power transfer from source to load with the help of transformers and at least three loads.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305a	NEURAL NETWORKS

UNIT	CONTENT

Course Outcomes:

At the end of the course, students will demonstrate the ability to

CO1. Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning

CO2. Get the response of an Learning Processes system

CO3 Apply Artificial Neural Network models to handle uncertainty and solve engineering problems.

CO4 Recognize the feasibility of applying a Neuro-model for a particular problem

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305b	**Digital signal Processing**

UNIT	CONTENT

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete time and frequency domain

2. Get the response of an LSI system to different signals

3. Design of different types of digital filters for vari ous applications

4 Implement Z transform and inverse Z transform of discrete signals

5 Model IIR and FIR filter using window techniques

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305c	**Computer Architecture**

Course Outcomes:

After completion of this course, students will be able to:
CO1: Understand the basics of computer architecture and its organization.
CO2: Recognize processor models based on their organization, addressing modes and instruction set.
CO3: Understand basics of ALU, control unit and computer organization such as memory & I/O.
CO4: Understand various architectures based on performance, cost and applicability.
CO5: Understand impact of modern techniques like pipelining, express buses processor performance.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403a	**Image Processing**

Course Outcomes:

After completion of this course, students will be able to:

CO1- ***Identify*** the fundamental elements of an image and ***Describe*** the need of digital image processing

CO2- ***Understand*** different types of image transformation techniques and their properties.

CO3- ***Use*** various noise models and ***Calculate*** the values for restoration and degradation models.

CO4- ***Analyze*** and ***Evaluate*** various image compression techniques.

CO5- ***Integrate*** and ***Demonstrate*** various Image Transformation and Segmentation Techniques

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403b	**Power Quality and FACTS**

Course Outcomes

After completion of this course, students will be able to:

CO1: Acquire knowledge of the advantage of compensation and will learn several aspects such as description, operation and characteristics of Thyristor-based FACTS devices: Static VAR Compensator (SVC), Thyristor Controlled Series Capacitor (TCSC), Thyristor Controlled Braking Resistor and Single Pole Single Throw (SPST) Switch.

CO2: Acquire knowledge of the operation and applicability of Voltage Source Converters and their realization details for implementation in FACTS Devices.

CO3: Analyze different possible applications of FACTS devices in order to improve stability and for achieving better voltage regulation along with the applicability of these as a solution provider for power quality problems in distribution networks.

CO4: Acquire the knowledge of custom power device DSTATCOM, classification of DSTATCOM, different topological realizations, operation control of DSTATCOM and reference current extraction paradigm based on Synchronous Reference Frame Theory.

CO5: Acquire the knowledge of custom power devices for voltage power quality problems (DVR, UPQC) and for current power quality problems (UPQC), different topological aspects of DVR and UPQC, principle of operation of these devices along with control paradigms

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403c	GENERATION OF ELECTRICAL POWER

UNIT	CONTENT

Course Outcomes:

At the end of the course, students will demonstrate the ability to

CO1- Understand the load curves, load-duration Curve.

CO2-Understand the power plant economics and tariff

CO3- Explore the significance of economic operation of steam plants

CO4- Apply techniques to evaluate generation cost, depreciation reserve and Acquire knowledge of different method of energy cost reduction.

CO5- Apply techniques to evaluate tariff and comparative study of various power plants.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO

CO1	1	3	3	2	1							2	3	2	
CO2	3	3	3	2	1							2	3	2	
CO3	3	3	3	2	2							2	3	2	
CO4	3	3	3	2	2							2	3	2	
CO5	3	3	3	2	2							2	3	2	

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Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

8th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PEC-EE	PEC-EE-406	Program Elective -6	3	0	0	3	40	60	100
2	OEC-EE	OEC-EE-405	Open Elective -5	3	0	0	3	40	60	100
3	OEC-EE	OEC-EE-406	Open Elective -6	3	1	0	4	40	60	100
4	PROJ-EE	PROJ-EE-02	Project Stage-II	0	0	2	2	360	240	600
			Total	**9**	**1**	**2**	**12**			**900**

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1	PEC-EE	PEC-EE-306a	**MODERN CONTROL THEORY**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand various design specifications.

CO 2 Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).

CO 3 Design controllers using the state space approach.

CO 4-Understand various design Adaptive control sysem

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306b	**Smart grid technology**

UNIT	CONTENT

Course Outcomes :

At the end of this course, students will demonstrate the ability to:

CO 1 Understand technologies for smart grid.

CO 2 Appreciate the smart transmission as well distributionsystems.

CO 3 Realize the distribution generation and smart consumption.

CO 4 Know the regulations and market models for smart grid.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306c	**Artificial intelligence techniques**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.

CO 2 Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing

CO 3 Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.

CO4 Classify different learning paradigms and its application in Neural Network

CO5 Explain concepts of Natural Language processing and discuss Expert System

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405b	**Power System Engineering**

course Outcomes

CO1: Understand power stability problems and the basic concepts of modeling and analysis of dynamical systems.
CO2: Analyze the behavior of Steady State, Dynamic and transient stability on power systems.
CO3: Analyze stability of single machine and multi-machine systems.
CO4: Analyze the stability of power system by Modified Euler's and Runge – Kutta method.
CO5: Comprehend various factors affecting steady state and transient stabilities.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405c	**Power System Planning**

Course Outcomes:

After completion of this course, students will be able to:

CO1: Gain information about basic building blocks of Power System planning.

CO2: Understand the basic concept of Power system reliability at generation, transmission and distribution level.

CO3: Analyze the effect of various parameters involved in Generation, Transmission and Distribution systems.

CO4: Understand the impact of demand side planning in deregulated market environment

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406a	**Computer Aided Power System Analysis**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 To introduce computer applications in the analysis of power systems.

CO 2 To understand the solution methods and techniques used in power system studies.

CO 3 To solve numerically the complex IEEE bus networks and the energy flow

Co4- **CO3:** Elaborate the concept of digital protection and signal conditioning

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406b	**Advanced Power Electronics**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the operation of power electronic converters and their control strategies.

CO 2 Understand the vector control strategies for ac motor drives

CO 3 Understand the implementation of the control strategies using digital signal processors.

CO4: Acquire knowledge about different AC voltage controllers and their control.

	PO1	PO 2	PO3	PO4	PO 5	PO6	PO7	PO8	PO 9	P1 0	P1 1	P12	PSO1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406c	**Power System Transients**

CO1- To explain the sources and effects of lightning, switching and temporary over voltages.

CO2 -To model and estimate the over voltages in power system

CO3- To develop travelling wave equation and to analyze travelling wave.

CO4- To analyze the insulation coordination of power system and protective devices.

CO5- To develop the modeling of power system for transient over voltages using Electromagnetic Transient Program (EMTP)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	Project Stage-II		Credit
No of Practical	PROJ-EE	PROJ-EE-02	Max. Marks: 600 (IA:360, TE:240) (0L+0T+2P 1)

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

(i) Apply and verify basic scientific principals and technologies.

(ii) Identify the scope of interdisciplinary knowledge

(iii) Make and design a prototype which is preferably a working model

Guidelines

1) A group of 3-4 students under the mentorship of a teacher to make a minor project. Interdisciplinary projects to be encouraged.

2) The project title and scope to be decided and presented in first 2nd/3rd weeks of the semester.

3) The progress of the project to be evaluated (internal) in 8th/9th week of the semester.

4) A draft of the project report to be prepared and the project to be evaluated (internal) 12th/13th week of the semester.

5) The project report and the project to be submitted in the department at the time of external evaluation.

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
B.Tech (1st Semester)
(Common to all branches)

Engineering Graduates will be able to:

1) Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.
2) Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3) Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
4) Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
5) Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6) The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7) Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9) Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
10) Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
11) Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12) Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change.

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	BSC	BSC-101	Engineering Physics (Common to all) (Major Core)	3	1	THEORY	4	40	60	100
2	BSC	BSC-102	Engineering Mathematics I (Major Core)	3	0		3	40	60	100
3	ESC	ESC-101	Computer Fundamentals (Ability Enhancement)	3	0		3	40	60	100
4	ESC	ESC-102	Basics of Mechanical Engineering (Multidisciplinary)	3	0		3	40	60	100
5	MC	MC-I	Environmental Studies (Minor stream) (Multidisciplinary)	2	0		2	40	60	100
6	HSMC	HSMC-101	Communicative English (Common to all)	2	0		2	40	60	100
7	ESC	ESC-103	Branch wise Workshop Practice Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
8	BSC	BSC-103	Engineering Physics I Lab (Minor Stream)			2	1	60	40	100
9	ESC	ESC-104	Computer Fundamentals Lab(Ability Enhancement)			2	1	60	40	100
10	HSMC	HSMC-102	Language Lab (Skill Enhancement Course)			2	1	60	40	100
TOTAL				**16**	**01**	**08**	**21**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Engineering Physics (BSC-101)

CO1: Understand and apply Maxwell's equations, which describe the fundamental laws of electromagnetism, including Gauss's law for electricity, Gauss's law for magnetism, Faraday's law of electromagnetic induction, and Ampère's law with Maxwell's addition.

CO2: Understand, apply, and manipulate Maxwell's equations to describe and analyze electromagnetic phenomena in both static and dynamic situations.

CO3: Understand and describe the impact of solid-state device capabilities and limitation on electronic circuit performance.

CO4: Understand the concepts of X-Rays and Ultrasonics.

CO5: Understand the basic concepts such as Nuclear Detectors, Characteristics of gas filled detectors and properties of Ionization chamber, proportional counter, G. M. Counter and Scintillation Counter.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	2		1			3				3	3	3	3
CO2	3	2	1		1			3	2			3	3	3	2
CO3	3	2	2		1		2	3	1		3	3	3	3	2
CO4	3	2	1		1		2	3	2			3	3	3	2
CO5	3	2	3		1			3	2		3	3	3	3	3

2. Engineering Mathematics-I (BSC-102)

CO-1: To explore the fundamental knowledge of asymptote, curvature and their types.
CO-2: Use the Euler's theorem, homogeneous function.
CO-3: Develop knowledge of double integration.
CO-4: Understand how to determine the natural of first order and higher order differential equation.
CO-5: Understand how to determine the nature of second order differential equation.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2	3

3. Computer Fundamentals (ESC-102)

CO1: Demonstrate knowledge on C Programming constructs learn to develop simple applications in C using basic constructs.
CO2: Design and implement applications using arrays and string
CO3: Develop and implement modular applications in C using functions
CO4: Develop applications in C using structures and pointers.
CO5: Design applications using sequential and random access file processing.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3		1		2			2				3	3	3	3
CO2	3	1	1		2			2				3	3	3	3

CO3	3	2			2			2				3	3	3	3
CO4	3	3	2		2			2				3	3	3	3
CO5	3	2	1		2			2	1			3	3	3	3

4. Basics of MechanicalEngineering (ESC-102)

CO1: Apply various laws of thermodynamics to various processes and real systems.

CO2: Familiarize you with the refrigerants, vapour compression refrigeration system and multi stage vapour compression system.

CO3: Under the basic concepts such as stress, strain, Hooks law, stress-strain diagram.

CO4: Familiarity with common manufacturing processes, such as machining, casting, welding, and their advantages and limitations.

CO5: Identify and analyze common machine elements and components, such as bearings, gears, shafts, and fasteners.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	1							3	3	3	3	3
CO2	3	3	2	1							3	3	3	3	3
CO3	3	3	2	1	2						3	3	3	3	3
CO4	3	3	2	1	2						3	3	3	3	3
CO5	3	3	2	1	2						3	3	3	3	3

5. Environmental Studies (MC-1)

CO1: On completion of this course students will be able to describe the scientific inquiry in the field of modern ecology, explain the main limitations on patters of productivity, Energy Flow through the natural food chain and food webs, ecosystem dynamics and patterns in population and communities.

CO2: The students will understand the chemical properties of materials occurring in the environment, the phenomenon in the environment and apply the knowledge to various environmental processes.

CO3: Develop the ability to understand the patterns of air pollution dispersion with respect to micrometeorological changes.

CO4: The students will be able to describe the physical and chemical composition of water and wastewater and elucidate how and why these compositions fluctuate, main source of water pollution, the main types of pollutants and how each type can be controlled.

CO5: The students will understand the technical, legal and economic aspects of collection, transportation and management of hazardous wastes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	1	1	1	1	2	2						1	2		
CO2		1	2	2									1	1	
CO3			2						1			1			
CO4	1			2			1						2		
CO5															

6. Communicative English (HSMC-101)

CO1: Use English Language effectively in spoken and written forms.

CO2: Comprehend the given texts and respond appropriately.

CO3: Communicate confidently in various contexts and different cultures.

CO4: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								3		3		3			2
CO2								3	2	3		3			2
CO3								3	2	3		3			2
CO4								3		3		3			2
CO5								3		3		3			2

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
B.Tech (2nd Semester)
(Common to all branches) Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	BSC	BSC-104	Communicative English II	2	0		2	40	60	100

2	BSC	BSC-105	Engineering Mathematics II (Major Core)	3	0		3	40	60	100
3	ESC	ESC-105	Programming with C (Ability Enhancement)	3	0		3	40	60	100
4	ESC	ESC-106	Basics of Electrical Engineering (Multidisciplinary)	3	0		3	40	60	100
5	ESC	ESC-107	Engineering Mechanics (Major Core)	3	0		3	40	60	100
6	BSC	BSC-106	Engineering Chemistry (Common to all)	3	0		3	40	60	100
7	ESC	ESC-108	BEE Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
9	ESC	ESC-109	Engineering Drawing Lab (Skill Enhancement Course)			2	1	60	40	100
10	ESC	ESC-110	Programming with C (Ability Enhancement)			2	1	60	40	100
11	BSC	BSC-108	Engineering Chemistry Lab (Minor Stream)			2	1	60	40	100
TOTAL				**17**	**01**	**10**	**21**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Communicative English II (BSC-104)

CO1: Use English Language effectively in spoken and written forms.

CO2: Comprehend the given texts and respond appropriately.

CO3: Communicate confidently in various contexts and different cultures.

CO4: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								3		3		3			2
CO2								3	2	3		3			2
CO3								3	2	3		3			2
CO4								3		3		3			2
CO5								3		3		3			2

2. Engineering Mathematics-II (BSC-105)

CO1: Explore the knowledge of integration and differentiation to solve the orthogonality of two spheres.

CO2: define the rank of matrix to find the nullity of matrix and calculate the Eigen values.

CO3: Develop the knowledge of integration and differentiation to solve the curl and gradients questions.

CO4: Explore the knowledge of half range Fourier sine and cosine series.

CO5: Use Lagrange's function to solve the differential problems.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2	3

3. Programming with C (ESC-105)

CO1: Demonstrate knowledge on C Programming constructs learn to develop simple applications in C using basic constructs

CO2: Design and implement applications using arrays and string

CO3: Develop and implement modular applications in C using functions

CO4: Develop applications in C using structures and pointers.

CO5: Design applications using sequential and random access file processing.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2			2			2	3	3	3	3
CO2	3	3	2		2			2			2	3	3	3	2
CO3	3	3	2		2			2			2	3	3	3	2
CO4	3	3	3	3	2			2			2	3	3	3	2
CO5	3	2	3	3	2			2	3		2	3	3	3	3

4. Basics of Electrical Engineering (ESC-106)

CO1: Students will gain knowledge regarding the various laws and principles associated with electrical systems.

CO2: Students will gain knowledge regarding DC network and apply them for practical problems.

CO3: Students will gain knowledge regarding various types' of semiconductors.

CO4: Student will gain knowledge about transistors and their application.

CO5: Student will gain knowledge on Basic Electronic Circuits and Instrumentation.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	1	2	1						2	1	1	1	
CO2	2	2	2	3	2						2	2	3		
CO3	3	1	2	2								1	1		
CO4	3	1	2	3	1							2		1	
CO5	3	2	2		2						3	2	1	2	

5. Engineering Mechanics (ESC-107)

CO1: Students will understand the concepts of engineering mechanics.

CO2: Understand the phenomenon of friction and transmission of power and ability to solve problem related to the same.

CO3: Students will gain knowledge regarding center of gravity and moment of inertia and apply them for practical problems.

CO4: Modelling and analysis of forces systems acting on rigid bodies to evaluate position velocity and acceleration.

CO5: Fundamental understanding of mechanical vibrations and finding out natural frequency for mechanical systems. Application of free damped and forced vibrations on mechanical systems

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	1	3	2	2	3	3	3	3
CO2	3	3	3	3	3	3	2	1	2	2	2	3	3	3	3
CO3	3	3	3	3	3	2	2	1	2	2	2	3	3	3	3
CO4	3	3	3	3	3	3	3	1	2	2	2	3	3	3	3
CO5	3	3	3	3	3	3	3	1	2	3	2	3	3	3	3

6. Engineering Chemistry (BSC-106)

CO1: Analyze the need, design and perform a set of experiments.

CO2: Identify the structure of unknown/new compounds with the help of new engg material.

CO3: Differentiate hard and soft water, solve the related numerical problems on water purification and its significance in industry and daily life.

CO4: Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.

CO5: Understand the causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PS O1	PS O2	PS O3
CO1	3	3	2	3	1	2	1		2	2	1	2	3	2	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	2	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	2	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	1
CO5	3	2	1	1	3	3	2		1	1	1	2	3	3	2

SUBJECT NAME:-DATA STRUCTURE & ALGORITHM USING C
SUBJECT CODE:-PCC-CSE 201

CO1. Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented and used them and their common applications.
CO2. Discuss the efficiency of the sorting and searching algorithms
CO3. Implementation of Trees and Graphs and perform various operations on these data structures.
CO4. Understanding the concept of recursion, application of recursion and its implementation.
CO5. Identify the alternative implementations of data structures with respect to its performance to solve a real-world problem.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	

SUBJECT NAME: -OBJECT ORIENTED PROGRAMMING USING C++
SUBJECT CODE: -PCC-CSE-202

CO1. Able to develop programs with reusability.
CO2. Develop programs for file handling.
CO3. Handle exceptions in programming.
CO4. Develop applications for a range of problems using OOP techniques

CO5. Demonstrate the use of various OOPs concepts with the help of programs.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2	2									3		2
CO2	3	2	2									3		2
CO3	3	3	2									2		3
CO4	3	3	3	2	2	1			2		2	3	2	2
CO5	3											2		2

SUBJECT NAME:-DATABASE MANAGEMENT SYSTEM
SUBJECT CODE:-PCC-CSE-203
Course Outcomes:

CO 1. Describe the fundamental elements of relational database management systems.
CO 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
CO 3. Design ER-models to represent simple database application scenarios
CO 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
CO 5. Improve the database design by normalization.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3										1	2		
CO2	3	2	3								2	2	3	3
CO3	3	3	3	2	2	1	1		2	1	2	2	2	2
CO4	3	2		1								1		
CO5	3		2									2	1	

SUBJECT NAME:-UNIX & SHELL PROGRAMMING
SUBJECT CODE: - PCC-CSE-204
Course Outcomes:

CO1: Understand the basic concepts of UNIX Architecture and basic Command.
CO2: Understand the commands related to Shell basics, vi editor and regular expression commands.
CO3: Understand the concepts of advance file concepts, commands related to Shell script and filter commands.
CO4: Understand the concepts in Korn Shell and Interactive C Shell.
CO5: Understand different types of Files, File system and basic file system commands.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2	1									1		2
CO2	3	2	1									1		2
CO3	3	1	1									1		2

CO 4	3	1			1						1		2
CO 5	3		1								1		2

SUBJECT NAME:-Mathematics III

Course Outcomes:

CO1: To explore the fundamental knowledge of transforms and their types.

CO2: Laplace Transform and their applications.

CO3: Develop knowledge of double integration.

CO4: Explore the distribution in different situations.

CO5: Use Analytic functions

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3	3	2	3	1	2	1		2	2	1	2	3	3
CO 2	3	3	3	3	2	2	1		1	1	1	1	3	3
CO 3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO 4	3	3	3	3	3	2	2		2	1	1	1	3	2
CO 5	3	2	1	1	3	3	2		1	1	1	2	3	2

SUBJECT NAME:- Digital Electronics

CO1: Identify and enumerate different electronic components.

CO2: Illustrate reduction of logical expressions using boolean algebra and implement the functions using logic gates. Design and analyse synchronous and asynchronous sequential circuits using flip-flops.

CO3: Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.

CO4: Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application.

CO5: Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO 1	PSO 2
CO 1	2											2		
CO 2	2	3		2	2		3		1	1	1	1		
CO 3	1	2	2	2	2	2		3		2		2		
CO 4		2		2		2		2			1			
CO 5	2		1	1	1		2	1	1	1	1	1		2

SUBJECT NAME:-Discrete Mathematics

CO1: Explore the knowledge of set theory in relation, function and partially ordered relation.

CO2: define the concepts of truth table and modulus form to explore the universal quantification.

CO3: Develop the knowledge of generating function for recurrence relation.

CO4: Explore the knowledge of prime group, cyclic group and concept of ring.

CO5: Use graph theory to find the shortest path between any to vertices.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO 1	PSO 2
CO 1	3											1		
CO 2	3											3		
CO 3	2											2		
CO 4	3											3		
CO 5	3											3		

SUBJECT NAME:-Computer Organization and Architecture

CO1: Understand the theory and architecture of central processing unit.

CO2: Analyze some of the design issues in terms of speed, technology, cost, performance.

CO3: Design a simple CPU with applying the theory concepts.

CO4: Use appropriate tools to design verify and test the CPU architecture.

CO5: Learn the concepts of parallel processing, pipelining and interprocessor communication.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	2											2		
CO 2	2	1	1	1								2	2	2
CO 3	2	2	2		2							2		
CO 4	3	2	2	1	3							3		
CO 5	3	1							1	1		2		

SUBJECT NAME: - DESIGN AND ANALYSIS OF ALGORITHM
SUBJECT CODE: - PCC-CSE-212
Course Outcomes:
CO1.Students will be introduced with algorithm.
CO2.Students will learn to design algorithms.
CO3.Students will learn to implement algorithm for coding.
CO4. Argue the correctness of algorithms using inductive proofs and invariants.
CO5. Analyze worst-case running times of algorithms using asymptotic analysis.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	2	2	2	1	1							1	3	1
CO 2	2	1	1	1	1							1	1	1
CO 3	2	2	2	1	1							1	3	1
CO 4	2	2	2	1	1							1	3	1
CO 5	2	1	1	1	1							1	1	2

SUBJECT NAME: - OPERATING SYSTEM

SUBJECT CODE: - PCC-CSE-213

Course Outcomes:

CO 1. Identify the role of Operating System. To understand the design of control unit.

CO2. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems.

CO3. Describe the role of paging, segmentation and virtual memory in operating systems.

CO4. Description of protection and security and also the Comparison of UNIX and Windows based OS.

CO5. Defining I/O systems, Device Management Policies and Secondary Storage Structure.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	2											2		
CO 2	3	2			2							3	2	2
CO 3	3	2										2		
CO 4	2				2							2		
CO 5	2											1		

SUBJECT NAME: - SOFTWARE ENGINEERING

SUBJECT CODE: - PCC-CSE-302

Course Outcomes:

CO 1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO 2. An ability to work in one or more significant application domains.

CO 3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO 4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO 5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3	2	2	2								3	2	2
CO 2	3		1	1								2		
CO 3	2	2	3	2	2	1	1		3	2	2	3	3	3
CO 4	3				2							2		

CO 5	3				3	2	1					2		

SUBJECT NAME:-FORMAL LANGUAGE AND AUTOMATA THEORY
SUBJECT CODE: - PCC-CSE 303
Course Outcomes:
CO 1 Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.
CO 2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics .
CO 3 Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.
CO 4. Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language
CO 5. Attitude- Develop a view on the importance of computational theory

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											2		
CO 2	3	2	3	2								3	2	2
CO 3	3	2	3	2								2	2	2
CO 4	2	3	3	3								2	2	1
CO 5	2											1		

SUBJECT NAME: - Java Programming
SUBJECT CODE: - PCC-CSE 304
Course Outcomes:
CO 1. Learn to apply object oriented programming features and concepts for solving given problem.
CO2. Learn to use java standard API library to write complex programs
CO 3. Learn implementation of object oriented programming concepts using java
CO 4. Able to develop interactive programs using applets and swings.
CO 5. Develop advanced skills for programming in Java

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											3		
CO 2	2	2	2	2	3				2			2	2	2

CO 3	3											2		
CO 4	2											2		
CO 5	3	2	2	2	2	2			2	2	2	3	2	3

SUBJECT NAME: - Compiler Design
SUBJECT CODE: - PCC-CSE 308
Course Outcomes:
CO1. To realize basics of compiler design and apply for real time applications.
CO 2. To introduce different translation languages
CO 3. To understand the importance of code optimization
CO 4. To know about compiler generation tools and techniques
CO 5. To learn working of compiler and non-compiler applications and design of compiler for simple programming language.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3	1	1									2		
CO 2	2											1		
CO 3	3	3	2	2	3							2		
CO 4	2				3							2		
CO 5	3	2	3	2	2							3	3	3

SUBJECT NAME: - Data Mining & Ware-housing
SUBJECT CODE: - PCC-CSE 309
Course Outcomes:
CO 1. Understand the functionality of the various data mining and data warehousing component.
CO 2. Appreciate the strengths and limitations of various data mining and data warehousing models.
CO 3. Explain the analyzing techniques of various data.
CO 4. Describe different methodologies used in data mining and data ware housing.
CO 5. Compare different approaches of data ware housing and data mining with various technologies.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											2		

CO 2	3				2							2		
CO 3	2	2										2	2	
CO 4	3				3							3		
CO 5	2	2		1	2							2	2	

SUBJECT NAME: - Computer Network
SUBJECT CODE: - PCC-CSE 310
Course Outcomes:
CO 1. Students will be aware about computer networking.
CO 2. Students will know about various layers of OSI Model.
CO 3. Students will learn about wired & wireless technologies.
CO 4. Students will learn about the services of different layers.
CO 5. Explain the different Transport Layer function i.e. Port addressing, Connection Management,
Error control and Flow control mechanism.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											2		
CO 2	3											2		
CO 3	3				1					1		2		
CO 4	3	2		2	2							3		
CO 5	3	3		2	2							2	1	

SUBJECT NAME: - Elective-II (Theory of Computation-305)
SUBJECT CODE: - PEC-CSE 304-306
Course Outcomes:
CO1. Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.
CO2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics - Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.
CO3 Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language
CO4 Attitude- Develop a view on the importance of computational theory.

CO5. Describing the limitations of a computing machine.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											2		
CO 2	3	2	3	2								3	2	2
CO 3	3	2	3	2								2	2	2
CO 4	2	3	3	3								2	2	1
CO 5	2											1		

SUBJECT NAME: - Elective III (Web and Internet Technology-309)
SUBJECT CODE: -PEC-CSE 307-309

Course Outcomes:

CO 1. Students will be familiar with Internet.
CO 2. Students will be familiar with different protocols of internet.
CO 3. Students will learn different services of internet.
CO 4. Analyze a web page and identify its elements and attributes.
CO 5. Students will learn HTML, CSS, JAVA Scripts for web designing.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3				3	2	2	3	2	3		3	3	
CO 2	3											2		
CO 3	3											2		
CO 4	3				3	2	2	3		3	2	3	3	2
CO 5	3				3	3	2	3	2	2		3	3	2

SUBJECT NAME: - Open Elective-I Cyber Laws and Ethics-302)
SUBJECT CODE: - OEC-CSE 301-303

Course Outcomes:

CO 1. Make learner conversant with the social and intellectual property issues emerging from cyberspace.
CO 2. Explore the legal and policy developments in various countries to regulate cyberspace.
CO 3. Develop the understanding of relationship between commerce and cyberspace.
CO 4. Give learners in depth knowledge of information technology act and legal framework of right to privacy, data security and data protection.
CO 5. Make study on various case studies on real time crimes.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3					2		3				3		
CO 2	3					2		3				3		
CO 3	3					3		3				3		
CO 4	3					2		3				3		
CO 5	3					3		3				3		

SUBJECT NAME:- Network Security & Cryptography
SUBJECT CODE:- PCC-CSE-401
Course Outcomes:
CO 1. Understand basic cryptographic algorithms, message and web authentication and security.
CO 2. Identify information system requirements for both of them such as client and server.
CO 3. Understand the current legal issues towards information
CO 4. Distinguish and explain different protocol like SSL, TLS Visà-vis their applications.
CO 5. Comprehend and explain security services and mechanisms.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3					3						3		
CO 2	2	2				2		2				2	2	
CO 3	3					2		3				2		
CO 4	3					3						3		
CO 5	3				2	3		3				3	3	2

SUBJECT NAME: - Parallel and Distributed Algorithm
SUBJECT CODE:- PEC-CSE-402
Course Outcomes:
CO 1. Understand the requirements for programming parallel systems and how they can be used to facilitate the programming of concurrent systems.
CO 2. To learn and apply knowledge of parallel and distributed computing techniques and methodologies.
CO 3. To learn the architecture and parallel programming in graphics processing units (GPUs).
CO 4. Understand the memory hierarchy and cost-performance tradeoffs.
CO 5. To gain experience in the design, development, and performance analysis of parallel and distributed applications.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3											2		
CO 2	3		2	2	2			2	2		1	2	3	2
CO 3	3											2		
CO 4	2											2		
CO 5	3	2	3	2	3	2	2		2	2	2	3	3	3

SUBJECT NAME:-Cloud Computing
SUBJECT CODE:- PEC-CSE-406
Course Outcomes:

CO1. Able to understand basic concepts, principles and paradigm of Cloud Computing
CO2. Able to interpret various Cloud computing models and services.
CO3. Able to identify the significance of implementing virtualization techniques.
CO4. Able to understand the need of security in Cloud computing.
CO5. Understand the concept SOA and cloud based storage in Cloud computing.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	3	1			1	1		1			1	2		
CO 2	1	2	1	3	1		1					2		
CO 3		1	3	1	2	1		1				3		
CO 4	2	1	2	1		2	1					2		
CO 5		1	1	2	1	2		1				3		

SUBJECT NAME:-Advanced Computer Architecture
SUBJECT CODE:- PEC-CSE-403

CO1.Demonstrate concepts of parallelism in hardware/software.
CO2.Discuss memory organization and mapping techniques.
CO3.Describe architectural features of advanced processors.
CO4.Interpret performance of different pipelined processors.
CO5.Explain data flow in arithmetic algorithms.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2

CO 1	3											2		
CO 2	3											3		
CO 3	3											3		
CO 4	3	3			2							3	2	
CO 5	3											3		

SUBJECT NAME:-Artificial Intelligence & Expert System
SUBJECT CODE:- PEC-CSE-404

CO1 Study the concepts of AI and related searching algorithms.
CO2 Develop the knowledge skills and it's representational structure in AI.
CO3 Study the concepts of natural language processing in AI.
CO4 Study the concepts of supervised/unsupervised machine learning and game technique.
CO5 Study how design the programming skill in PROLOG, and concepts of pattern recognition approaches.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	2	3	3	2	2	1	1					3		
CO 2	1	2	3	1	2		1					2		
CO 3	1	1		1	1		3					2		
CO 4	2	1	2	3	1		1					2		
CO 5	1	2	3	3	2		1					3	2	2

SUBJECT NAME:-Optimization Technique
SUBJECT CODE:- PEC-CSE 407

CO1: Formulate the engineering problems as an optimization problem.

CO2: Apply necessary and sufficient conditions for a given optimization problem for optimality

CO3: Select appropriate solution methods and strategies for solving an optimization problem and interpret and analyze the solution obtained by optimization algorithms

CO4: Justify and apply the use of modern heuristic algorithms for solving optimization problems

CO5: Solve Engineering Design and Manufacturing related optimization problem using software tools.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1	2	3	1	1	1				1	1		1	1	
CO 2	1	3	2	1						1			1	
CO 3	1	3	2	1	1				2	1				
CO 4	2	2	2	2	2				2	1				
CO 5	1	3	3	2	3				2	2		1		

SUBJECT NAME:- Human Resource Management
SUBJECT CODE:- OEC-CSE 404

CO1: To understand Strategic HRM, Aligning systems with business strategy

CO2: Be able to establish the linkage between firm strategy and HR practices of the firm through Resource-based view of Competitive Advantage and Sustained Competitive Advantage.

CO3: Be able to identify the HR Strategy in work force utilization, employee shortage and surplus.

CO4: Be able to identify strategies for performance and development. Able to develop view point for performance from employer and employee both side.

CO-5: To understand effectiveness and future of SHRM, Measure cost and benefit of HRM.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P1 0	P1 1	P1 2	PSO 1	PSO 2
CO 1				3										
CO 2	2			3										
CO 3		1	2		3									
CO 4			3		3	2							2	2
CO 5		3				1								

SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
RAFFLES UNIVERSITY, NEEMRANA
Department of Mechanical Engineering
B.Tech (4 Years Degree Program)

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.
PO 2	Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO 4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO 5	Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO 11	Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO 12	Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change

Program Education Objective

PEO 1	To impart deep knowledge of mechanical engineering and interdisciplinary subjects.
PEO 2	To use modern tools in academic to enhance the technical skills of the students for implementation of the scientific concepts.

PEO 3	To prepare the students to address social, technical and engineering challenges innovatively.
PEO 4	To enhance various skills of the students involved in decision making.
PEO 5	To motivate and prepare the students to take-up career in different industries or to pursue higher studies in mechanical and interdisciplinary programs.

Program Specific Objectives

PSO 1	To impart proper knowledge of science and mechanical engineering related subjects to the students.
PSO 2	To enhance the skills of the students with the ability to implement the scientific concepts for betterment of the society.
PSO 3	To prepare the students to become innovators who can address social, technical and engineering challenges.

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (3rd Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	BSC	BSC- 201	Mathematics III (Multidisciplinary	3	0	THEORY	3	40	60	100
2	PCC	PCC-ME- 201	Strength of Materials (Major Core)	3			3	40	60	100
3	PCC	PCC -ME-202	Thermodynamics (Major Core)	3	0		3	40	60	100
4		PCC-ME- 203	Material Science and Engineering (Major Core)	3	0		3	40	60	100
5	PCC	PCC- ME-204	Manufacturing Process I (Major Core)	3	0		3	40	60	100
6	MC	MC-III	Introduction of Indian Law (Value Added Courses)	2	0		2	40	60	100
7	PCC	PCC-M-205	Machine Drawing and Auto Cad Lab (Major (Core)	PRACTICAL		2	1	60	40	100
8	PCC	PCC-ME-206	Thermodynamics Lab (Minor Core)			2	1	60	40	100
9	PCC	PCC-ME-207	Manufacturing Process I Lab (Major Core)			2	1	60	40	100

10	PCC	PCC-ME-208	Strength of Materials Lab (Major Core)			2	1	60	40	100
TOTAL				**15**	**02**	**08**	**21**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Mathematics III (BSC-201)

CO1: To explore the fundamental knowledge of transforms and their types.

CO2: Laplace Transform and their applications.

CO3: Develop knowledge of double integration.

CO4: Explore the distribution in different situations.

CO-5: Use Analytic functions

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3		3	2	2		1	2	1	2	3	3	2	3
CO2	3	3		3	2	2		1	1	1	2	3	2	2	3
CO3	3	3		2	2	2		1	2	1	2	3	3	2	3
CO4	3	2		3	2	2		1	1	1	2	3	3	2	3
CO5	3	2		3	2	2		1	1	1	2	3	3	2	3

2. Strength of Materials (PCC- ME-201)

Course Outcomes:

CO1: Apply materials and their elastic constants for composite bar subjected to various loads including thermal load.

CO2: Solve the problems on structural members subjected to Uni-axial load.

CO3: Construct Shear Force, Bending moment and Bending stress distribution in beams subjected to transverse load.

CO4: Determine the deflection of statically determinant beam.

CO5: Design Columns with different end conditions.

CO-PO Mapping

Course	Program Outcomes	PSO

Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	3	1	1	2	2	2	3	3	3	2
CO2	3	2	3	3	3	3	1		2	2	2	3	3	3	2
CO3	3	2	3	3	3	2	1		3	2	2	3	3	3	2
CO4	3	2	3	3	3	2	1		3	2	2	3	3	3	2
CO5	3	2	3	3	3	3	1	1	2	2	2	3	3	3	2

3. Thermodynamics (PCC -ME -202)

Course Outcomes:

CO1: Apply various laws of thermodynamics to various processes and real systems.

CO2: Apply the concept of Entropy, Calculate heat, effort and other important thermodynamics properties for various ideal gas processes.

CO3: Estimate performance of various thermodynamics gas power cycles and gas refrigeration cycles and availability in each case.

CO4: Estimate stoichiometric air required for combustion, performance of vapour power cycle and vapour compression cycle.

CO5: Use psychometric charts and estimates various essential properties related to Psychrometry and process.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1					2	3	3	3	2
CO2	3	3	3	3	3	1					2	3	3	3	2
CO3	3	3	3	3	3	1					2	3	3	3	2
CO4	3	3	3	3	3	1					2	3	3	3	2
CO5	3	3	3	3	3	1					2	3	3	3	2

4. Material Science and Engineering (PCC -ME -203)

CO1. Identify and depict the crystal structure and their properties based on the structure.

CO2. Quantify the imperfections in a crystal.

CO3. Analyze the mechanical properties of engineering materials, draw the stress – strain diagrams.

CO4. Classify composite materials and their importance in engineering design and determine the type of fracture mechanism.

CO5. Outline heat treatment process to obtain required mechanical properties for a given alloy.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	3	3	2						3	3	3	3	3
CO2	3	3	3	3	2						3	3	3	2	3
CO3	3	3	3	3	2						3	3	3	2	3
CO4	3	3	3	3	2						2	3	3	3	2
CO5	3	3	3	3	2						2	3	3	3	2

5. Manufacturing Process- I (PCC -ME -204)

CO1. To apply the knowledge of various manufacturing processes

CO2. To identify various process parameters and their effect on processes

CO3: Students should be able to design and analyze various manufacturing processes and tooling

CO4: To figure out the application of modernization in machining.

CO5: Get the knowledge of Jigs and Fixtures so as to utilize machine capability for variety of operations

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						2	3	3	3	3
CO5	3	3	3	3	3						2	3	3	3	3

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (4th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-210	Kinematics of Machine	2	1	THEORY	3	40	60	100

			(Minor Core)							
2	PCC	PCC-ME-211	Fluid Mechanics (Major Core)	3	0		3	40	60	100
3	PCC	PCC-ME-212	Manufacturing Process II (Major Core)	3	0		3	40	60	100
4	PCC	PCC-ME-213	Heat Transfer (Major Core)	2	1		3	40	60	100
5	PCC	PCC-ME-214	Industrial Engineering	2	1		3	40	60	100
6	PCC	PCC-ME-215	Design of Machine Element	2	1		3	40	60	100
7	PCC	PCC-ME-216	Kinematics of Machine Lab	2	0		1	40	60	100
8	PCC	PCC-ME-217	Fluid Mechanics Lab	PRACTICAL		2	1	60	40	100
9	PCC	PCC-ME-218	Manufacturing Process-II Lab			2	1	60	40	100
10	PCC	PCC-ME-219	Heat Transfer Lab			2	1	60	40	100
TOTAL				**16**	**03**	**06**	**22**	**460**	**540**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Kinematics of Machine (PCC -ME-210)

CO1: Designing a suitable mechanism depending on application

CO2: Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers,

CO3: Drawing velocity and acceleration diagrams for different mechanisms,

CO4: Selecting gear and gear train depending on application.

CO5: Understand the kinetics of the rigid bodies and solve simple problems using work-energy method.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1					3	3	3	3	3
CO2	3	3	3	3	3	1					3	3	3	3	3

CO3	3	3	3	3	3	1					3	3	3	3	3
CO4	3	3	3	3	3	1					3	3	3	3	3
CO5	3	3	3	3	3	1					3	3	3	3	3

2. Fluid Mechanics (PCC -ME-211)

CO1: To familiarize with the properties of fluids and fluid kinematics.

CO2: Apply Bernoulli's equation to fluid flow problems.

CO3: To understand the concept of dimensional analysis and incompressible flow.

CO4: Apply appropriate equations and principles to analyze pipe flow problems and turbulent flow.

CO5: Apply the boundary layer theory to determine lift and drag forces on a submerged body.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	3	3	2							3	3	2	3
CO2	3	3	3	3	2							3	3	2	3
CO3	3	3	3	3	2							3	3	2	3
CO4	3	3	3	3	2							3	3	2	3
CO5	3	3	3	3	2							3	3	2	3

3. Manufacturing Process-II (PCC -ME -212)

CO1: Student should be able to apply the knowledge of various manufacturing processes.

CO2: Student should be able to identify various process parameters and their effect on processes.

CO3: Student should be able to design and analyze various manufacturing processes and tooling.

CO4: Student should be able to figure out application of modernization in machining.

CO5: Students should get the knowledge of Jigs and Fixtures so as to utilize machine capability for variety of operations.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	3	3	3	2					3	3	3	3	3
CO2	3	3	3	3	3	2					3	3	3	3	3
CO3	3	3	3	3	3	2					3	3	3	3	3
CO4	3	3	3	3	3	2					3	3	3	3	3

CO5	3	3	3	3	3	2					3	3	3	3	3

4. Heat Transfer (PCC -ME -213)

CO1: Apply the principles of heat transfer to analyze and solve practical engineering problems.

CO2: Demonstrate proficiency in conducting experiments related to heat transfer.

CO3: Analyze and design heat exchangers and other heat transfer equipment.

CO4: Apply computational tools and software for heat transfer analysis.

CO5: Evaluate and select appropriate heat transfer techniques for specific engineering applications.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	2	2
CO2	3	3	3	3	3						3	3	3	2	2
CO3	3	3	3	3	3						3	3	3	2	2
CO4	3	3	3	3	3						3	3	3	2	2
CO5	3	3	3	3	3						3	3	3	2	2

5. Industrial Engineering (PCC -ME -214)

CO1: Students will be able to understand the Basic Concepts of Industrial Engineering as well as the organization structures of Industry.

CO2: Students will be able to understand the Various Production Systems and Sale Forecasting Methods.

CO3: Students will be able to understand the concept of work study to improve productivity of men, machines and materials.

CO4: Students will be able to understand the Importance of Planning in the Industry

CO5: Students will be able to know the Importance of Inventory Control and Material Handling systems.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	2			1	2	3	3	3	3	3
CO2	3	2	3	2	3	2			1	2	3	3	3	3	3
CO3	3	2	3	2	3	2			1	2	3	3	3	3	3
CO4	3	2	3	2	3	2			1	2	3	3	3	3	3

CO5	3	2	3	2	3	2			1	2	3	3	3	3	3

6. Design of Machine Element (PCC -ME -215)

CO1: To understand and apply principles of gear design for Spur, Helical, Bevel and Worm gear

CO2: To understand and analyse the concepts of Mechanical Joints like Riveted Joint, Welded Joints and Screwed Joints

CO3: To develop capability to design and analyse the Shaft diameter and different spring parameters.

CO4: To inculcate an ability to design belt drives and selection of belt, rope and chain drives.

CO5: To achieve an expertise in design of Sliding contact bearing in industrial applications.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (5th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC ME 301	Dynamics of Machines (Major Core)	2	1	THEORY	3	40	60	100
2	PCC	PCC ME 302	Hydraulic Machines (Major Core)	2	1		3	40	60	100
3	PCC	HSMC 301	Principle of Management (Value Added Courses)	3	0		3	40	60	100
4	PCC	PCC ME 303	IC Engines (Major (Core)	2	1		3	40	60	100
5	HSMC	PCC ME 304	Design of Transmission Systems (Major Core)	2	0		2	40	60	100

6	PEC	PCC ME 305	Measurement and Metrology (Multidisciplinary)	2	0		2	40	60	100
7	PCC	PCC ME 306	Hydraulic Machines Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
8	PCC	PCC ME 307	Dynamics of Machines Lab (Major Core)			2	1	60	40	100
9	PCC	PCC ME 308	IC Engine Lab (Minor Core)			2	1	60	40	100
10	PROJ	PROJ ME 301	Industrial Training/ Project Seminar			2	1	60	40	100
TOTAL				**13**	**03**	**10**	**20**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**
***ESE (End Semester Exam)**

1. Dynamics of Machines (PCC-ME-301)

CO1: To equip the student with fundamental knowledge of dynamics of machines so that student can appreciate problems of dynamic force balance, transmissibility of forces, isolation of systems, vibrations.

CO2: Compute frictional losses, torque transmission of mechanical systems.

CO3: Develop knowledge of analytical and graphical methods for calculating balancing of rotary and reciprocating masses.

CO4: Develop understanding of dynamic balancing, gyroscopic forces and moments.

CO5: Understand how to determine the natural frequencies of continuous systems starting from the general equation of displacement.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

2. Hydraulic Machines (PCC-ME -302)

CO1: Work out the hydrodynamic force by liquid jet on plane surface and curved vanes for fixed and moving conditions.

CO2: Apprehend working of impulse and reaction turbine and their components parts.

CO3: Design and analysis performance characteristics of Pelton wheel, Kaplan turbine and Francis turbine

CO4: Comprehend working of different types of pumps and work out the efficiency of Centrifugal pump.

CO5: Compare hydropower plants with other types of power plants and calculate load factor and capacity factor for the hydropower plants.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2							3	3	3	3
CO2	3	3	2	2	2							3	3	2	3
CO3	3	3	2	2	2							3	3	2	3
CO4	3	3	2	2	2							3	3	3	3
CO5	3	3	2	2	2							3	3	2	3

3. Principle of Management (HSMC-301)

CO1: Identify and apply appropriate management techniques for managing business

CO2: Have a conceptual knowledge about the planning and decision making

CO3: Apply the concept of organizing for the effective functioning of a management

CO4: Evaluate leadership style to anticipate the consequences of each leadership style

CO5: Demonstrate the techniques for controlling and coordination

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3
CO2	3	3	3	2	3	2	2	3	3	3	3	3	3	3	3
CO3	3	3	3	2	3	2	2	3	3	3	3	3	3	3	3
CO4	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3
CO5	3	3	3	2	3	2	3	3	3	3	3	3	3	3	3

4. I.C Engines (PCC-ME-303)

CO1: Understand different types of engines, applications, ideal cycles of operation and deviation with actual cycle and performance parameters

CO2: Understand fuel air cycles and deviations with actual cycles, effect of various operating variables of SI and CI engines, value timing diagrams and working of 2-S and 4-S engines.

CO3: Understand combustion phenomena in SI and CI engines and combustion chamber design, Knocking phenomena, fuel additives and different types of fuels.

CO4: Understand fuel supply systems, cooling systems and lubrication systems.

CO5: Apply basic calculations of the engine on performance and understand governing methods.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2						3	3	3	3	3
CO2	3	3	3	3	2						3	3	3	3	3
CO3	3	3	3	3	2						3	3	3	3	3
CO4	3	3	3	3	2						3	3	3	3	3
CO5	3	3	3	3	2						3	3	3	3	3

5. Design of Transmission Systems (PCC-ME-304)

CO1: Apply materials and their elastic constants for composite bar subjected to various loads including thermal load.

CO2: Solve the problems on structural members subjected to Uni-axial load.

CO3: Construct Shear Force, Bending moment and Bending stress distribution in beams subjected to transverse load.

CO4: Able to Determine the deflection of statically determinant beam.

CO5: Able to Design Columns with different end conditions.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3						3	3	3	3	3
CO2	3	3	3	3	3						3	3	3	3	3
CO3	3	3	3	3	3						3	3	3	3	3
CO4	3	3	3	3	3						3	3	3	3	3
CO5	3	3	3	3	3						3	3	3	3	3

6. Measurement and Metrology (PCC-ME-305)

CO1: Develop a solid understanding of the fundamental principles and concepts of measurement, including units, standards, and measurement systems.

CO2: Gain knowledge about the role of limits, fits, and tolerances in ensuring proper assembly and functionality of mechanical components.

CO3: Gain a comprehensive understanding of various measuring instruments used for dimensional measurement, such as calipers, micrometers, gauges, and dial indicators. Understand their working principles, features, and applications.

CO4: Gain proficiency in using thread gauges, thread micrometers, and other specialized measuring instruments for thread measurement.

CO5: Develop a comprehensive understanding of the geometric principles and concepts related to machine tools.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3		2				3	3	3	3	3
CO2	3	3	3	3	3		2				3	3	3	3	3
CO3	3	3	3	3	3		2				3	3	3	3	3
CO4	3	3	3	3	3		2				3	3	3	3	3
CO5	3	3	3	3	3		2				3	3	3	3	3

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (6th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME 310	Automobile Engineering	3	0	THEORY	3	40	60	100
2	OEC	PCC-ME 311	Mechanical Vibration	3	0		3	40	60	100
3	OEC	PCC-ME 312	Operation Research	3	0		3	40	60	100
4	PCC	PEC ME 302	Professional elective Tribology Elective-1 Multidisciplinary	2	1		3	40	60	100
5	OEC	OEC-302	Open Elective I (TQM) (Multidisciplinary)	2	1		3	40	60	100
6	OEC	OEC-304	Open Elective II (Cyber Law and Security) (Value Added Courses)	2	1		3	40	60	100

7	PCC	PCC-ME 313	Automobile Engineering Lab	PRACTICAL	2	1	60	40	100
8	PCC	PCC-ME 314	Mechanical Vibration Lab		2	1	60	40	100
9	PCC	PCC-ME-315	Robotics Lab		2	1	60	40	100
10	HSMC	HSMC-ME-302	Aanandam (Activity of joy)		4	2			100
TOTAL				**15**	**03**	**08**	**23**	**480**	**520**	**1000**

***CIE (Continues Internal Evaluation)**
***ESE (End Semester Exam)**

1. Automobile Engineering (PCC-ME -310)

CO1: Identify the different parts of the automobile

CO2: Explain the working of various parts like engine, transmission, clutch, Brakes

CO3: Describe how the steering and the suspension systems operate.

CO4: Understand the environmental implications of automobile emissions

CO5: Develop a strong base for understanding future developments in the automobile industry

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	1	2				3	3	3	3	3
CO2	3	3	3	3	3	1	2				3	3	3	3	3
CO3	3	2	3	3	3	1	2				3	3	3	3	3
CO4	3	2	3	3	3	1	2				3	3	3	3	3
CO5	3	3	3	3	3	1	2				3	3	3	3	3

2. Mechanical Vibration (PCC-ME -311)

CO1: Obtain equations of motion to understand the behavior of oscillatory systems.

CO2: Understand the fundamentals of various damping systems to reduce vibration.

CO3: Learn various vibration excitations, practical aspects of isolations, and vibration measuring instruments.

CO4: Analyze the mathematical modeling of the two degrees of freedom systems and various vibration-absorbing devices.

CO5: Understand the characteristics of noise, sound, and its relationship with power and intensity.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2				3	3	3	3	3
CO2	3	3	3	3	3	2	2				3	3	3	3	3
CO3	3	3	3	3	3	2	2				3	3	3	3	3
CO4	3	3	3	3	3	2	2				3	3	3	3	3
CO5	3	3	3	3	3	2	2				3	3	3	3	3

3. Operation Research (PCC-ME-312)

CO1: Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.

CO2: Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods, Finding initial basic feasible and optimal solution of the Transportation problems

CO3: Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.

CO4: Model competitive real-world phenomena using concepts from game theory.

CO5: Formulate Network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these Network problems

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2			2	2	3	3	3	2	3
CO2	3	3	3	3	3	2			2	2	3	3	3	2	3
CO3	3	3	3	3	3	2			2	2	3	3	3	2	3
CO4	3	3	3	3	3	2			2	2	3	3	3	2	3
CO5	3	3	3	3	3	2			2	2	3	3	3	2	3

4. Tribology (PCC-ME-302)

CO1: Understand the different techniques used to solve mechanical engineering problems.

CO2: Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.

CO3: Apply mechanics of materials and machine design topics to provide preliminary results used for testing the reasonableness of finite element results.

CO4: Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.

CO5: Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	2	2	3						1	3	3	3	2
CO2	3	3	2	2	3						1	3	3	3	2
CO3	3	3	2	2	3						2	3	3	3	2
CO4	3	3	2	2	3						2	3	3	3	2
CO5	3	3	2	2	3						1	3	3	3	2

5. Total Quality Management (OEC-302)

CO1: To understand and apply the principles of total quality management.

CO2: Choose appropriate statistical techniques for improving processes.

CO3: Develop the organizational, competitive and economic potential of quality.

CO4: Integrate biblical principles with the practice of total quality management.

CO5: Identify requirements of quality improvement programs

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO2	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO3	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO4	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2
CO5	2	2	1	3	3	1	3	3	2	1	3	3	3	3	2

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (7th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-401	Computer Aided Design (Major Core)	3	0	THEORY	3	40	60	100

2	PCC	PCC-ME-402	Refrigeration and Air Conditioning (Major Core)	2	1		3	40	60	100
3	HSMC	HSMC-401	Engineering Economics (Value Added Courses)	2	1		3	40	60	100
4	PEC	PEC-ME 401	Professional Elective (Welding Technology (Skill Enhancement Course)	2	1		3	40	60	100
5	PCC	PCC-ME-403	Refrigeration and Air Conditioning Lab (Minor Stream)	PRACTICAL		2	1	60	40	100
6	PCC	PCC-ME-404	Computer Aided Design Lab			2	1	60	40	100
7	PROJ	PROJ-ME-402	Minor Project-II			12	6	120	80	200
8	PROJ	PROJ-ME-401	Industrial Training / Project Seminar			4	2	120	80	200
TOTAL				**09**	**03**	**18**	**22**	**620**	**380**	**1000**

***CIE (Continues Internal Evaluation)**
***ESE (End Semester Exam)**

1. Computer Aided Design (PCC-ME-401)

CO1: Provide basic foundation in CAD, computer graphics and Coordinate systems etc.

CO2: Understand and develop the Mathematical representations of curves used in geometric construction

CO3: Understand and develop the Mathematical representations of solids used in geometric construction

CO4: Understand the concepts of Scan Conversion, Rendering, Rasterising polygons and Hidden surface removal etc.

CO5: Creation of part drawings and 3D models using CAD techniques.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3				2		2	3	3	3	2
CO2	3	3	3	2	3				2		2	3	3	3	2
CO3	3	3	3	2	3				2		2	3	3	3	2
CO4	3	3	3	2	3				2		2	3	3	3	2
CO5	3	3	3	2	3				2		2	3	3	3	2

2. Refrigeration and Air Conditioning (PCC-ME-402)

CO1: Familiarize you with the terminology associated with refrigeration and air-conditioning.

CO2: To cover the basic principle of psychrometric and applied psychrometric.

CO3: Familiarize you with load calculation and duct design.

CO4: Familiarize you with the refrigerants, vapour compression refrigeration system and multi stage vapour compression system.

CO5: Understand the concept of vapour compression refrigeration system and other cooling system.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2		2				2	3	3	3	3
CO2	3	3	3	3	2		2				2	3	3	3	3
CO3	3	3	3	3	2		2				2	3	3	3	3
CO4	3	3	3	3	2		2				2	3	3	3	3
CO5	3	3	3	3	2		2				2	3	3	3	3

3. Engineering Economics (HSMC-401)

CO1: To understand the core economic terms, concepts and theories.

CO2: Identify the key elements of the demand and supply model and use it to critically analyze the real world examples.

CO3: Compare and contrast economic profits with accounting profits

CO4: Identify economic indicators and utilize them to articulate the state of the economy and prescribe monetary and fiscal policy

CO5: To have a conceptual knowledge about the role of government in countries economical changes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	1	1	2			2	2				3	3		2	2
CO2	1	1	2			2	2				3	3		2	2
CO3	1	1	2			2	2				3	3		2	2
CO4	1	1	2			2	2				3	3		2	2

CO5	1	1	2			2	2				3	3		2	2

4. Welding Technology (PCC-ME-401)

CO1: Identify the various materials for manufacturing process for a particular application.

CO2: Analyze gating systems and discuss mechanization procedures in foundries.

CO3: Explain various core making processes and special casting processes.

CO4: Select the various types of Fabrication Process for Mechanical applications. CO5: To select and apply knowledge, techniques, skills, and modern tools of the Welding Processes.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2			3		2				1	3	3	1	3
CO2	3	2			3		2				2	3	3	1	3
CO3	3	2			3		2				2	3	3	1	3
CO4	3	2			3		2				1	3	3	1	3
CO5	3	2			3		2				1	3	3	1	3

RAFFLES UNIVERSITY, NEEMRANA
SCHOOL OF ENGINEERING AND TECHNOLOGY (SOE&T)
Department of Mechanical Engineering
B.Tech (8th Semester)

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Marks		
				L	T	P		CIE	ESE	Total
1	PCC	PCC-ME-404	Power Plant Engineering (Major Core)	3	1	PRACTICAL	4	40	60	100
2	PCC	PEC-ME-405	CNC Machines and Automation (Skill Enhancement Course)	3	1		4	40	60	100
3	PCC	PCC-ME-407	CNC Machine and Automation Lab (Minor Stream)				2	60	40	100
4	SI	SI-ME-401	Seminar	THEORY		4	2	60	40	100
5	PROJ	PROJ-ME-403	Major Project II (Research Project) and Dissertation)			16	8	360	240	600

TOTAL	**06**	**02**	**20**	**20**	**560**	**440**	**1000**

***CIE (Continues Internal Evaluation)**

***ESE (End Semester Exam)**

1. Power Plant Engineering (PCC-ME-404)

CO1: Enable students to understand about different types of power plants and boilers and combined power plant

CO2: Identify elements and their functions and operations of steam power plants.

CO3: Identify elements and their functions and operations of nuclear and hydel power plants

CO4: Identify elements and their functions and operations of diesel and gas turbine power plants

CO5: To illustrate the students to get the exposure of different renewable energy resources and to understand the economics of power plants and pollution control techniques.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	2	3		2		3	3	3	3	3
CO2	3	3	3	2	2	2	3		2		3	3	3	3	3
CO3	3	3	3	2	2	2	3		2		3	3	3	3	3
CO4	3	3	3	2	2	2	3		2		3	3	3	3	3
CO5	3	3	3	2	2	2	3		2		3	3	3	3	3

2. CNC Machines and Automation (PEC-ME-405)

CO1: Able to read and measure part drawings and design callouts correctly without any difficulty.

CO2: Able to Understand fundamentals of NC/CNC Machine for producing quality Product of complexity.

CO3: Able to interpret manually program correctly a CNC machine to reduce waste.

CO4: Capable to use conversation of M & G codes by reading the program and knowing what action the machine intends to take thereby confirming the intended Action.

CO5: Able to use NC Programming through CAD/CAM and able to produce as per Design and proper functioning Maintenance and Trouble Shooting of CNC machine tools to maintained market demand in time.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PS O1	PS O2	PS O3
CO1	3	3	3	3	3				1	2	2	3	3	3	3
CO2	3	3	3	3	3				1	2	2	3	3	3	3
CO3	3	3	3	3	3				1	2	2	3	3	3	3
CO4	3	3	3	3	3				1	2	2	3	3	3	3
CO5	3	3	3	3	3				1	2	2	3	3	3	3

B.TECH ELCTRICAL ENGINEERING SCHEME CREDITS CALCULATION

S.No.	Category of Course	Abbreviation Used	Credits
1.	Humanities and Social Sciences including Management Courses	HSMC	13
2.	Basic Sciences Courses	BSC	26
3.	Engineering Sciences Courses including workshop, Drawing, Basics of Electrical/ Mechanical/ Computer etc.	ESC	26
4.	Professional Core Courses	PCC	98
5.	Professional Elective C ourses relevant to chosen specialization/ branch	PEC	13
6.	Open Subjects- Electives from other technical and /or emerging subjects	OEC	12
7.	Project Work, Seminar and internship in industry or elsewhere	PROJ	16
8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
Total			**204**

B.TECH ELCTRICAL ENGINEERING SCHEME CREDITS CALCULATION

S.No.	Category of Course	Abbreviation Used	Credits
1.	Humanities and Social Sciences including Management Courses	HSMC	13
2.	Basic Sciences Courses	BSC	26
3.	Engineering Sciences Courses including workshop, Drawing, Basics of Electrical/ Mechanical/ Computer etc.	ESC	26
4.	Professional Core Courses	PCC	98
5.	Professional Elective C ourses relevant to chosen specialization/ branch	PEC	13
6.	Open Subjects- Electives from other technical and /or emerging subjects	OEC	12
7.	Project Work, Seminar and internship in industry or elsewhere	PROJ	16
8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
Total			**204**

1	PCC-EE	PCC-EE-201	**Electrical Circuit Analysis**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1. Apply network theorems for the analysis of electrical circuits

CO2. Obtain the transient and steady-state response of electrical circuits

CO3. Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
CO4.Analyze two port circuit behavior

CO5. Synthesize networks and filters

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	**PCC-EE**	**PCC-EE-203**	**Analog Electronics**

UNIT	**CONTENT**

Course Outcomes

At the end of this course, students will demonstrate the ability to:

CO1**.** Understand the working principle of PN junction diode and its applications.

CO2. Understand the working of BJT and its applications.

CO3. Understand the working of JFET and MOSFET

CO4. Analysis and design of Differential, multi-stage and operational amplifiers

CO5. Analysis and design of Linear applications of op-amp. Analysis and design of Nonlinear applications of op-amp.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2

CO1	3	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-205	**Electrical Machines – I**

UNIT	**CONTENT**

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1. Understand the concepts of magnetic circuits

CO2. Understand the operation of DC machines

CO3. Analyse the differences in operation of different DC machine configurations

CO4. Analyse single phase transformers circuits.

CO5. Analyse three phase transformers circuits.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-207	**Electromagnetic Fields**

UNIT	**CONTENT**

Course Outcomes:
At the end of the course, students will demonstrate the ability:

CO1. To understand the basic laws of electromagnetism

CO2. To obtain the electric and magnetic fields for simple configurations under static conditions

CO3. To analyse time varying electric and magnetic fields

CO4. To understand Maxwell's equation in different forms and different media.

CO5. Investigate behavior of EM waves in different medias and to calculate average power density radiated.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

6	ESC	ESC- 201	Engineering Mechanics
UNIT	**CONTENT**	MC	MC-I	Indian Constitution
9			

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Understand the concepts of co-ordinate systems

CO2. Analyse the three-dimensional motion

CO3. Understand the concepts of rigid bodies

CO4. Explain and solve numerical problems on kinematics of particles and rigid bodies

CO5. Explain and apply work-energy principle, impulse-moment principle to solve numerical problems on linear and angular motion and collision.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Syllabus**for B.Tech (Batch 2022-26)**

4th Semester

S No	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PCC-EE	PCC-EE202	Digital Electronics	3	0	0	3	40	60	100
2	PCC-EE	PCC-EE-204	Electrical Machines – II	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-206	Power Electronics	3	1	0	4	40	60	100
4	PCC-EE	PCC-EE-208	Signals and Systems	3	0	0	3	40	60	100
5	BSC	BSC -201	Mathematics–III	3	0	0	3	40	60	100
6	BSC	BSC -202	Biology-medical instrumentation	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE-210	Digital Electronics Laboratory	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-212	Electrical Machines Laboratory – II	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-214	Power Electronics Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

1	PCC-EE	PCC-EE202	Digital Electronics

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Understand number systems, basic logic gates, Boolean algebra and derive digital logic circuits

CO2- Classify various minimization techniques and choose the best for designing logic circuit .

CO3- Define characteristics of logic families and calculate their parameters

CO4- Design combinational logic circuits such as adder, subtractor, multiplexer, decoder.

CO5. Classify the different types of flip flops and design counters, registers using flip flops.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-204	**Electrical Machines – II**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Understand the construction and working of AC machines .

CO2- Understand the generation of rotating magnetic field in AC machines.

CO3- Solve the performance parameters of AC machines.

CO4- Interpret the behavior of AC machines using phasors, equivalent circuits and its characteristics.

CO5- Examine the performance behavior of AC machines under different loading condition.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-206	Power Electronics
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course students will demonstrate the ability to:

CO1-Understand the differences between signal level and power level devices

CO2-Analyse controlled rectifier circuits

CO3-Analyse the operation of DC-DC choppers

CO4-Analyse the operation of voltage source inverters

CO5- Interpret the speed control of DC motors using converters and choppers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-208	Signals and Systems
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1-Understand the concepts of continuous time and discrete time systems.

CO2-Analyse systems in complex frequency domain

CO3-Understand sampling theorem and its implications

CO4- Understand mathematical tools to be able to apply in state variable modeling

CO5- Analyze signal and system properties like stability and causality using Laplace and Z transforms

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO 1	1	3	3	2	1							2	3	2
CO 2	3	3	3	2	1							2	3	2
CO 3	3	3	3	2	2							2	3	2

CO 4	3	3	3	2	2							2	3	2
CO 5	3	3	3	2	2							2	3	2

5	BSC	BSC -201	Advance Mathematics

UNIT	CONTENT

Course Objectives: The objective of this course is to familiarize the student with statistical techniques. It aims to equip he students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline
Course Outcomes: At the end of the course, the student will be able to
CO1-Have basics knowledge about measure of central tendency, kurtosis and moments and their applications in engineering fields.

CO2-Familiarize the student with expectations of discrete and continuous random variable

CO3-Familiarize probability techniques and random variables and detailed knowledge of probability distribution with so as to use it with any date of engineering problem formulation

CO4-Have basic idea about statistics including correlation, regression and then up to advanced level with testing of large samples that is important in solving problems related to engineering

CO5- **Use Z-transform and its applications to solve difference equations**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO 1	1	3	3											2
CO 2	3	3	3											2
CO 3	3	3	3											2
CO 4	3	3	3											2
CO 5	3	3	3											2

6	BSC	BSC -202	Bio-medical instrumentation

UNIT	CONTENT

Course Outcomes
At the end of this course students will demonstrate the ability to
CO 1. understand basic Biomedical Instruments and their functioning
CO2. describe Microelectrodes, Electro conduction systems

CO3. explain ECG, EEG, EMG, ERG, etc. CO4. understand Ventilators and other important Clinical Instruments CO5- Outline medical imaging techniques and equipment for certain diagnosis and therapies.														
	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2021-25)

5th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks

1	PCC-EE	PCC-EE-301	Power Systems – I	3	1	0	4	40	60	100
2	PCC-EE	PCC-EE-303	Control Systems	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-305	Microprocessors	3	0	0	3	40	60	100
4	PEC-EE	PEC-EE-301	Program Elective - 1	3	0	0	3	40	60	100
5	OEC-EE	OEC-EE-301	Open Elective-1	3	0	0	3	40	60	100
6	HSMC	HSMC-301	Engineering Economics	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE307	Power Systems Laboratory - I	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-309	Control Systems Laboratory	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-311	Microprocessors Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

1	PCC-EE	PCC-EE-301	Power Systems – I

UNIT	CONTENT	No. Of Hrs.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the concepts of power systems.

CO 2 Understand the various power system components.

CO 3 Evaluate fault currents for different types of faults.

CO 4 Understand the generation of over-voltages and insulation coordination.

CO 5 Understand basic protection schemes.

2	PCC-EE	PCC-EE-303	Control Systems

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the modelling of linear-time-invariant systems using transfer function and state-space representations.

CO 2 Understand the concept of stability and its assessment for linear-time invariant systems. Design simple feedback controllers.

CO3- Formulate different types of analysis in frequency domain to explain the nature of stability of the system.

CO4- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system

CO5- Design simple Lag, Lead, Lag- Lead network & PID controllers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

	PCC-EE	PCC-EE-305	Microprocessors

UNIT	CONTENT

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
CO 1 Study of 8085 and 8086 Microprocessors.
CO 2 Do assembly language programming.
CO 3 Do interfacing design of peripherals like 8255, 8253,8279,8251 etc
CO4: Acquire the knowledge of synchronous and asynchronous communication and interfacing to protocols like blue-tooth, etc.
CO5: Design electrical circuitry to the microcontroller I/O ports in order to interface the processor to exter

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO 1	1	3	3	2	1							2	3	2
CO 2	3	3	3	2	1							2	3	2
CO 3	3	3	3	2	2							2	3	2
CO 4	3	3	3	2	2							2	3	2
CO 5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 a	Wind and solar Energy Systems

Course Outcomes:
At the end of this course, students will demonstrate the ability to
CO1-Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.
CO2- Understand the basic physics of wind and solar power generation.
CO3- Understand the power electronic interfaces for wind and solar generation.
CO4- Understand the issues related to the solar technologies and wind topologies.
CO5: Demonstrate the Solar Thermal and PV applications along with its storage systems.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO 1	1	3	3	2	1							2	3	2
CO 2	3	3	3	2	1							2	3	2
CO 3	3	3	3	2	2							2	3	2

CO 4	3	3	3	2	2							2	3	2
CO 5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 b	**Line Commutated and Active PWM Rectifiers**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1-Analyse controlled rectifier circuits.

CO2- Understand the operation of line-commutated rectifiers – 6 pulse and multi-pulse configurations.

CO3- Understand the operation of PWM rectifiers –.

CO4- operation in rectification and regeneration modes and lagging, leading and unity power factor mode

CO5-

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 c	Electrical Drives

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

(i) Understand the characteristics of dc motors and induction motors.

(ii) Understand the principles of speed-control of dc motors and induction motors.

(iii) Apply the knowledge of power electronics to understand the working of dc-dc converters.
(iv) Apply the knowledge of control system for the speed control of electrical machines.
CO5- Illustrate control of slip ring induction motor (SLIM).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-301a	Electronic Devices

UNIT	**CONTENT**

Course Outcomes

At the end of this course students will demonstrate the ability to:

1. Understand physics of semiconductors and behavior of charge carriers within semiconductors 2. Understand the working of semiconductor diodes supported with mathematical explanation. 3. Understand the working of BJT and MOSFET with their equivalent small signal models.

4. Understand the chemical processes used in fabrication of integrated circuits.

5	OEC-EE	OEC-EE-301b	Data Structures and Algorithms

UNIT	**CONTENT**

Course outcomes

Student will be able to:

CO 1. Understand operations like searching, insertion, deletion, traversing on linear Data Structures and to determine their computational complexities

CO2. Understand operations like searching, insertion, deletion, traversing on various non linear Data Structures and to determine their computational complexities

CO3. Write algorithms for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.

CO4. Apply appropriate Data Structure as per specific problem definition CO5-Identify, model, solve and develop algorithms for real-life problems like shortest path and MST using graph theory.

	PO 1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-301c	Analog and Digital Communication
UNIT	**CONTENT**		

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth

CO2. Analyze the behavior of a communication system in presence of noise

CO3. Investigate pulsed modulation system and analyze their system performance

CO4. Analyze different digital modulation schemes and can compute the bit error performance

CO5-Apply time division multiplexing concepts in different pulse modulation techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1
CO1	1	3	3	2	1							2	3
CO2	3	3	3	2	1							2	3
CO3	3	3	3	2	2							2	3
CO4	3	3	3	2	2							2	3
CO5	3	3	3	2	2							2	3

6	HSMC	HSMC-301	Engineering Economics

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Understand the basic principles, scope and the applications of Engineering Economics

CO2. Understand and apply the knowledge of elasticity of demand and supply on price determination.

CO 3. Apply the knowledge of demand forecasting to make effective demand forecast.

CO4. Understand the complexity of uncertain market structure and be able to take decisions of price determinations.

CO 5. Understand the various management concepts and thoughts and using for better resource management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

1	PCC-EE	PCC-EE-302	Power Systems – II

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Use numerical methods to analyze a power system in steady state.

CO2- Understand stability constraints in a synchronous grid.

CO3- Understand methods to control the voltage, frequency and power flow.

CO4-Understand the monitoring and control of a power system

CO5- Acquire knowledge about the Regulatory framework, ancillary services, power system economics and power management.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-304	**Measurements and Instrumentation**

Course Outcomes

After completion of this course, students will be able to –

CO1-Identify various types instrument suitable for specific measurement.

CO2- Classify various errors present in measuring instruments.

CO3- Understand construction, working principle and types of oscilloscopes.

CO4-Comprehend different types of signal generators and analyzers, their construction and operatio

CO5-Describe the working principle, selection criteria and applications of various transducers used measurement systems.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 a	**Electrical Engineering Materials**

UNIT	**CONTENT**

Course Outcomes:

CO 1 To Understand the basic concepts of materials.

CO 2 To use simplified materials selection concepts for design purposes.

CO 3 To Understand the properties of Materials.

CO4 Acquire knowledge of Conductivity of metals Ohm's law and relaxation time of electrons, collision time and mean free path, electron scattering and resistivity of metals.

CO5: Acquire knowledge of Classification of semiconductors, semiconductor conductivity, temperature dependence, Carrier density and energy gap, Trends in materials used in Electrical Equipment.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 b	**Electrical Machine Design**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the construction and performance characteristics of electrical machines.

CO 2 Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines

CO 3 Understand the principles of electrical machine design and carry out a basic design of an ac machine.

CO 4 Use software tools to do design calculation

CO5 Identify the limitations (assumptions) of traditional designs and need for CAD anal ysis, synthesis and hybrid models.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 c	**Power System Protection**

UNIT	**CONTENT**

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
CO 1 Understand power system protection.
CO 2 Understand the main components used in power system protection for electric machines, transformers.
CO 3 Understand the bus bars, overhead and underground feeders.
CO 4 Understand the earthing protection.

CO5 Explain the simulation of protection schemes by using Electro-Magnetic Transients (EMT) programs.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 b	**Renewable Energy Sources**

UNIT	**CONTENT**

Course Outcomes:
CO 1 To Understand the Need, importance and scope of non-conventional and alternate energy resources.
CO 2 To understand role significance of solar energy and wind energy
CO 3 To understand the role of ocean energy in the Energy Generation.
CO 4 To get the utilization of Biogas plants and geothermal energy

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 c	**High Voltage Engineering**

UNIT	**CONTENT**

Course outcomes:

At the end of the course, the student will demonstrate

CO1-Understand the basic physics related to various breakdown processes in solid, liquid, and gaseous insulating materials.

CO2- Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.

CO3- Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.

CO4- Knowledge of how over-voltages arise in a power system, and protection against these over-voltages.

CO5- Study and understand the nature of faults happening on both the AC and DC sides of the converters and formulate protection schemes for the same.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 a	**Computer Networks**

UNIT	**CONTENT**

Course Outcomes: The student will be able to:

CO1: Explain the functions of the different layer of the OSI Protocol;

CO2:. Describe the function of each block of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs);

CO3: Develop the network programming for a given problem related TCP/IP protocol; &

CO4: Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available

CO5 ***Analyze*** the features and operations of various application layer protocols such as HTTP, DNS and SMTP.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 b	Embedded System

Course Outcomes

After completion of this course, students will be able to –
CO1-Define basic operations of embedded microcontroller cores, processors and memories.
CO2-Describe the concept of Embedded System and its design for real life applications.
CO3-Explain the technological aspects of embedded systems through analog and digital blocks, systems and user interfacing.
CO4-Examine design metrics, design tradeoffs and software aspects of embedded systems.
CO5- Illustrate Real Time Programming Languages and Real Time operating systems.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 c	VLSI Circuits

UNIT	**CONTENT**

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. understand the process of VLSI fabrication

2. Investigate the Oxidation processes for VLSI/ULSI device fabrication

3. Learn about the environment for VLSI/ULSI technology

4. Understand Lithography and deposition processes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

6	HSMC	HSMC-302	Personality Development Programme
UNIT	**CONTENT**		

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

7th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PEC-EE	PEC-EE404	Program Elective -4	3	0	0	3	40	60	100
2	PEC-EE	PEC-EE-405	Program Elective -5	3	1	0	4	40	60	100
3	OEC-EE	OEC-EE-403	Open Elective -3	3	0	0	3	40	60	100
4	OEC-EE	OEC-EE-404	Open Elective -4	3	0	0	3	40	60	100
5	PROJ-EE	PROJ-EE01	Project Stage-I	0	0	2	2	180	120	300
6	SI	EE-SI	Summer Internship	0	0	2	2	120	80	200
			Total	**12**	**1**	**4**	**17**			**900**

1	PEC-EE	PEC-EE304a	**Electrical Energy Conservation and Auditing**
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the current energy scenario and importance of energy conservation. Understand the concepts of energy management.

CO 2 Understand the methods of improving energy efficiency in different electrical systems.

CO 3 Understand the concepts of different energy efficient devices.

CO4: To analyze, calculate and improve the energy efficiency and performance of electrical and industrial utilities.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304b	**Industrial Electrical Systems**

UNIT	**CONTENT**

Course Outcomes:

CO1-At the end of this course, students will demonstrate the ability to

CO2- Understand the electrical wiring systems for residential, commercial, and industrial consumers, representing the systems with standard symbols and drawings, SLD.

CO3- Understand various components of industrial electrical systems.

CO4- Analyze and select the proper size of various electrical system components.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304c	**Power System Dynamics and Control**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1- Understand the problem of power system stability and its impact on the system.

CO2- Analyse linear dynamical systems and use of numerical integration methods.

CO3-Model different power system components for the study of stability.

CO4-Understand the need and plan the methods to improve stability.

CO5: Design a mini project on having 2-3 generation sources having 3 generation sources and perform the process of power transfer from source to load with the help of transformers and at least three loads.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305a	**NEURAL NETWORKS**

UNIT	**CONTENT**

Course Outcomes:
At the end of the course, students will demonstrate the ability to

CO1. Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning
CO2. Get the response of an Learning Processes system

CO3 Apply Artificial Neural Network models to handle uncertainty and solve engineering problems.

CO4 Recognize the feasibility of applying a Neuro-model for a particular problem

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305b	**Digital signal Processing**

UNIT	**CONTENT**

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete time and frequency domain

2. Get the response of an LSI system to different signals

3. Design of different types of digital filters for vari ous applications

4 Implement Z transform and inverse Z transform of discrete signals

5 Model IIR and FIR filter using window techniques

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305c	**Computer Architecture**

Course Outcomes:

After completion of this course, students will be able to:
CO1: Understand the basics of computer architecture and its organization.
CO2: Recognize processor models based on their organization, addressing modes and instruction set.
CO3: Understand basics of ALU, control unit and computer organization such as memory & I/O.
CO4: Understand various architectures based on performance, cost and applicability.
CO5: Understand impact of modern techniques like pipelining, express buses processor performance.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403a	**Image Processing**

Course Outcomes:

After completion of this course, students will be able to:

CO1- ***Identify*** the fundamental elements of an image and ***Describe*** the need of digital image processing

CO2- ***Understand*** different types of image transformation techniques and their properties.

CO3- ***Use*** various noise models and ***Calculate*** the values for restoration and degradation models.

CO4- ***Analyze*** and ***Evaluate*** various image compression techniques.

CO5- ***Integrate*** and ***Demonstrate*** various Image Transformation and Segmentation Techniques

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403b	**Power Quality and FACTS**

Course Outcomes

After completion of this course, students will be able to:

CO1: Acquire knowledge of the advantage of compensation and will learn several aspects such as description, operation and characteristics of Thyristor-based FACTS devices: Static VAR Compensator (SVC), Thyristor Controlled Series Capacitor (TCSC), Thyristor Controlled Braking Resistor and Single Pole Single Throw (SPST) Switch.

CO2: Acquire knowledge of the operation and applicability of Voltage Source Converters and their realization details for implementation in FACTS Devices.

CO3: Analyze different possible applications of FACTS devices in order to improve stability and for achieving better voltage regulation along with the applicability of these as a solution provider for power quality problems in distribution networks.

CO4: Acquire the knowledge of custom power device DSTATCOM, classification of DSTATCOM, different topological realizations, operation control of DSTATCOM and reference current extraction paradigm based on Synchronous Reference Frame Theory.

CO5: Acquire the knowledge of custom power devices for voltage power quality problems (DVR, UPQC) and for current power quality problems (UPQC), different topological aspects of DVR and UPQC, principle of operation of these devices along with control paradigms

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403c	GENERATION OF ELECTRICAL POWER

UNIT	**CONTENT**

Course Outcomes:

At the end of the course, students will demonstrate the ability to

CO1- Understand the load curves, load-duration Curve.

CO2-Understand the power plant economics and tariff

CO3- Explore the significance of economic operation of steam plants

CO4- Apply techniques to evaluate generation cost, depreciation reserve and Acquire knowledge of different method of energy cost reduction.

CO5- Apply techniques to evaluate tariff and comparative study of various power plants.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

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Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

8th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	**T**	**P**	**C**	I.A Marks	ESE Marks	**Total Marks**
1	PEC-EE	PEC-EE-406	Program Elective -6	3	0	0	3	40	60	100
2	OEC-EE	OEC-EE-405	Open Elective -5	3	0	0	3	40	60	100
3	OEC-EE	OEC-EE-406	Open Elective -6	3	1	0	4	40	60	100
4	PROJ-EE	PROJ-EE-02	Project Stage-II	0	0	2	2	360	240	600
			Total	**9**	**1**	**2**	**12**			**900**

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1	PEC-EE	PEC-EE-306a	**MODERN CONTROL THEORY**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand various design specifications.

CO 2 Design controllers to satisfy the desired design specifications using simple controller structures
(P, PI, PID, compensators).

CO 3 Design controllers using the state space approach.

CO 4-Understand various design Adaptive control sysem

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306b	**Smart grid technology**

UNIT	**CONTENT**

Course Outcomes :

At the end of this course, students will demonstrate the ability to:

CO 1 Understand technologies for smart grid.

CO 2 Appreciate the smart transmission as well distributionsystems.

CO 3 Realize the distribution generation and smart consumption.

CO 4 Know the regulations and market models for smart grid.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306c	**Artificial intelligence techniques**

UNIT	**CONTENT**

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
CO 1 Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.
CO 2 Develop intelligent algorithms for constraint satisfaction problems and also design intelligent
systems for Game Playing
CO 3 Attain the capability to represent various real life problem domains using logic based techniques
and use this to perform inference or planning.
CO4 Classify different learning paradigms and its application in Neural Network
CO5 Explain concepts of Natural Language processing and discuss Expert System

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405b	**Power System Engineering**

course Outcomes

CO1: Understand power stability problems and the basic concepts of modeling and analysis of dynamical systems.
CO2: Analyze the behavior of Steady State, Dynamic and transient stability on power systems.
CO3: Analyze stability of single machine and multi-machine systems.
CO4: Analyze the stability of power system by Modified Euler's and Runge – Kutta method.
CO5: Comprehend various factors affecting steady state and transient stabilities.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405a	Testing & Commissioning of Electrical Equipments

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
CO1-Describe the method procurement process and state of the art global practices in maintenance of electrical equipment .
CO2- Analyze and explaining of the requirement common to all equipment
CO3- Analyze and explaining the installation of synchronous machines
CO4-understand the specification and testing of transformer

2	OEC-EE	OEC-EE-405c	**Power System Planning**

Course Outcomes:

After completion of this course, students will be able to:

CO1: Gain information about basic building blocks of Power System planning.

CO2: Understand the basic concept of Power system reliability at generation, transmission and distribution level.

CO3: Analyze the effect of various parameters involved in Generation, Transmission and Distribution systems.

CO4: Understand the impact of demand side planning in deregulated market environment

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406a	**Computer Aided Power System Analysis**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 To introduce computer applications in the analysis of power systems.

CO 2 To understand the solution methods and techniques used in power system studies.

CO 3 To solve numerically the complex IEEE bus networks and the energy flow

Co4- **CO3:** Elaborate the concept of digital protection and signal conditioning

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406b	**Advanced Power Electronics** **Power System Transients**

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the operation of power electronic converters and their control strategies.

CO 2 Understand the vector control strategies for ac motor drives

CO 3 Understand the implementation of the control strategies using digital signal processors.

CO4: Acquire knowledge about different AC voltage controllers and their control.

OEC-EE OEC-EE-406c

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3

CO1- To explain the sources and effects of lightning, switching and temporary over voltages.
CO2 -To model and estimate the over voltages in power system
CO3- To develop travelling wave equation and to analyze travelling wave.
CO4- To analyze the insulation coordination of power system and protective devices.
CO5- To develop the modeling of power system for transient over voltages using Electromagnetic Transient Program (EMTP)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PO 9	P1 0	P1 1	P12	PSO 1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	Project Stage-II		Credit
No of Practical	PROJ-EE	PROJ-EE-02	Max. Marks: 600 (IA:360, TE:240) (0L+0T+2P 1)

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

(i) Apply and verify basic scientific principals and technologies.

(ii) Identify the scope of interdisciplinary knowledge

(iii) Make and design a prototype which is preferably a working model

Guidelines

1) A group of 3-4 students under the mentorship of a teacher to make a minor project. Interdisciplinary projects to be encouraged.

2) The project title and scope to be decided and presented in first 2nd/3rd weeks of the semester.

3) The progress of the project to be evaluated (internal) in 8th/9th week of the semester.

4) A draft of the project report to be prepared and the project to be evaluated (internal) 12th/13th week of the semester.

5) The project report and the project to be submitted in the department at the time of external evaluation.

SCHOOL OF ENGINEERING & TECHNOLOGY (SOET)

RAFFELS UNIVERSITY, NEEMRAN

BTECH (4 Years Degree Program)

2022-23

PROGRAM B. TECH(CSE)

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1) Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.

2) Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

3) Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

4) Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

5) Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6) The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

7) Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9) Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

10) Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

11) Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12) Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change.

CBCS Scheme for B.Tech (3rd Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 201	Data structure & algorithm using C	3	1	0	20	20	60	100	4
2	PCC	PCC-CSE 202	Object ori-ented pro-gramming through C++	3	1	0	20	20	60	100	4
3	PCC	PCC-CSE 203	Database Management System	3	1	0	20	20	60	100	4
4	PCC	PCC-CSE 204	Unix & Shell Programming	3	1	0	20	20	60	100	4

5	BSC	BSC 201	Mathematics –III	3	1	0	20	20	60	100	4
6	HSMC	HSMC 201	Human Values	3	1	0	20	20	60	100	4
7	PCC	PCC-CSE 205	Data structure & algorithm Using C Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 206	Object oriented programming through C++ Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE 207	Database Management System Lab	0	0	2	30	30	40	100	1
10	PCC	PCC-CSE 208	Unix & Shell Programming Lab	0	0	2	30	30	40	100	1
			Total	**18**	**6**	**8**				**1000**	**28**

SUBJECT NAME: -DATA STRUCTURE & ALGORITHM USING C

SUBJECT CODE: -PCC-CSE 201

Course outcomes:

CO1. Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented and used them and their common applications.

CO2. Discuss the efficiency of the sorting and searching algorithms

CO3. Implementation of Trees and Graphs and perform various operations on these data structures.

CO4. Understanding the concept of recursion, application of recursion and its implementation.

CO5. Identify the alternative implementations of data structures with respect to its performance to solve a real-world problem.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	

SUBJECT NAME: -OBJECT ORIENTED PROGRAMMING USING C++

SUBJECT CODE: -PCC-CSE-202

Course outcomes:

CO1. Able to develop programs with reusability.

CO2. Develop programs for file handling.

CO3. Handle exceptions in programming.

CO4. Develop applications for a range of problems using OOP techniques

CO5. Demonstrate the use of various OOPs concepts with the help of programs.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2									3		2
CO2	3	2	2									3		2
CO3	3	3	2									2		3
CO4	3	3	3	2	2	1			2		2	3	2	2
CO5	3											2		2

SUBJECT NAME: -DATABASE MANAGEMENT SYSTEM

SUBJECT CODE: -PCC-CSE-203

Course Outcomes:

CO 1. Describe the fundamental elements of relational database management systems.

CO 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.

CO 3. Design ER-models to represent simple database application scenarios

CO 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

CO 5. Improve the database design by normalization.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3										1	2		
CO2	3	2	3								2	2	3	3
CO3	3	3	3	2	2	1	1		2	1	2	2	2	2
CO4	3	2		1								1		
CO5	3		2									2	1	

SUBJECT NAME: -UNIX & SHELL PROGRAMMING

SUBJECT CODE: - PCC-CSE-204

Course Outcomes:

CO1: Understand the basic concepts of UNIX Architecture and basic Command.

CO2: Understand the commands related to Shell basics, vi editor and regular expression commands.

CO3: Understand the concepts of advance file concepts, commands related to Shell script and filter commands.

CO4: Understand the concepts in Korn Shell and Interactive C Shell.

CO5: Understand different types of Files, File system and basic file system commands.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1									1		2
CO2	3	2	1									1		2
CO3	3	1	1									1		2

CO4	3	1			1							1		2
CO5	3		1									1		2

SUBJECT NAME: -Mathematics III

SUBJECT CODE: - BSC - 201

Course Outcomes:

CO1: To explore the fundamental knowledge of transforms and their types.

CO2: Laplace Transform and their applications.

CO3: Develop knowledge of double integration.

CO4: Explore the distribution in different situations.

CO5: Use Analytic functions

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2

SUBJECT NAME: -HUMAN VALUES

SUBJECT CODE: - HSMC 201

Course outcomes:

CO1. CO1: Understand and analyse the essentials of human values and skills, self-exploration, happiness and prosperity.

CO2: Evaluate coexistence of the “I” with the body.

CO3: Identify and evaluate the role of harmony in family, society and universal order.

CO4: Understand and associate the holistic perception of harmony at all levels of existence.

CO5: Develop appropriate technologies and management patterns to create harmony in professional and personal lives.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3

CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

CBCS Scheme for B.Tech (4th Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 209	Digital Electronics	4	1	0	20	20	60	100	5
2	PCC	PCC-CSE 210	Discrete Mathematics	3	1	0	20	20	60	100	4
3	PCC	PCC-CSE 211	Computer Organization & Architecture	3	0	0	20	20	60	100	3
4	PCC	PCC-CSE 212	Design & Analysis of Algorithm	4	0	0	20	20	60	100	4
5	PCC	PCC-CSE 213	Operating Systems	4	0	0	20	20	60	100	4
6	HSMC	HSMC 401	Organizational Behaviour	3	0	0	20	20	60	100	3
7	PCC	PCC-CSE 214	Computer Organization & Architecture Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 215	Operating Systems Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE	Design & Analysis of Algorithm	0	0	2	30	30	40	100	1

		216	Lab								
10	MC	MC-III	Constitutional Law	0	0	0	0	0	100	100	0
			Total	**21**	**2**	**6**				**1000**	**26**

SUBJECT NAME: - Digital Electronics

SUBJECT CODE: - PCC-CSE-209

Course outcomes:

CO1: Identify and enumerate different electronic components.

CO2: Illustrate reduction of logical expressions using boolean algebra and implement the functions using logic gates. Design and analyse synchronous and asynchronous sequential circuits using flip-flops.

CO3: Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.

CO4: Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application.

CO5: Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	2	3		2	2		3		1	1	1	1		
CO3	1	2	2	2	2	2		3		2		2		
CO4		2		2		2		2			1			
CO5	2		1	1	1		2	1	1	1	1	1		2

SUBJECT NAME: -Discrete Mathematics

SUBJECT CODE: - PCC-CSE-210

Course outcomes:

CO1: Explore the knowledge of set theory in relation, function and partially ordered relation.

CO2: define the concepts of truth table and modulus form to explore the universal quantification.

CO3: Develop the knowledge of generating function for recurrence relation.

CO4: Explore the knowledge of prime group, cyclic group and concept of ring.

CO5: Use graph theory to find the shortest path between any to vertices.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	1	2	1		2	2	1	2	3	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO4	3	3	3	3	3	2	2		2	1	1	1	2	3
CO5	3	2	1	1	3	3	2		1	1	1	2	2	3

SUBJECT NAME: -Computer Organization and Architecture

SUBJECT CODE: - PCC-CSE-211

Course outcomes:

CO1: Understand the theory and architecture of central processing unit.

CO2: Analyze some of the design issues in terms of speed, technology, cost, performance.

CO3: Design a simple CPU with applying the theory concepts.

CO4: Use appropriate tools to design verify and test the CPU architecture.

CO5: Learn the concepts of parallel processing, pipelining and interprocessor communication.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	2	1	1	1								2	2	2
CO3	2	2	2		2							2		
CO4	3	2	2	1	3							3		
CO5	3	1							1	1		2		

SUBJECT NAME: - DESIGN AND ANALYSIS OF ALGORITHM

SUBJECT CODE: - PCC-CSE-212

Course Outcomes:

CO1.Students will be introduced with algorithm.

CO2.Students will learn to design algorithms.

CO3.Students will learn to implement algorithm for coding.

CO4. Argue the correctness of algorithms using inductive proofs and invariants.

CO5. Analyze worst-case running times of algorithms using asymptotic analysis.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	1							1	3	1
CO2	2	1	1	1	1							1	1	1
CO3	2	2	2	1	1							1	3	1
CO4	2	2	2	1	1							1	3	1
CO5	2	1	1	1	1							1	1	2

SUBJECT NAME: - OPERATING SYSTEM

SUBJECT CODE: - PCC-CSE-213

Course Outcomes:

CO 1. Identify the role of Operating System. To understand the design of control unit.

CO2. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems.

CO3. Describe the role of paging, segmentation and virtual memory in operating systems.

CO4. Description of protection and security and also the Comparison of UNIX and Windows based OS.

CO5. Defining I/O systems, Device Management Policies and Secondary Storage Structure.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	3	2			2							3	2	2
CO3	3	2										2		
CO4	2				2							2		
CO5	2											1		

SUBJECT NAME: - ORGANIZATIONAL BEHAVIOUR

SUBJECT CODE: - HSMC- 401

Course Outcomes:

CO 1: Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organization behavior.

CO 2: Critically evaluate the potential effects of important developments in the external environment on organizational behavior.

CO 3: Analyze organizational behavioral issues in the context of organizational behavior theories, models, and concepts.

CO 4: Manage conflict in organizational context and deal with stress.

CO 5: Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

CBCS Scheme for B.Tech (5th Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 301	Data Communication	4	0	0	20	20	60	100	4
2	PCC	PCC-CSE 302	Software Engineering	4	0	0	20	20	60	100	4
3	PCC	PCC-CSE 303	Formal Language & Automata Theory	3	1	0	20	20	60	100	4
4	PCC	PCC-CSE 304	Java Programming	3	0	0	20	20	60	100	3
5	HSMC	HSMC-CSE-301	Human Resource Management	3	0	0	20	20	60	100	3
	PEC	PEC-CSE		4	0	0	20	20	60	100	4

6		301-303	Elective – I								
7	PCC	PCC-CSE 305	Software Engineering Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 306	Java Programming Lab	0	0	2	30	30	40	100	1
9	PCC	PCC-CSE 307	Data Communication Lab	0	0	2	30	30	40	100	1
10	PROJ	PROJ-CSE 301	Industrial Training/ Project Seminar	0	0	4	0	0	100	100	2
			Total	**21**	**1**	**10**				**1000**	**27**

SUBJECT NAME: - DATA COMMUNICATION NETWORK

SUBJECT CODE: - PCC-CSE-301

Course Outcomes:

CO1 Student will be able to understand network communication using the layered concept, Open System Interconnect (OSI) and the Internet Model.

CO2 Student will be able to understand various types of transmission media, network devices; and parameters of evaluation of performance for each media and device.

CO3 Student will be able to understand the concept of flow control, error control and LAN protocols; to explain the design of, and algorithms used in, the physical, data link layers

CO 4 Student will understand the working principles of LAN and the concepts behind physical and logical addressing, subnetting and supernetting

CO5 Student shall understand the functions performed by a Network Management System and to analyze connection establishment and congestion control with respect to TCP Protocol.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

SUBJECT NAME: - SOFTWARE ENGINEERING

SUBJECT CODE: - PCC-CSE-302

Course Outcomes:

CO 1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO 2. An ability to work in one or more significant application domains.

CO 3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO 4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO 5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2								3	2	2
CO2	3		1	1								2		
CO3	2	2	3	2	2	1	1		3	2	2	3	3	3
CO4	3				2							2		
CO5	3				3	2	1					2		

SUBJECT NAME: -FORMAL LANGUAGE AND AUTOMATA THEORY

SUBJECT CODE: - PCC-CSE 303

Course Outcomes:

CO 1 Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.

CO 2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics .

CO 3 Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.

CO 4. Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language

CO 5. Attitude- Develop a view on the importance of computational theory.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3	2	3	2								3	2	2
CO3	3	2	3	2								2	2	2
CO4	2	3	3	3								2	2	1
CO5	2											1		

SUBJECT NAME: - Java Programming

SUBJECT CODE: - PCC-CSE 304

Course Outcomes:

CO 1. Learn to apply object-oriented programming features and concepts for solving given problem.

CO2. Learn to use java standard API library to write complex programs

CO 3. Learn implementation of object-oriented programming concepts using java

CO 4. Able to develop interactive programs using applets and swings.

CO 5. Develop advanced skills for programming in Java.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											3		
CO2	2	2	2	2	3				2			2	2	2
CO3	3											2		
CO4	2											2		
CO5	3	2	2	2	2	2			2	2	2	3	2	3

SUBJECT NAME: - EMBEDDED SYSTEM

SUBJECT CODE: - PCC-CSE 304

Course Outcomes:

CO 1. Understand the microprocessor architecture and its components used in embedded systems

CO 2. Write the 8051-assembly language code for specific purposes

CO 3. Implement code for interfacing various devices.

CO 4. Develop simple embedded systems for real time operations

CO 5. Compose simple embedded system with error free software to obtain target system.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

SUBJECT NAME: - HUMAN RESOURCE MANAGEMENT

SUBJECT CODE: - HSMC-CSE-301

Course Outcomes:

CO 1. To develop the understanding of the concept of human resource management and to understand its relevance in organizations.

CO 2. To develop necessary skill set for application of various HR issues.

CO 3. To analyze the strategic issues and strategies required to select and develop manpower resources.

CO 4. To integrate the knowledge of HR concepts to take correct business decisions.

CO-PO Mapping:

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1								3				1	3	3
CO2							1						3	3
CO3						2	1						3	3
CO4						2	2					1	3	3
CO5						2	2	3				1	3	3

Scheme for B.Tech (6th Seme) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 308	Compiler Design	3	1	0	20	20	60	100	4
	PCC	PCC-CSE 309	Data Mining & Ware-	3	0	0	20	20	60	100	3

2			housing								
3	PCC	PCC-CSE 310	Computer Network	3	0	0	20	20	60	100	3
4	PEC	PEC-CSE 304-306	Elective-II	4	0	0	20	20	60	100	4
5	PEC	PEC-CSE 307-309	Elective-III	4	0	0	20	20	60	100	4
6	OEC	OEC-CSE 301-303	Open Elec-tive-I	3	0	0	20	20	60	100	3
7	PCC	PCC-CSE 311	Compiler Design Lab	0	0	2	30	30	40	100	1
8	PCC	PCC-CSE 312	Computer Network Lab	0	0	2	30	30	40	100	1
9	PROJ	PROJ-CSE 302	Minor Pro-ject- I	0	0	4	50	50	100	200	2
			Total	**20**	**1**	**8**				**1000**	**25**

SUBJECT NAME: - Compiler Design

SUBJECT CODE: - PCC-CSE 308

Course Outcomes:

CO1. To realize basics of compiler design and apply for real time applications.

CO 2. To introduce different translation languages

CO 3. To understand the importance of code optimization

CO 4. To know about compiler generation tools and techniques

CO 5. To learn working of compiler and non-compiler applications and design of compiler for simple programming language.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1									2		
CO2	2											1		
CO3	3	3	2	2	3							2		

CO4	2				3							2		
CO5	3	2	3	2	2							3	3	3

SUBJECT NAME: - Data Mining & Ware-housing

SUBJECT CODE: - PCC-CSE 309

Course Outcomes:

CO 1. Understand the functionality of the various data mining and data warehousing component.

CO 2. Appreciate the strengths and limitations of various data mining and data warehousing models.

CO 3. Explain the analyzing techniques of various data.

CO 4. Describe different methodologies used in data mining and data ware housing.

CO 5. Compare different approaches of data ware housing and data mining with various technologies.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3				2							2		
CO3	2	2										2	2	
CO4	3				3							3		
CO5	2	2		1	2							2	2	

SUBJECT NAME: - Computer Network

SUBJECT CODE: - PCC-CSE 310

Course Outcomes:

CO 1. Students will be aware about computer networking.

CO 2. Students will know about various layers of OSI Model.

CO 3. Students will learn about wired & wireless technologies.

CO 4. Students will learn about the services of different layers.

CO 5. Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3											2		
CO3	3				1					1		2		
CO4	3	2		2	2							3		
CO5	3	3		2	2							2	1	

SUBJECT NAME: - Elective-II (Theory of Computation-305)

SUBJECT CODE: - PEC-CSE 304-306

Course Outcomes:

CO1. Knowledge Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Turing machines, Grammar, halting problem, computability and complexity.

CO2. Cognitive skills (thinking and analysis). - Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics - Be able to design sample automata - Be able to minimize FA's and Grammars of Context Free Languages.

CO3 Professional Skill - Perceive the power and limitation of a computer - Solve the problems using formal language

CO4 Attitude- Develop a view on the importance of computational theory.

CO5. Describing the limitations of a computing machine.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3	2	3	2								3	2	2
CO3	3	2	3	2								2	2	2
CO4	2	3	3	3								2	2	1
CO5	2											1		

SUBJECT NAME: - Elective III (Web and Internet Technology-309)

SUBJECT CODE: -PEC-CSE 307-309

Course Outcomes:

CO 1. Students will be familiar with Internet.

CO 2. Students will be familiar with different protocols of internet.

CO 3. Students will learn different services of internet.

CO 4. Analyze a web page and identify its elements and attributes.

CO 5. Students will learn HTML, CSS, JAVA Scripts for web designing.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

CO1	3				3	2	2	3	2	3		3	3	
CO2	3											2		
CO3	3											2		
CO4	3				3	2	2	3		3	2	3	3	2
CO5	3				3	3	2	3	2	2		3	3	2

SUBJECT NAME: - Open Elective-I Cyber Laws and Ethics-302)

SUBJECT CODE: - OEC-CSE 301-303

Course Outcomes:

CO 1. Make learner conversant with the social and intellectual property issues emerging from cyberspace.

CO 2. Explore the legal and policy developments in various countries to regulate cyberspace.

CO 3. Develop the understanding of relationship between commerce and cyberspace.

CO 4. Give learners in depth knowledge of information technology act and legal framework of right to privacy, data security and data protection.

CO 5. Make study on various case studies on real time crimes.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					2		3				3		
CO2	3					2		3				3		
CO3	3					3		3				3		
CO4	3					2		3				3		
CO5	3					3		3				3		

CBCS Scheme for B.Tech (7th Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 401	Network Security & Cryptography	3	1	0	20	20	60	100	4
2	PEC	PEC-CSE	Elective- IV	4	0	0	20	20	60	100	4

		401-403									
3	PEC	PEC-CSE 404-406	Elective- V	3	1	0	20	20	60	100	4
4	OEC	OEC-CSE 401-403	Open Elective- II	3	0	0	20	20	60	100	3
5	PCC	PCC-CSE 401	Network Security & Cryptography Lab	0	0	2	30	30	40	100	1
6	PROJ	PROJ-CSE-401	Minor Project-II	0	0	16	50	50	400	500	8
			Total	**13**	**1**	**18**				**1000**	**24**

SUBJECT NAME: - Network Security & Cryptography

SUBJECT CODE: - PCC-CSE-401

Course Outcomes:

CO 1. Understand basic cryptographic algorithms, message and web authentication and security.

CO 2. Identify information system requirements for both of them such as client and server.

CO 3. Understand the current legal issues towards information

CO 4. Distinguish and explain different protocol like SSL, TLS Visà-vis their applications.

CO 5. Comprehend and explain security services and mechanisms.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					3						3		
CO2	2	2				2		2				2	2	
CO3	3					2		3				2		
CO4	3					3						3		
CO5	3				2	3		3				3	3	2

SUBJECT NAME: - Parallel and Distributed Algorithm

SUBJECT CODE: - PEC-CSE-402

Course Outcomes:

CO 1. Understand the requirements for programming parallel systems and how they can be used to facilitate the programming of concurrent systems.

CO 2. To learn and apply knowledge of parallel and distributed computing techniques and methodologies.

CO 3. To learn the architecture and parallel programming in graphics processing units (GPUs).

CO 4. Understand the memory hierarchy and cost-performance tradeoffs.

CO 5. To gain experience in the design, development, and performance analysis of parallel and distributed applications.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3		2	2	2			2	2		1	2	3	2
CO3	3											2		
CO4	2											2		
CO5	3	2	3	2	3	2	2		2	2	2	3	3	3

SUBJECT NAME: -Cloud Computing

SUBJECT CODE: - PEC-CSE-406

Course Outcomes:

CO1. Able to understand basic concepts, principles and paradigm of Cloud Computing

CO2. Able to interpret various Cloud computing models and services.

CO3. Able to identify the significance of implementing virtualization techniques.

CO4. Able to understand the need of security in Cloud computing.

CO5. Understand the concept SOA and cloud based storage in Cloud computing.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1			1	1		1			1	2		
CO2	1	2	1	3	1		1					2		
CO3		1	3	1	2	1		1				3		
CO4	2	1	2	1		2	1					2		
CO5		1	1	2	1	2		1				3		

CBCS Scheme for B.Tech (8th Sem) (2022-26)

S.No.	Category	Code	Course Title	Hours Per Week			IA		EA	Total	Credit
				L	T	P	TA	MTA			
1	PCC	PCC-CSE 403	Advanced Computer Architecture	3	1	0	20	20	60	100	4
2	PCC	PCC-CSE 404	Artificial Intelligence & Expert Systems	3	0	0	20	20	60	100	3
3	PEC	PEC-CSE 407- 409	Elective- VI Optimization Techniques	3	1	0	20	20	60	100	4
4	OEC	OEC-CSE 404-406	Open Elective- III Industrial Relations	3	0	0	20	20	60	100	3
5	PCC	PCC-CSE 405	Artificial Intelligence & Expert Systems Lab	0	0	4	30	30	40	100	2
6	PROJ	PROJ-CSE-402	Major Project	0	0	16	50	150	400	600	8
			Total	**12**	**2**	**20**				**1100**	**24**

SUBJECT NAME: -Advanced Computer Architecture

SUBJECT CODE: - PEC-CSE-403

Course Outcomes:

CO1.Demonstrate concepts of parallelism in hardware/software.

CO2.Discuss memory organization and mapping techniques.

CO3.Describe architectural features of advanced processors.

CO4.Interpret performance of different pipelined processors.

CO5.Explain data flow in arithmetic algorithms.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	3											3		
CO3	3											3		
CO4	3	3			2							3	2	
CO5	3											3		

SUBJECT NAME: -Artificial Intelligence & Expert System

SUBJECT CODE: - PEC-CSE-404

Course Outcomes:

CO1 Study the concepts of AI and related searching algorithms.

CO2 Develop the knowledge skills and it's representational structure in AI.

CO3 Study the concepts of natural language processing in AI.

CO4 Study the concepts of supervised/unsupervised machine learning and game technique.

CO5 Study how design the programming skill in PROLOG, and concepts of pattern recognition approaches.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1					3		
CO2	1	2	3	1	2		1					2		
CO3	1	1		1	1		3					2		
CO4	2	1	2	3	1		1					2		
CO5	1	2	3	3	2		1					3	2	2

SUBJECT NAME: -Optimization Technique

SUBJECT CODE: - PEC-CSE 407

Course Outcomes:

CO1: Formulate the engineering problems as an optimization problem.

CO2: Apply necessary and sufficient conditions for a given optimization problem for optimality

CO3: Select appropriate solution methods and strategies for solving an optimization problem and interpret and analyze the solution obtained by optimization algorithms

CO4: Justify and apply the use of modern heuristic algorithms for solving optimization problems

CO5: Solve Engineering Design and Manufacturing related optimization problem using software tools.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	1	1				1	1		1	1	
CO2	1	3	2	1						1			1	
CO3	1	3	2	1	1				2	1				
CO4	2	2	2	2	2				2	1				
CO5	1	3	3	2	3				2	2		1		

SUBJECT NAME: - INDUSTRIAL RELATIONS

SUBJECT CODE: - OEC-CSE – 406

Course Outcomes:

CO 1. Students should able to elaborate the concept of Industrial Relations.

CO 2. The students should able to illustrate the role of trade union in the industrial setup.

CO 3. Students should able to outline the important causes & impact of industrial disputes.

CO 4. Students should able to elaborate Industrial Dispute settlement procedures.

CO 5. Student should be able to summarize the important provisions of Wage Legislations, in reference to Payment of Wages Act 1936, Minimum Wages Act 1948 & Payment of Bonus Act 1965.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1							1		2		2	2		
CO2							1				1	2	2	
CO3							1				2	2		2
CO4							1				2	2		2
CO5							1		1		1	2		

Semester III (Second year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 201	Data structure & algorithm using C	3	1	0	4

Total Hrs:45

Unit I: Arrays, Records and Pointers (7Hr**)**

Introduction to Linear Arrays, Arrays ADT, Representation Linear in Memory, Traversing Array

Inserting and deleting, Sorting; Bubble Sort, Searching; Linear Search, Binary Search, Multidimensional Arrays, Representation of Polynomials Using Arrays, Pointers; Pointer Arrays, Dynamic Memory Management, Records; Record Structures, Representation of Records in Memory; Parallel Arrays, Matrices, Sparse Matrices.

Unit II: Linked List (9Hrs)

Introduction Linked Lists, Representation of Linked Lists in Memory Traversing a Linked List Searching a Linked List, Memory Allocation; Garbage Collection, Insertion into a Linked List, Deletion from a Linked List, Header Linked List, Circularly Linked Lists, Two-Way Lists (or Doubly Linked Lists), Josephus Problem and its Solution, Buddy Systems.

Unit III: Stacks, Queue and Recursion (9Hrs)

Introduction Stacks, Array Representation of Stacks, Linked Representation of Stacks, Stack as ADT, Arithmetic Expression; Polish Notation, Application of Stacks, Recursion, Towers of Hanoi, Implementation of Recursive Procedures by Stacks, Queue, Linked Representation of Queues, Queues as ADT, Circular of Queues, Deques, Priority Queues, Applications of Queues.

Unit IV: Trees (10Hrs)

Introduction Binary Trees ,Representing Binary Tree in Memory ,Traversing Binary Trees, Traversal Algorithms Using Stacks, Header Nodes; Threads, Threaded Binary Trees ,Binary Search Trees ,Searching and Inserting in Binary Search Trees ,Deleting in a Binary Search Tree, Balanced Binary Trees, AVL Search Trees ,Insertion in an AVL Search Tree ,Deletion in an AVL Search Tree, m-way Search Trees ,Searching, Insertion and Deletion in an m-way Search tree, B-Trees ,Searching, Insertion and Deletion in a B-tree, B+-Trees.

Unit V: Graphs and their Applications (6Hrs)

Introduction, Graph Theory Terminology, Sequential Representation of Graphs; Adjacency Matrix; Path Matrix, Warshall ‟s Algorithm; Shortest Paths, Linked Representation of a Graph, Operations on Graphs, traversing a Graph, Topological Sorting, Spanning Trees

Unit VI: Sorting and Searching (4Hrs)

Introduction, Sorting, Insertion Sort, Selection Sort, Merging, Merge-Sort, Shell Sort, Radix Sort, Searching and Data Modification, Hashing.

Text Books: 1. Seymour Lipschutz, Schaums Outlines, „Data Structures with C‟,Tata Mc Graw Hill

Reference Books: 1. S. Sahani, „Data Structures in C‟

2. D.Samantha, „Classic Data Structure‟, PHI Publications

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 202	Object oriented programming through C++	3	1	0	4

Total Hrs:45

Unit-I: Principles of Object Oriented Programming (8 Hrs)

Differences between C and C++.A look at procedure Oriented programming, object oriented programming paradigm, basic concepts of OOP, Benefits of OOP, OO languages, A sample program, structure of C++ program. Introduction to OOPS: The origins of C++, What is Object Oriented Programming? Some C++ fundamentals, Headers & Name Spaces, Introducing C++ Classes & Object.

Unit-II: Overloading (10Hrs)

Introduction of overloading, Function overloading, Operator overloading, Inheritance, Constructors & Destructors,Function & Operator Overloading constructor functions, Localizing variables, Function overloading & Ambiguity, Finding the address of an overloaded function, this Pointer, References, Using reference to overload a unary operator, overriding.

Unit-III: Inheritance, Virtual Functions and polymorphism (7 Hrs)

Inheritance and the access specifies, Constructors and Destructors in derived classes, Multiple Inheritance, Passing parameters to a basic class, Pointers and references to derived types, Virtual Functions, Why virtual functions?, Pure virtual functions and abstract types, Early Vs Latebinding.

Unit-IV: Static & Dynamic memory allocation (10 Hrs)

Static & Dynamic allocation using new and delete, static class members, Virtual base classes, const member functions and mutable, volatile member functions, Using the as keyword, linkage specification, The .* and ->* operators, Creating conversion functions, Copy constructors, Granting access, namespaces, Explicit constructors, type name and export.

Unit-V: Exceptions Handling (10 Hrs)

Exception Handling, fundamentals, options the uncaught exception ( ), Applying exception Handling, and RTTI, casting operators, Recent trends in Object Oriented Programming in C++ , Advanced topics & its Application.

Templates : Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters.

Text Books:

1. Object Oriented Programming in C++ -Robert Lafore, edition, Galgotia publications
2. The Complete Reference C++, Herbert Schildt, 4th Edition, TMH

Reference Books:

1. Y. Kanetkar, „Let‟s C++‟, BPB publications
2. E Balagurusamy, „Object oriented programming with C++‟, 4th edition, TMH
3. Sourav Sahay , „Object-Oriented Programming with C++‟ , Oxford University Press, 2006.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 203	Database Management System	3	1	0	4

Total hrs: 45

UNIT – I: Database System Applications: (8 Hrs)

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

Unit-II: Database Design Theory (9 Hrs)

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.

Unit-III: Physical Database Design and Memory Management in database (9 Hrs)
SQL: Queries, Constraints, Triggers: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases. Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

Unit -IV: Query Optimization and Performance Tuning (9 Hrs)
Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

Unit-V: Transaction Management (10Hrs)

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

Text Books:

1. Fundamentals of Database Systems – Emissary ,Navathe & Gupta, Pearson Education
2. Database System Concepts by Henry Korth

Reference Books:

1. Database Systems by S. K. Singh, Pearson Education.
2. Principles of Database Systems – Ullman, Golgotia Publications 1998.
3. Database Systems by Connolly, 3rd edition, Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 204	Unix & Shell Programming	3	1	0	4

Total Hrs:45

UNIT-I INTRODUCTION (8Hrs)

Introduction to Unix-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

UNIT-II INTRODUCTION TO FILE (7Hrs)

The File system –The Basics of Files-What's in a File-Directories and File Names-Permissions-I,Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

UNIT-III REGULAR EXPRESSIONS: (8Hrs)

Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

UNIT-IV KORN SHELL: (7Hrs)

Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language-Good Files and Good Filters.

UNIT-V INTERACTIVE C SHELL (7Hrs)

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The Read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

UNIT-VI FILE MANAGEMENT (8Hrs)

The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control.

Text Book: 1.UNIX and Shell Programming Richard F. Gilberg

Reference Books: 1. Mastering UNIX Shell Scripting: Bash, Bourne, and Korn Shell.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
BSC	BSC 201	Mathematics - III	3	1	0	4

Unit –I (9Hours)

Fourier transform: Discrete and Fast Fourier transform Complex form of Fourier transform and its inverse, Fourier sine and cosine transform and their inversion. Properties of F-transform, Convolution theorem for F-transform, Parse Val‟s identity of for F-transforms Applications of Fourier transform for the solution of partial differential equations having constant coefficients with special reference to heat equation and wave equation.

Unit –II (9Hours)

Laplace transform, Inverse transform, properties, Transforms of derivatives and integrals, Unit step function, Dirac‟s delta function, Differentiation and integration of transforms, Applications to differential equations.

Unit –III (9Hours)

Statistical Techniques: Discrete and Continuous random variables–Moments–Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions, Moments, Moment generating functions, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non –linear

Unit –IV (9Hours)

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Unit –V (9Hours)

Cauchy-Riemann equations: Necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions.

Text and Reference books:

1. Chandrika Prasad, Mathematics for Engineers, Prasad Mudralaya
2. Jeffrey, Advanced Engineering Mathematics , ELSEVIER
3. Chandrika Prasad , Advanced Mathematics for Engineers, Prasad Mudralaya
4. Grewal B. S., Higher engineering Mathematics, Khanna Publication, New Delhi
5. Keyszig E., Advanced Engineering Mathematics, Wiley Eastern Publication
6. Peter V. O. Neil, Advanced Engineering mathematics, Thomson Publication
7. Gerald, C.F., and Wheatley, P.O., Applied Numerical Analysis, Addison Wesley.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
HSMC	HSMC 201	Human Values	3	1	0	4

Total Hrs:45

UNIT-I: Course Introduction (9Hrs)

Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self-Exploration - what is it? - its 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. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-II: Harmony in the Human Being (9Hrs)

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 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-III: Relationship and Goals (9Hrs)

Understanding Harmony in the Family and Society - Harmony in Human - 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. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in thesociety (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva 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-IV: Nature and Values (9Hrs)

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-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT-V: Ethics and Ability (9Hrs)

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems.

Text books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

Reference books:

1. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 205	Data structure & algorithm using C lab	0	0	2	1

Total Hrs: 20

List of Practical's-

1. Write and execute a program in C to implement stack using arrays
2. Write and execute a program in C to implement queue using arrays
3. Write and execute a program in C to implement simple linked list
4. Write and execute a program in C to implement stack using linked list
5. Write and execute a program in C to implement queue using linked list
6. Write and execute a program in C to implement doubly linked list
7. Write and execute a program in C to implement circular linked list.
8. Write and execute a program in C to reverse a singly and doubly linked list
9. Write and execute a program in C to insert a node in a linked list in a sorted fashion 154
10. Write and execute a program in C to implement binary tree, finding the depth of a tree
11. Write and execute a program in C to implement in order, preorder and post order traversals
12. Write and execute a program in C to find if two trees are identical

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 206	Object oriented programming through C++ lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. Write a C++ program to find the sum of individual digits of a positive integer.
2. Write a C++ program to generate the first n terms of the sequence
3. Write a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C++ program to find both the largest and smallest number in a list of integers.
5. Write a C++ program to sort a list of numbers in ascending order.
6. Write a Program to illustrate New and Delete Keywords for dynamic memory allocation
7. Write a program Illustrating Class Declarations, Definition, and Accessing Class Members.
8. Program to illustrate default constructor, parameterized constructor and copy constructors
9. Write a Program to Demonstrate the i)Operator Overloading.ii) Function Overloading.
10. Write a Program to Demonstrate Friend Function and Friend Class.
11. Write a Program to Access Members of a STUDENT Class Using Pointer to Object Members.
12. Write a Program to Generate Fibonacci Series use Constructor to Initialize the Data Members.
13. Write C++ programs that illustrate how the following forms of inheritance are supported:
    a. Single inheritance b)Multiple inheritance c)Multi level inheritance d)Hierarchical inheritance
14. Write a C++ program that illustrates the order of execution of constructors and destructors when new class is derived from more than one base class.
15. Write a Program to Invoking Derived Class Member Through Base Class Pointer
16. Write a Program Containing a Possible Exception. Use a Try Block to Throw it and a Catch Block to Handle it Properly.
17. Write a Program to Demonstrate the Catching of All Exceptions.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 207	Database Management System Lab	0	0	2	1

Total Hrs: 20

List of Practicals:

1. Creation of a database and writing SQL queries to retrieve information from the database.
2. Performing Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of Views, Synonyms, Sequence, Indexes, save point.
4. Creating an Employee database to set various constraints.
5. Creating relationship between the databases.
6. Study of PL/SQL block.
7. Write a PL/SQL block to satisfy some conditions by accepting input from the user.
8. Write a PL/SQL block that handles all types of exceptions.
9. Creation of Procedures.
10. Creation of database triggers and functions.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 208	Unix & Shell Programming Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. Write a shell script to write your user name as a banner to the front of the file being sent to the printer
2. Write a shell script to print the first five arguments in reverse order
3. Write a shell script to append a line to the file. Both the file name and line have to be specified to the script at the command line. Ensure that it runs the sh shell script. Print the number of lines in the file after you done.
4. Write a shell script that tests and print outs the name of all the files in a directory that are executable. Do not print any other file or directory names. If there are subdirectories, go down recursively. How would you change this script to not go down recursively?
5. Write a shell script that given a person‟s UID, tells you how many times that person is logged on
6. Write a shell script called lsdirs which lists just the directories in the current directory
7. Write a shell script called see taking a filename name as argument which uses ls if the file is a directory and more if file is otherwise
8. Write a shell script that asks a user to type w word in, then tells the user how long that wordis.
9. In many versions of UNIX there us a –i argument for cp so that you will be prompted for confirmation if you are about to overwrite a file. Write a script called cpi which will prompt if necessary without using the –i argument.
10. Write a shell script that takes a uid as an argument and prints out that person‟s name, home directory, shell and group number, and other groups that person may belong to.
11. Sort /etc/passwd using the uid as the key.
12.
    a. Write a program to generate Machine OpCode Table, Symbol Table and Pseudo OpCode table during First Pass Assembler.
    b. Write a program to generate Machine Opcode table using two pass Assembler.

Semester IV (Second year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 209	Digital Electronics	4	1	0	5

Total Hrs:45

Unit –I

Overview of electronics: Electronic Components-Resistor, capacitor and Inductors, Semiconductor devices: Diodes, transistors (BJT and FET). Integrated circuits, Popular IC packages, Analog vs digital electronics, Transistor as a switch.
Boolean algebra: Representation of values and complements, De'Morgans theorem-simplifying expressions.

Unit –II

Logic gates: AND, OR, NOT, XOR, XNOR, NAND, NOR gates and their truth tables, combining logic circuits for expressions using NAND and NOR gates, Logic circuit families and characteristics, SSI, MSI,LSI and VLSI circuits. Combinational and sequential circuits: (Simple block diagrams, truth tables and IC packages only required).
Adders, decoders, multiplexers, encoder circuits , Flip-flops: RS, clocked RS, JK, D and T flip flops, Master-slave flip flops, edge and level triggering, Multivibrators - A stable, Bistable, Monostable,counters-ripple and decade. Registers, latches and Tristate buffers.

Unit –III

Building blocks of a computer system: Basic building blocks-I/O, memory, ALU, Control and their interconnections, Control unit and its functions- Instruction-word, Instruction execution cycle, organizational sequence of operation of control registers; controlling of arithmetic operations; branch, skip, jump and shift instructions, ALU-its components.

Unit –IV

Addressing techniques and registers: Addressing Techniques-Direct, immediate addressing; paging, relative, Indirect and indexed addressing. Memory buffer register; accumulators; Registers-Indexed,General purpose, Special purpose; overflow, carry, shift, scratch registers; stack pointers; floating point; status information and buffer registers

Unit –V

Memory: Main, RAM, static and Dynamic, ROM, EPROM, EAROM, EEPROM, Cache and Virtual memory. Interconnecting System components: Buses, Interfacing buses, Bus formats-address, data and control,Interfacing keyboard, display, auxiliary storage devices, and printers. I/O cards in personal computers. Development of Indian Super Computer 'PARAM': History, Characteristics, Strengths, Weakness and basic Architecture.

Text / Reference Books

1. A.S.Tannenbaum : Structured Computer Organization, Pearson
2. Thomas C. Bartee : Digital Computer Fundamentals, McGraw-Hill
3. Duglus V Hall : Microprocessors and Interfacing: programming and Hardware, McGraw-Hill, 1986.
4. Introduction to Computer Architecture, Stone S.Galgotia Publicatons 1996.
5. Microprocessor Architecture Programming & Applications, R. Gaonkar, Wiley Eastern-1987.
6. Computer Architecture and Organization by N.P. Carter, 4th Edition, McGraw-Hill, 2014.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 210	Discrete Mathematics	3	1	0	4

UNIT-I: Set Theory, Relation: Definition, Function: (10Hrs)

Definition of Sets, Venn Diagrams, complements, Cartesian products, power sets, counting principle, cardinality and count ability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle. Types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation. Definition and types of function, composition of functions, recursively defined functions.

UNIT-II: Propositional logic: (8Hrs)

Proposition logic, basic logic, logical connectives, truth tables, tautologies, contradiction, normal forms (conjunctive and disjunctive), modus ponens and modus tollens, validity, predicatelogic, universal and existential quantification. Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table, proof by counter example.

UNIT-III: Combinatories: (8Hrs)

Mathematical induction, recursive mathematical definitions, basics of counting, permutations, combinations, inclusion-exclusion, recurrence relations (nth order recurrence relation with constant coefficients, Homogeneous recurrence relations, Inhomogeneous recurrence relation), generating function (closed form expression, properties of G.F., solution of recurrence relation using G.F, solution of combinatorial problem using G.F.)

Unit-IV: Algebraic Structure: (9Hrs)

Binary composition and its properties definition of algebraic structure; Groyas Semi group, Monoid Groups, Abelian Group, properties of groups, Permutation Groups, Sub Group, Cyclic Group, Rings and Fields (definition and standard results).

UNIT-V: Graphs: (10Hrs)

Graph terminology, types of graph connected graphs, components of graph, Euler graph, Hamiltonian path and circuits, Graph coloring, Chromatic number. Tree: Definition, types of tree(rooted, binary), properties of trees, binary search tree, tree traversing (preorder, inorder,

postorder). Finite Automata: Basic concepts of Automation theory, Deterministic finite Automation(DFA), transition function, transition table, Non Deterministic Finite Automata (NDFA), Mealy and Moore Machine, Minimization of finite Automation.

Text/Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill, 2002.
2. J.P.Tremblay & R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science" Mc.Graw Hill, 1975.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 211	Computer Organization & Architecture	3	0	0	3

Unit I: Basic Structure of Computers (7 Hrs)

Functional Units, Basic operational concepts, Bus structures Addressing modes, subroutines: parameter passing, Instruction formats, expanding op codes method.

Unit II: Basic Processing Unit (8 Hrs)

Bus architecture, Execution of a Complete Instruction, sequencing of control signals, Hardwired control, Micro programmed Control, microinstruction format, Bit slice concept.

Unit III: Arithmetic Unit (7 Hrs)

Number representations and their operations, Design of Fast Adders, Signed multiplication, Booth‟s Algorithm, bit pair recoding, Integer Division, Floating point numbers and operations, guard bits and rounding.

Unit IV: The Memory System (8 Hrs)

Various technologies used in memory design, higher order memory design, multimodal memories and interleaving, Associative Memory, Cache memory, Virtual Memory.

Unit V: Input /Output Organization (7Hrs)

I/O mapped I/O and memory mapped I/O, interrupts and interrupts handling mechanisms, vectored interrupts, synchronous vs. asynchronous data transfer, Direct Memory Access COMPUTER PERIPHERALS: I/O devices such as magnetic disk, magnetic tape, CDROM systems.

Unit VI: RISC (8 Hrs)

Pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, influence of pipelining on instruction set design, multiple execution Units, performance considerations, Basic concepts in parallel processing & classification of parallel architectures. Vector Processing0, Array Processors. Recent trends in Computer Architecture & Organization.

Text Books:

1. V.C.Hamacher,Z.G.Vranesic and S.G.Zaky, „Computer Organization‟, McGraw Hill,5th edition ,2002.

References Books:

1.A.S.Tanenbaum, “Structured Computer Organization” 4th Edition, Pearson Education.
2.M Mano, “Computer System and Architecture”, Pearson Education
3.W. Stallings, “Computer Organization & Architecture”, Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 212	Design & Analysis of Algorithm	4	0	0	4

Unit – I: Introduction **(8 Hrs)**

INTRODUCTION: Algorithm, pseudo code for expressing algorithms, performance analysis-space complexity, time complexity, asymptotic notation- big (O) notation, omega notation, theta notation and little (o) notation, recurrences, probabilistic analysis, disjoint set operations, union and find algorithms.

Unit – II: Asymptotic notations (8 Hrs)

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: Advanced data structures (9 Hrs)

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: Greedy Method & Dynamic Programming (10Hrs)

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: Traversal and Search Techniques (9 Hrs)

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 et. al. “Introduction to Algorithms”, Prentice Hall of India.
2. Design & Analysis of Computer Algorithms by Aho,. Horowitz, Sahani, Rajsekharam, Pearsoneducation

Reference Books:

1. “Computer Algorithms”, Galgotia Publications Pvt. Ltd. Brassard, Bratley, “Fundamentals ofAlgorithms”, Prentice Hall
2. 2. Computer Algorithms: Introduction to Design and analysis, 3rd Edition, By Sara Baase & A. V. Gelder Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC- CSE 213	Operating Systems	4	0	0	4

Total Hrs:45

Unit-I: Introduction (6 Hrs)

Evolution of OS, Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation.

Unit-II: File Systems (8Hrs)

File systems: File concept, Access methods, Disk space management and space allocation strategies, directory structures, Recovery, Log-structured File System, disk arm scheduling strategies.

Unit-III: Process and Its Scheduling (7Hrs)

Process concept, process control block, Types of scheduler, context switch, threads, multithreading model, goals of scheduling and different scheduling algorithms.

Unit-IV: Memory Management (8Hrs)

Contiguous allocation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging , Virtual Memory Concepts, page faults and instruction restart , page replacement algorithms , working sets ,Locality of reference, Thrashing, Garbage Collection.

Unit-V: Process management and synchronization (8Hrs)

Concurrency conditions, Critical section problem, software and hardware solution, semaphores, conditional critical regions and monitors, classical inter process communication problems

Unit-VI: Deadlocks detection & avoidance (8Hrs)

Deadlock definitions, Prevention, Avoidance, detection and Recovery, Goals of Protection, access matrix, Deadlock implementation.

Text Books:

1. Operating System concepts – Silberchatz & Galvin, Addison Wesley, 6th Edn.
2. Modern Operating Systems – Tanenbaum, Pearson Edn. 2ndedn.

Reference Books:

1. Operating Systems – S R Sathe, Macmillan Publishers, India, 2008
2. Operating System –Milan Milenkovik, McGraw-Hill, 1987

Category	Code	Course Title	Hours PerWeek			Credit
			L	T	P	
HSMC	HSMC 401	Organizational Behavior	3	0	0	3

Total Hrs: 45

Unit-l: OrganizationalBehavior (9 Hrs)

Definition - Importance - Historical Background - Fundamental concepts of OB - 21st Century corporate - Different models of OB i.e. autocratic, custodial, supportive, collegial and SOBC.

Unit II: Perception Process & Personality & Attitudes (9 Hrs)

Nature & Importance - Perceptual Selectivity - Perceptual Organization - Social Perception – Impression Management Meaning of personality - Development of personality - Nature and dimensions of attitude - Job Satisfaction - Organizational Commitment.

Unit III: Learning & Motivation (9 Hrs)

Process of Learning - Principles of Learning - Organizational Reward Systems - Behavioral Management Motives - Characteristics - Classification of motives - Primary Motives - Secondary motives - Morale - Definition and relationship with productivity - Morale Indicators Theories of Work Motivation - Maslow's theory of need hierarchy - Herzberg's theory of job loading.

Unit IV: Leadership & Organizational Design (9Hrs)

Definition - Importance - Leadership Styles - Models and Theories of Leadership Styles Various organizational structures and their effects on human behaviour - Organizational Climate - Organizational Culture - Organizational Effectiveness.

Unit V: Conflict Management (9 Hrs)

Modern view of conflict - Constructive and Destructive conflict - Conflict Process - Strategies for encouraging constructive conflict - Strategies for resolving destructive conflict. Stress Management - Concept of stress - Sources of stress - Effects of stress on humans - Managementof Stress.

Text Books:

1. Organizational Behaviour, 9th Ed. - Stephen Robbins

2. Human Behaviour at work - Davis and Newstorm

3. Organizational Behaviour - Uma Sekaran

Reference Books:

4. Organizational Behaviour - Fred Luthans
5. Organizational Behaviour - K.Aswathappa
6. Human Behaviour at Work - Keith Davis

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 214	Computer Organization & Architecture Lab	0	0	2	1

Total Hrs: 20

List of practicals -

1. Machine and assembly languages (generic)
2. The process of assembly and linking
3. Special assembly language programming issues
4. Parameter passing: assembly language and "external"a.Return addresses and co-routines

b.Traps and interrupts: mechanism and handling

c. Worms and viruses: malicious code and defending against it

5. Special miscellaneous topics
6. Operating system interface: traps and interrupts

a.Access to IO devices: display, keyboard, real-time clocks, DMA

b.Communications (serial and parallel), simple error detection and correction codes (parity, Hamming),

7. Low level programming in C. This includes all sorts of "tricks" that emphasize the power of low-level computing, as an aid to understanding computing systems in depth: Pointers tofunctions and their applications for self modifying code and applications.
8. Write the working of 8085 simulators GNUsim8085 and basic architecture of 8085 along with small introduction.
9. Study the complete instruction set of CPU and write the instructions in the instruction set of8085 along with examples.
10. Write an assembly language code in GNUsim8085 to implement data transferinstruction.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 215	Operating Systems Lab	0	0	2	1

Total Hrs:20

List of practical's -

1. Basics of UNIX commands.
2. Shell programming
3. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority
4. Implement all file allocation strategies
5. Implement Semaphores
6. Implement File Organization Techniques
7. Implement Bankers algorithm for Dead Lock Avoidance
8. Implement an Algorithm for Dead Lock Detection
9. Implement the all page replacement algorithms a) FIFO b) LRU c) LFU
10. Implement Shared memory and IPC
11. Implement Paging Technique f memory management.
12. Implement Threading & Synchronization Applications

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 216	Design & Analysis of Algorithm Lab	0	0	2	1

Total Hrs: 20

List of practicals -

1. To find HCF and LCM of two numbers
2. Code and analyses to find median element in an array of integers.
3. Code and analyse to find majority element in an array of integers.
4. Code and analyse to sort an array of integers using merge sort
5. Code and analyse to sort an array of integers using quick sort
6. To implement maximum and minimum problem using divide and conquer strategy
7. To implement binary search using divide and conquer strategy
8. To implement program of Heap Sort.
9. WAP of minimum spanning tree using Kruskal algorithm.
10. WAP of minimum spanning tree using Prim‟s algorithm.
11. WAP to implement matrix chain multiplication
12. Code to find the shortest path in graph using Dijkstra‟s algorithm.
13. Code to find the shortest path using Bellman-Ford algorithm.
14. To implement LCS problem using Dynamic Programming.
15. To implement matrix chain multiplication problem using dynamic programming.
16. Code and analyze to find the minimum spanning tree in a weighted, undirected graph.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	MC-III	Constitutional Law	3	0	0	0

Unit – I (9 Hrs)

Salient features of the Indian constitution. Preamble Definition of State (Art. 12) Doctrines of Ultra-virus, severability, eclipse, waiver (Art, 13)

Unit – II (9 Hrs)

Right to equality (Art. 14) Prohibition of discrimination, Rights to equality of opportUNITy (Art. 15-16) Right to freedom under Article 19: Freedom of association; Freedom of movement; Freedom of residence; Freedom of assembly; Freedom of association; Freedom of movement; Freedom of residence; Freedom of occupation, trade and business; Right to take out processions; Right of the State to impose reasonable restrictions

Unit – III (9 Hrs)

Protection in respect of Conviction under Article 20, Ex-post-facto law; Double jeopardy; Self-incrimination; Right of Life and Personal Liberty (Act. 21), Protection in respect of arrest and detention Right to freedom of Religion (Articles 25-28)

Unit – IV (9 Hrs)

Cultural and Education Rights (Articles 29-30) Enforcement of Fundamental Right, Writ Jurisdiction of the Supreme Court and High Court (Article 32, 226) Right to property before and after the Constitution 42nd Amendment Act, 1976 Abolition of Untouchability, Titles (Articles 17-18) Right against exploitation (Articles 23, 24)

Reference Books:

1. Austin Granville: Constitution of India: Cornerstone of a Nation and Working A Democraticconstitution
2. Narender Kumar : Constitutional Law of India.
3. Basu D. D : Shorter Constitution of India
4. Jain, M.P.: Constitutional Law of India,
5. Seervai, H.M. : Constitutional Law of India, Vols. I-III
6. Shukla, V.N. : Constitutional of India (ed. M.P.Singh)
7. B.R. Sharma : Constitutional Law and judicial Activism

Semester V (Third Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 301	Data Communication	4	0	0	4

Total Hrs: 45

Unit-l: Signals (8Hrs)

ANALOG AND DIGITAL: Analog and digital data, Analog and digital signals; PERIODIC AND APERIODIC SIGNALS, ANALOG SIGNALS: Simple analog signals; TIME AND FREQUENCY
DOMAINS; COMPOSITE SIGNALS: Frequency spectrum and Bandwidth; DIGITAL SIGNALS: Decomposition of digital signal; TRANSMISSION MODES: Serial and Parallel transmission, Asynchronous and Synchronous Transmission, Simplex, Half-Duplex and Full-Duplex communication.

Unit II: Encoding And Modulation (8Hrs)

DIGITAL-TO-DIGITAL CONVERSION: Unipolar, Polar, Bipolar; ANALOG-TO-DIGITAL CONVERSION: Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM), Sampling Rate, How many Bits per Sample? Bit rate; DIGITAL-TO-ANALOG CONVERSION: Aspects of Digital-to-Analog conversion, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase shift Keying (PSK), Quadrature Amplitude modulation (QAM), Bit / Baud comparison; ANALOG-TO-ANALOG CONVERSION: amplitude modulation (AM), Frequency Modulation (FM), Phase Modulation(PM).

Unit III: Interfaces and Modems (8Hrs)

DIGITAL DATA TRANSMISSION: Parallel transmission, Serial Transmission; DTE-DCE INTERFACE: Data Terminal Equipment (DTE), Data Circuit-Terminating Equipment (DEC), Standards, EIA-232 Interface; OTHER INTERFACE STANDARDS: EIA-449, EIA-530.

Unit IV: Communication Media (7Hrs)

GUIDED MEDIA: Twisted pair cable, Coaxial cable, Optical Fiber cable; UNGUIDED MEDIA: Radio frequency allocation, Propagation of Radio waves, Terrestrial microwave, Satellite communication, Cellular Telephony; TRANSMISSION IMPAIRMENTS: Attenuation, Distortion, Noise; PERFORMANCE: Throughput, Propagation Speed, Propagation time.

Unit V: MULTIPLEXING (7Hrs)

FREQUENCY DIVISION MULTIPLEXING (FDM), TIME DIVISION MULTIPLEXING (TDM): Inverse Multiplexing, WAVE-DIVISION MULTIPLEXING, MULTIPLEXING APPLICATIONS: THE TELEPHONE SYSTEM: Common carrier services and hierarchies, Analog services, Digital Services.

Unit VI: Data Compression (7Hrs)

Huffman code, Run-Length Encoding, Relative Encoding, Lempel-Ziv Encoding, Image Compression, PEG, MPEG.

Text Book:

1. Behrouz A. Forouzan , „Data Communications and 161 Networking“, 4th edition, Tata McGraw Hill.

Reference Book:

1. William A.Shay,„Understanding Data Communications and Networks“, 2nd Edition,Vikas publication

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 302	Software Engineering	4	0	0	4

Total Hrs: 45

Unit-I: Introduction (5 Hrs)

An Introduction to Software Engineering, Software Myths, Software Engineering- A Layered Technology, Software Process Framework, Software Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Process Model, Agile Process Models.

Unit-II: Software Planning (5 Hrs)

Software Engineering Practice An overview, Communication Practices, Planning Practices, Modeling Practices, Construction Practice & Deployment, System Engineering Hierarchy, Business Process Engineering, Product Engineering, System Modeling, Requirements Engineering.

Unit-III : Software Analysis And Design (9 Hrs)

Software Engineering Analysis & Design An overview, Requirements Analysis, Analysis Modeling Approaches, Data Modeling, Object-Oriented Analysis, Scenario Based Modeling, Flow-Oriented Modeling, Class-based Modeling, Behavioral Model. Design Engineering Concepts, DesignModel, Pattern-Based Software Design.

Unit-IV: Software Testing (9 Hrs)

Testing Strategies and Tactics An overview, level of testing: Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging techniques. Software Testing Fundamentals, Black-Box Testing, White-Box Testing.

Unit-V: Software Metrics And Software Quality Management (8 Hrs)

Product Metrics An overview, Software Quality, A Framework for Product Metrics, Metrics for Analysis & Design Models, Metrics for Source Code, Metrics for Testing & Maintenance, Software Project Management An overview, Software Measurements, Metrics for Software Quality, Software Project Estimation Techniques, Project Scheduling, Risk Management, Quality Management, Change Management, Software Reengineering.

Unit-VI: Trends in Software Engineering And Project Management (9 Hrs)

Software project management (PERT/CPM): Developing a network plan, overview of PERT /CPM, basic rules for developing network, basic rules for developing project network. Recent trends in Software Engineering and Project.

Text Book:

1. Software Engineering- A Practitioner‟s Approach (Sixth Edition) - Roger Pressman (TMH)

Reference Books:

1. Software Engineering (Seventh Edition)- Ian Summerville, Pearson Education.
2. Software Engineering Theory and Practice by Pfleeger, Pearson Education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 303	Formal Language & Automata Theory	3	1	0	4

Total Hrs: 45

Unit-I: Fundamentals (9Hrs)

Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and nondeterministic finite automaton, transition diagrams and Language recognizers.

Unit-II: Finite Automata & Regular Languages (8Hrs)

NFA with Î transitions – Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without Î transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM"s, Finite Automata with output- Moore and Melay machines. Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

Unit-III: Context Free Grammars & Grammar Formalism (9Hrs)

Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (proofs omitted).Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings.

UNIT-IV: Push Down Automata & Turing Machine (9Hrs)

Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA. Turing Machine: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church"s hypothesis, counter machine, types of Turing machines (proofs not required).

UNIT-V: Computability Theory (10Hrs)

Chomsky hierarchy of languages, linear bounded automata and context sensitive language,LR(0) grammar, decidability of, problems, Universal Turing Machine, undecidability of posts. Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

Text Book:

1. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.

Reference Book:

1. Introduction to languages and the Theory of Computation ,John C Martin, TMH

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 304	Java Programming	3	0	0	3

Total Hrs: 45

UNIT-I: (9Hrs)

Introduction to OOP, procedural programming language and object-oriented language, principles of OOP, applications of OOP, history of java, java features, JVM, program structure. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting, flow of control.

UNIT-II: (8Hrs)

Classes and objects, class declaration, creating objects, methods, constructors and constructor overloading, garbage collector, the importance of static keyword and examples, this keyword, arrays, command line arguments, nested classes.

UNIT-III: (8Hrs)

Inheritance, types of inheritance, super keyword, final keyword, overriding an abstract class. Interfaces, creating the packages, using packages, the importance of CLASSPATH and java.lang package. Exception handling, the importance of try, catch, throw throws and finally block, user-defined exceptions, Assertions.

UNIT-IV: (8Hrs)

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. Reading data from files and writing data to files, random access file,

UNIT-V: (6Hrs)

Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

UNIT-VI: (6Hrs)

AWT: introduction, components and containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Container class, Layouts, Menu and Scrollbar.

TEXT BOOK:

1. Cay S. Horstmann and Gary Cornell, “Core Java: Volume I – Fundamentals”, Eighth Edition, Sun Microsystems Press, 2008.

REFERENCES Books:

1. K. Arnold and J. Gosling, “The JAVA programming language”, Third edition, Pearson Education, 2000.
2. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
HSMC	HSMC-CSE-301	Human Resource Management	3	0	0	3

Total Hrs: 45

Unit-I:INTRODUCTION (9Hrs)

Overview of Human Resources, Historical evolution, Integrated HR function, Corporate and HR environment, Strategic environment, Strategic Management

UNIT-II: PLANNING (9Hrs)

HR planning at Enterprise level, Need for systematic planning, Planning process, Operating Environment- Internal & External, Job description, Models & techniques of Manpower demand and Supplyforecasting. Retention-Redeployment and Exit strategies

UNIT-III:SKILLES DEVELOPMENT (9Hrs)

Career management-Recruitment and Selection, Employee Induction Programme, Employee training, Training needs & objective setting, Methods of training, Development & Development needs, Human Resource Development, Development process

UNIT-IV: PERFORMANCE PLANNING (9Hrs)

Performance planning – Performance appraisal, Measures of appraisal, System components appraisal methods, Ethics of appraisal, Problems & issues

UNIT-V: HUMAN RESOURCE (9Hrs)

Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level

Text Book:

1. Praveen Durai (2010), Human Resource Management, Pearson Education, South Asia

Reference Books

1. John Storey, Graeme Salaman, Christopher Mabey(1998): Strategic Human Resource Management: A
   Reader, SAGE Publications, 1998
2. Christopher Mabey, Rosemary Thomson (2011): Developing Human Resources,Routledge, Taylor and francis group, New York, USA.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 301	Soft Computing	4	0	0	4

Total Hrs: 45

UNIT-I: NEURAL NETWORKS (9 hours)

Fundamentals of Neural Networks – History- Architectures- Learning methods XOR problem-Delta rule-derivation-Back propagation- applications- parameters in BPN- Associative memory – Hetero associative- BAM-energy function problems-applications of associative memories- ART1-ART2- applications of adaptive networks.

UNIT-II: FUZZY LOGIC (9 hours)

Fuzzy set theory – crisp sets – fuzzy sets – crisp relations – Fuzzy relations – Fuzzy systems- Crisp logic – predicate logic – fuzzy logic- fuzzy based systems Defuzzification methods – applications.

UNIT-III: GENETIC ALGORITHMS (9 hours)

Fundamentals of GA – creation of offspring‟s – encoding – fitness function reproduction – crossover- insertioo & deletion- mutation- bitwise operators – applications.

UNIT-IV: HYBRID SYSTEMS (9 hours)

Hybrid systems – Neuro Fuzzy – Neuro Genetic – fuzzy Genetic hybrids- GA based weight determination and applications- fuzzy BPN – simplified fuzzy ARTMAP.

UNIT-V: PROGRAMMING USING MATLAB (9 hours)

Using Neural Network toolbox – Using Fuzzy Logic toolbox- Using Genetic Algorithm & directedsearch toolbox.

TEXT BOOKS:

1. Rajasekaran S. and VijayalakshmiPai G.A, “Neural Networks, Fuzzy Logic and GeneticAlgorithms”, PHI, 2011.
2. Timothy J.Ross, “Fuzzy Logic with Engineering applications”, John Wiley and Sons, 2010.

REFERENCES

1. Jang J.S.R, Sun C.T, Mizutani E, “Neuro fuzzy and Soft Computing”, PHI Learning Pvt. Ltd., 2012.
2. Davis E. Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y.,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 302	Image Processing	4	0	0	4

Total Hrs: 45

Unit-I: Introduction (8Hrs)

Origins of digital image processing, Various Imaging techniques, components of an image processing system, Image sensing and acquisition, Image sampling and quantization, neighbors of a pixel, Adjacency, Connectivity, Regions and boundaries.

Unit-II: Filtering (8Hrs)

Basic intensity transformation and spatial filtering, Image negatives, log transforms power-law transformations, median filtering, Histogram equalization, Histogram matching spatial correlation and convolutions

Unit-III: Transformation (8Hrs)

Two-dimensional orthogonal and Unitary Transforms, properties of unitary transforms 2D-DFT, Cosine transforms, Sine transforms, Hadamard transform, Haar transforms, Slant transforms.

Unit-IV: Image Degradation /Restoration Process (7Hrs)

Model of image Degradation/Restorations process, Noise models, Restoration in the presenceof noise only, periodic noise reduction by Frequency domain filtering, Image reconstructionfrom Projections, Image compression models, Huffman coding, LZW coding, Run length coding,Bit-plane coding.

Unit-V: Image Morphology (7Hrs)

Some basic algorithms, Boundary extraction, convex hull, thinning, morphological Reconstruction. Colorimage color models. skeletons, morphological processing, color models, RGB color models, CMY and CMYK color models the HIS.

Unit-VI: Image Segmentation (7Hrs)

Image segmentation, Fundamentals, Point, Line and edge detection, of segmentation, Thresholding, Regionbased segmentation, watershed segmentation algorithm Applications of segmentation.

Text Book:

1. Digital image processing by Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson PHIPublication.

Reference Books:

1. Fundamental of Digital Image Processing by A. K. Jain, P. H. I. Publication.
2. Digital image processing by S. Jayaraman, S. Esakkirajan, T. Virakumar, McGraw Hill.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 303	Embedded System	4	0	0	4

Total Hrs: 45

Unit- I: Microcontrollers (10Hrs)

Microprocessors and Micro-controllers, Types of Microcontrollers, External memory, Processor Architecture – Harvard v/s Van Neumann; CISC v/s RISC, Microcontroller, Memory types, Software development tools like assembler, cross- compiler, emulator, and 173 simulator, 8051 controller, Block Diagram &Architecture.

Unit-II: Device and Communication Bus for Devices Network (10Hrs)

IO Types and examples, Serial communication devices, Parallel Device ports, Sophisticated Interfacing Feature in Devices Ports, Wireless Devices, Timer and Counting Devices, Watch dog timer, Real time clock, Network Embedded Systems, Serial Bus Communication Protocols, parallel Bus Devices protocol Parallel communication Network using ISA, PCI, PCI-X and advanced buses, Internet Enabled Systems- Network protocols, Wireless and mobile system protocol.

Unit-III: Device Drivers and Interrupt Services Mechanism (10Hrs)

Programmed-I/O Busy-wait Approach without Interrupt Services Mechanism, ISR Concept, Interrupt Sources, Interrupt Servicing (Handling) Mechanism, Multiple Interrupts, Context and the Periods for Context Switching, Interrupt Latency and Deadline, Classification of Processor Interrupt Service Mechanism from Context-Saving Angle, Direct Memory Access, Device Driver Programming.

Unit-IV: Inter process Communication and Synchronization (8Hrs)

Multiple process in an application, Multiple Threads in an application, Task and Task state, Task and Data, Clear-cut Distinction between Functions, ISRS and Tasks by their Characteristics, Concept of Semaphores, Shared Data, Inter process Communication, Signal Function, Semaphore Functions, Message Queue Functions, Mailbox Functions, Pipe Functions, Socket Functions, RPC Functions.

Unit-V: Interfacing Buses (7Hrs)

Industrial Interfacing Buses (10 Hrs) PCI, ESA, EISA, I2C, USB, RS232. Advance topics on embedded system.

Text Book

1. Myke Predko, “Programming and Customizing The 8051 Micro-controller”, Tata McGrawHill edition.

2. John B. Peatman, “Design with PIC Microcontrollers”, Low Price Edition, Pearson Education Asia.

Reference Books:

1. Embedded System :Architecture, programming and design by Rajkamal,TMH

2. ARM Assembly Language: Fundamentals and Techniques, William Hohl, CRC Press

3. ARM Architecture Reference Manual / Edition 2, by David Seal.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 305	Software Engineering lab	0	0	2	1

List of Practical's-

1. Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements. For a set of about 20 sample problems
2. Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem(Use of a CASE tool required). (1 class)
3. Develop structured design for the DFD model developed. (1 class)
4. Develop UML Use case model for a problem (Use of a CASE tool any of Rational rose,Argo UML, or Visual Paradigm etc. is required)
5. Develop Sequence Diagrams
6. Develop Class diagrams.
7. Develop code for the developed class model using Java
8. Use testing tool such as Joint.
9. Use configuration management tool
10. Use any one project management tool such as Microsoft Project or Gantt Project, etc.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 306	Java Programming Lab	0	0	2	1

Total Hrs:20

List of Practical's:

1. Create a java program to implement stack and queue concept.
2. Write a java package to show dynamic polymorphism and interfaces.
3. Write a java program to show multithreaded producer and consumer application.
4. Create a customized exception and also make use of all the exception keywords.
5. Convert the content of a given file into the uppercase content of the same file.
6. Develop an analog clock using applet.
7. Develop a scientific calculator using swings.
8. Create an editor like MS-word using swings.
9. Create a servlet that uses Cookies to store the number of times a user has visited your servlet.
10. Create a simple java bean having bound and constrained properties.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 307	Data Communication Lab	0	0	2	1

Total Hrs: 20

List of Practical's:

1. Study of basic data communication system.
2. Demonstrate Analog and digital signals.
3. To Convert Analog signal into digital signal.
4. To Convert digital signal into Analog signal.
5. Study of Amplitude modulation.
6. Study of Frequency modulation.
7. Study of Phase modulation.
8. Study of Amplitude shift keying.
9. Study of Frequency shift keying.
10. Study of Binary Phase shift keying.
11. Study of Quadrature amplitude shift keying.
12. Study of Frequency division Multiplexing (FDM)
13. Study of Time division Multiplexing (TDM)
14. Study of various interface standards.
15. Study of Twisted pair cable, Coaxial cable and Optical Fiber cable

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ- CSE 301	Industrial Training/ Project Seminar	0	0	2	2

Objective of Industrial Training: The objective of industrial training is to provide work experience so that students engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineeringproblem and possibly an industry guide for their Major Project in final semester.

Scheme of Studies: Duration 4 weeks in summer break after IV semester, assessment to be done in V semester practical examination. During training students will prepare a first draft of training report in consultation with section in charge. After training they will prepare final draft with the help of Faculty of the concern Department of mechanical engineering. Then they will present a seminar on their training and present it in the institute in front of the committee headed by the HOD/Faculty Member.

Learning through Industrial Training: During industrial training students must observe followingto enrich their learning:

- Industrial environment and work culture.
- Organizational structure and inter personal communication. Hardware
- / Software configuration knowledge and specifications.Project
- Planning, development and maintenance.
- Problems related to various areas of work etc.
- Students are supposed to acquire the knowledge on above by Direct Observations without disturbing personnel at work.
- Interaction with officials at the workplace in free/ tea time Study of Literature at the workplace (e.g. User Manual, standards, processes, schedules, etc.)
- Hands on" experience Undertaking/assisting project work. Solving problems at the work place.
- Presenting a seminar participating in group meeting/discussion.
- Consulting current technical journals and periodicals in the library.

Semester VI (Third Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 308	Compiler Design	3	1	0	4

Total Hrs: 45

Unit-I: INTRODUCTION TO COMPILERS (8Hrs)

Translators-Compilation and Interpretation-Language processors -The Phases of Compiler-Errors Encountered in

Different Phases-The Grouping of Phases-Compiler Construction Tools - Programming Language basics.

Unit-II: LEXICAL ANALYSIS (8Hrs)

Need and Role of Lexical Analyzer-Lexical Errors-Expressing Tokens by Regular Expressions-Converting Regular Expression to DFA- Minimization of DFA-Language for Specifying Lexical Analyzers-LEX-Design of Lexical Analyzer for a sample Language.

Unit-III: SYNTAX ANALYSIS (10Hrs)

Need and Role of the Parser-Context Free Grammars -Top Down Parsing -General Strategies-Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item-Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC-Design of a syntax Analyzer for a Sample Language .

Unit-IV: SYNTAX DIRECTED TRANSLATION & RUN TIME ENVIRONMENT (10Hrs)

Syntax directed Definitions-Construction of Syntax Tree-Bottom-up Evaluation of S-Attribute Definitions- Design of predictive translator - Type Systems-Specification of a simple type checker-Equivalence of Type Expressions-Type Conversions. RUN-TIME ENVIRONMENT: Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables-Dynamic Storage Allocation-Storage Allocation in FORTAN.

Unit-V: CODE OPTIMIZATION AND CODE GENERATION (9Hrs)

Principal Sources of Optimization-DAG- Optimization of Basic Blocks-Global Data Flow Analysis- Efficient Data Flow Algorithms-Issues in Design of a Code Generator - A Simple Code Generator Algorithm.

Text Book:

1. A Retarget able C Compiler: Design and Implementation Fraser and Hansen, Benjamin-Cummings, 1995.

References Books:

1. Advanced Compiler Design and Implementation, Much nick, Morgan and Kaufmann,1998.
2. Crafting a Compiler, Fischer and LeBlanc, Benjamin-Cummings, 1988.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 309	Data Mining & Warehousing	3	4	0	3

Total Hrs: 45

UNIT-I (9Hrs)

Data warehouse: Introduction to Data warehouse, Difference between operational database systems and data warehouses, Data warehouse Characteristics, Data warehouse Architecture and its Components, Extraction-Transformation-Loading, Logical(Multi-Dimensional), Data Modeling, Schema Design, Star and Snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non Addictive Measures; Fact-Less-Facts, Dimension Table Characteristics; OLAP Cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP.

UNIT-II (9Hrs)

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration &Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT-III (9Hrs)

Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set-Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT-IV (9Hrs)

Classification: Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers , Classification techniques, Decision Trees-Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction ; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbor classification-Algorithm and Characteristics. Prediction: Accuracy and Error measures, Evaluating the accuracy of classifier or a predictor, Ensemble methods.

UNIT-V (9Hrs)

Clustering: Clustering Overview, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, , Partitioning Clustering-K-Means Algorithm, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Key Issues in Hierarchical Clustering, Strengths and Weakness, Outlier Detection.

Text Book:

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 310	Computer Network	3	0	0	3

Total Hrs:45

UNIT – I (9Hrs)

INTRODUCTION: Network applications, network hardware, network software, reference models: OSI, TCP/IP, Internet, Connection oriented network - X.25, frame relay. THE PHYSICAL LAYER: Theoretical basis for communication, guided transmission media, wireless transmission, the public switched telephone networks, mobile telephone system.

UNIT – II (9Hrs)

THE DATA LINK LAYER: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. THE MEDIUM ACCESS SUBLAYER: Channel allocations problem, multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless Bluetooth.

UNIT – III (9Hrs)

THE NETWORK LAYER: Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service.

UNIT – IV (9Hrs)

THE TRANSPORT LAYER: Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP.

UNIT – V (9Hrs)

THE APPLICATION LAYER: Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http. APPLICATION LAYER PROTOCOLS: Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet..

Text Books:

1. Data Communication & Networking by Behrouz A. Forouzan McGraw Hill

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 304	Distributed System	4	0	0	4

Total Hrs:45

UNIT – I (9Hrs)

Characterization of Distributed Systems-Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models -Introduction, Architectural and Fundamental models, Networking and Internetworking, Interprocess Communication, Distributed objects and Remote Invocation-Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI.

UNIT – II (9Hrs)

Operating System Support- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture, Distributed File Systems-Introduction, File Service architecture.

UNIT – III (9Hrs)

Peer to Peer Systems–Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies-Pastry, Tapestry, Application case studies-Squirrel, Ocean Store.

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 – IV (9Hrs)

Transactions and Concurrency Control-Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering. Distributed Transactions-Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.

UNIT – V (9Hrs)

Replication-Introduction, System model and group communication, Fault tolerant services, Transactions with replicated data.

Distributed shared memory, Design and Implementation issues, Consistency models.

Text Books:

1. Singhal&Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill

2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill

Reference Books:

1. Vijay K.Garg Elements of Distributed Compuitng , Wiley

2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education

3. Tenanuanbaum, Steen," Distributed Systems", PHI.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 305	Theory of computation	4	0	0	4

Total Hrs:45

Unit I: Mathematicalpreliminaries (7Hrs)

Sets, operations, relations, strings, transitive closure, count ability and diagonalisation, induction and proof methods-pigeon-hole principle and simple applications – concept of language – grammars and production rules –Chomsky hierarchy.

Unit II: Finite automata & regular expressions (8Hrs)

Finite State machine, regular languages, deterministic finite automata, conversion to deterministic automata, E-closures – regular expressions, finite automata, and minimization of automata, Moore and Mealy machine and their equivalence.

Unit III: Regular grammar & context free grammar (9Hrs)

Pumping lemma for regular sets- closure properties of regular sets- decision properties for regular sets, equivalence between regular language and regular grammar. Context – freelanguages – parse trees and ambiguity, reduction of CFGS ,Chomsky and Griebach normalforms.

Unit IV: Push – down Automata (PDA) (9Hrs)

Non Determinism – acceptance by two methods and their equivalence, conversion of PDA to CFG CFLs and PDAs-closure and decision properties of CFLs.

Unit V: Turing machines (12Hrs)

Variants – recursively enumerable (r.e.) set – recursive sets ,TM as computer of function – decidability and solvability – Halting Problem – reductions – Post correspondence Problem (PCP) and un solvability of ambiguity problem of CFGs, Church‟s hypothesis, Introduction to recursive function theory – primitive recursive and partial recursive functions.

Text Books

1. Introduction Of Automata Theory, Languages and computation- J.E. Hopcroft , J.D.Ulman, Pearson education.

Reference Books

1. John Martin, „Introduction Of Automata Theory, Languages and computation‟
2. Peter Linz , „Introduction to formal languages and automata‟,Norasa,2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 306	Speech and Natural Language Processing	4	0	0	4

Total Hrs: 45

UNIT-I: INTRODUCTION (9Hrs)

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT-II: WORD LEVEL ANALYSIS (9Hrs)

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT-III: SYNTACTIC ANALYSIS (9Hrs)

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures,Unification of feature structures.

UNIT-IV: SEMANTICS AND PRAGMATICS (9Hrs)

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT-V: DISCOURSE ANALYSIS AND LEXICAL RESOURCES (9Hrs)

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Co reference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill‟s Tagger, WorldNet, Prop Bank, Frame Net, Brown Corpus, British National Corpus (BNC).

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction toNatural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.

2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition,
OReilly Media, 2009.

REFERENCES:

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java, OReilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford
University Press,
2008.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 307	Advance Operating System	4	0	0	4

Total Hrs: 45

UNIT-I: FUNDAMENTALS OF OPERATING SYSTEMS (9 Hrs)

Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

UNIT-II: DISTRIBUTED OPERATING SYSTEM (9 Hrs)

Issues in Distributed Operating System – Architecture – Communication Primitives –Lamport‟s Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT-III: DISTRIBUTED RESOURCE MANAGEMENT (9 Hrs)

Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol – Security and Protection.

UNIT-IV: REAL TIME AND MOBILE OPERATING SYSTEMS (9 Hrs)

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems –Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.

UNIT-V: CASE STUDIES (9 Hrs)

Linux System: Design Principles - Kernel Modules - Process Management Scheduling -Memory Management - Input-Output Management - File System - Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer -Services Layer - Core OS Layer - File System.

REFERENCES BOOKS:

1. Mukesh Singhal and Niranjan G. Shivaratri, “Advanced Concepts in Operating SystemsDistributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley & Sons, 2004.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 308	Real Time Operating System	4	0	0	4

Total Hrs:45

Unit-I: Introduction (9Hrs)

Real-time Versus Conventional Software, Computer Hardware for Monitoring and Control, Software Engineering Issues. SOFTWARE ARCHITECTURES: Process and State-based Systems model, Periodic and Sporadic Process, Cyclic Executives, CE definitions and Properties, Foreground-Background Organizations, Standard OS and Concurrency, Systems Objects and Object-Oriented Structures, Abstract Data Types, General Object Classes.

Unit-II: Requirements And Design Specifications (9Hrs)

Classification of Notations, Data Flow Diagrams, Tabular Languages, State Machine, Communicating Real Time State Machine- Basic features, Timing and clocks, Semantics Tools and Extensions, State chartsConcepts and Graphical Syntax, Semantics and Tools.

Unit-III: Declarative Specifications And Deterministic Scheduling (9Hrs)

DECLARATIVE SPECIFICATIONS Regular Expressions and Extensions, Traditional Logics-Propositional Logic, Predicates, Temporal logic, Real time Logic. DETERMINISTIC SCHEDULING Assumptions and Candidate Algorithms, Basic RM and EDF Results, Process Interactions-Priority Inversion and Inheritance.

Unit-IV: Execution Time Specification (9Hrs)

Measurement of Software by software, Program Analysis with Timing Schema, Schema Concepts, Basic Blocks, Statements and Control, Schema Practice, Prediction by optimization, System Interference and Architectural Complexities Timer Application, Prosperities of Real and ideal clocks, Clock Servers – Lamport ‟s Logical clocks, Monotonic Clock service, A software Clock server, Clock Synchronization Centralized Synchronization, Distributed Synchronization.

Unit-V: Programming Language (9Hrs)

PROGRAMMING LANGUAGES: Real Time Language Features, Ada-Core Language, Annex Mechanism for Real Time Programming, Ada and Software Fault Tolerance, Java and Real-time Extensions, CSP and Occam.

Text Book:

Real – Time Systems and software by Alan C. Shaw ; John Wiley & Sons Inc, 2001.

Reference Book:

1. Real-Time Systems, Jane W.S. Liu, Prentice Hall, 2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 309	Web and Internet	4	0	0	4

Total Hrs: 45

UNIT I: (9Hrs)

Web Basics and Overview: Introduction to Internet, World Wide Web, Web Browsers, URL, MIME, HTTP, Web Programmers Toolbox. HTML Common tags: List, Tables, images, forms, frames, Cascading Style Sheets (CSS) & its Types. Introduction to Java Script, Declaring variables, functions, Event handlers (onclick, on submit, etc.,) and Form Validation.

UNIT II: (9Hrs)

Introduction to XML: Document type definition, XML Schemas, Presenting XML , Introduction to XHTML, Using XML Processors: DOM and SAX. PHP: Declaring Variables, Data types, Operators, Control structures, Functions.

UNIT III: (9Hrs)

Web Servers and Servlets: Introduction to Servlets, Lifecycle of a Servlet, JSDK, Deploying Servlet, The Servlet API, The javax. Servlet Package, Reading Servlet parameters, Reading Initialization parameters. The javax. servlet HTTP package, Handling Http Request & Responses, Cookies and Session Tracking.

UNIT IV: (9Hrs)

Database Access: Database Programming using JDBC, JDBC drivers, Studying Javax.sql.* package, Connecting to database in PHP, Execute Simple Queries, Accessing a Database from a Servlet. Introduction to struts frameworks.

UNIT V: (9Hrs)

JSP Application Development: The Anatomy of a JSP Page, JSP Processing. JSP Application Design and JSP Environment, JSP Declarations, Directives, Expressions, Scripting Elements, implicit objects. Java Beans: Introduction to Beans, Deploying java Beans in a JSP page.

Reference Book

1. Greenlaw R and Hepp E "Fundamentals of Internet and www" 2nd EL, Tata McGrawHill,2007.

2. Ivan Bayross, "HTML, DHTML, JavaScript, Perl CGI", 3rd Edition, BPB Publications.

3.D. Comer, "The Internet Book", Pearson Education, 2009.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 301	Management & employee performance	3	0	0	3

Total Hrs: 45

Unit I: Performance Management (PM) Conceptual FrameWork (9 Hrs)

Introduction to Performance Management, Definition, nature, scope, importance, Business and sub functional Performance Management, Performance Management as a management Tool, Performance objectives and standards, Standards of Performance. Performance Domains and dimensions.

Unit II: Performance Planning (9 Hrs)

Performance Planning Process, Contents of Performance Plan, 8 Step Model, Individual and Group Performance Planning, Role clarity and Job description, Meaning of Performance appraisal, methods and approaches to performance appraisal, Obstacles in appraisal, Designing appraisal for better results, Performance Appraisal Interview, Potential Appraisal.

Unit III: Performance Appraisal (9 Hrs)

Introduction, Definition, Purpose and Role of appraisal in Performance Management, Methods and Steps in Performance Appraisal. Why Appraisal Fail, Types of Appraisal, Approaches and Design, MBO, 360*, Potential Appraisal, Performance Review, Performance counseling/ Mentoring. Team Performance Appraisal.

Unit IV: Performance Management System (9Hrs)

Introduction to PMS, Importance, Features, Process of Building PMS, PMS Dimensions, Conceptual Framework. 4 pillars of PMS, PMS Prism, Strategic Performance Management, Performance and Strategy linkage, Components of SPM, SPM- Balanced Score Card, SPM and Metrix, SPM Environment teatre and Risks.

Unit V: Latest trends in Performance Management (9 Hrs)

Competency Based Performance Management System, Performance Measurement, Performance Measurement through BSC, Performance and Succession Plan/ Career Development, International Performance Management, Performance Audit, Human Resource Valuation accounting andAudit.

Recommended Book:

D. K. Bhattacharya, Performance Management Systems and Strategies- Text book, Pearson.

Reference Books:

- Aquinis, Performance Management, Pearson.
- Chadha, Performance Management, Macmillan.
- Armstrong, Michael, Baron, Jaico, Performance Management.
- Cardy, Performance Management, PHI.
- Kohli, Deb, Performance Management, Oxford.
- D Sharma, Performance Management, HPH.
- R.K. Sahu, Performance Management System, EB.
- TV Rao, Performance Management and Appraisal, Sage.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 302	Cyber law & ethics	3	0	0	3

Total Hrs:45

Unit-I: Introduction (9 Hrs)

Concepts of Technology and Law Understanding Technology, Basic Concepts ofTechnology and Law Understanding the Technology of Internet, Scope of Cyber Laws, CyberJurisprudence.

Unit-II: Law of Digital Contracts (9 Hrs)

The Essence of Digital Contracts, the System of Digital Signatures, The Role and Function of Certifying Authorities, The Science of Cryptography.

Unit-III: Intellectual Property Issues in Cyber Space (9 Hrs)

Domain Names and Related issues, Copyright in the Digital Media, Patents in the Cyber World, Rights of Netizens and E-Governance ,Privacy and Freedom Issues in the Cyber World, E-Governance E-Governance, Cyber Crimes and Cyber Laws.

Unit-IV: International Scenario in Cyber Laws (9Hrs)

Data Protection Laws in EU and USA ,Child Abuse Protection Laws in EU and USA, Cyber Laws - the Malaysian Approach.

Unit-V: Cyber law Issues For Management (9Hrs)

Cyber Law Issues in E-Business Management, Major issues in Cyber Evidence Management ,Cyber Law Compliancy Audit

Text Book:

1. “The Law of the Internet” by J. Rosenoer, Cyber Law (Springer Verlag).

Reference Books:

1. "Cyber Laws in India.. ITA-2000 and Beyond" by Navvi
2. “Handbook of Cyber Laws” By Sharma Vakul.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 303	Non- Conventional Energy Sources	3	0	0	3

Total Hours: 45

Unit-I (9 Hrs)

Global and National scenarios, Form and characteristics of renewable energy sources.

Solar Energy: Solar radiation, its measurements and prediction, Solar thermal collectors, flat plate collectors, concentrating collectors, Basic theory of flat plate collectors, solar heating of buildings, solar still, solar water heaters, solar driers, conversion of heat energy in to mechanicalenergy, solar thermal power generation systems.

Solar Photovoltaic: Principle of photovoltaic conversion of solar energy, types of solar cells and fabrication, Photovoltaic applications: battery charger, domestic lighting, street lighting, water pumping, power generation schemes.

Unit-II (9 Hrs)

Wind Energy: Atmospheric circulations, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS- classification, characteristics and applications.

Unit-III (9 Hrs)

Ocean Energy: Ocean energy resources, ocean energy routes, Principles of ocean thermal energy conversion systems, ocean thermal power plants, Principles of ocean wave energy conversion and tidal energy conversion.

Unit-IV (9 Hrs)

Other Sources: Nuclear fission and fusion, Geothermal energy- Origin, types of geothermal energy sites, site selection, geothermal power plants, Magneto-hydro-dynamic (MHD) energy conversion, Formation of biomass, photosynthesis, Biomass resources and their classification, Chemical constituents and physicochemical characteristics of biomass, Biomass conversion processes.

Unit-V (9 Hrs)

Fuel Cells: Thermodynamics and electrochemical principles, Basic design, types, applications.
Hydrogen Energy:
Economics of hydrogen, Production methods.

References Books:

1. Power Generation through Renewable Source of Energy, Rai and Ram Prasad, Tata McGraw-Hill,

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 311	Compiler Design Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1 & 2 implement a lexical analyzer in "C".

3. Use LEX tool to implement a lexical analyzer.

4. Implement a recursive descent parser for an expression grammar that generates arithmetic expressions with digits, + and *.

5. Use YACC and LEX to implement a parser for the same grammar as given in problem

6. Write semantic rules to the YACC program in problem 5 and implement a calculator that takes an expression with digits, + and * and computes and prints its value.

7 & 8. Implement the front end of a compiler that generates the three address code for a simple language with: one data type integer, arithmetic operators, relational operators, variable declaration statement, one conditional construct, one iterative construct and assignment statement.

9 &10. Implement the back end of the compiler which takes the three address code generatedin problems 7 and 8, and produces the 8086 assembly language instructions that can be assembled and run using a 8086 assembler. The target assemblies instructions can be simple move, add, sub, and jump. Also simple addressing modes are used.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 312	Computer Network Lab	0	0	2	1

Total Hrs:20

List of Practical's-

1. To demonstrate the operation of the Ethernet – network using OPNET IT Guru
2. To demonstrate the implementation of the token ring network using OPNET IT Guru
3. To demonstrate the implementation of the Switched local area network using OPNET IT Guru
4. To demonstrate the basics of designing a network using OPNET IT Guru
5. To examine the effect of ATM adaptation layers and service classes on the performance of network using OPNET IT Guru.
6. To Configure & analyze the performance of routing information protocol (RIP) model using OPNET IT Guru
7. To configure & analyze the performance of open shortest path first (OSPF) routing protocol using OPNET IT Guru
8. To demonstrate the congestion control algorithm implemented by the TCP using OPNET ITGuru
9. To create a network cable using RJ-45 connectors. 10. To install a network interface card
10. Simulation of Dijkstra Algorithm in C
11. Simulation of Spanning tree algorithm in C
12. To configure a Wireless access point in a local network
13. To install and configure wireless LAN card in the computer
14. To understand the working of layer-3 switch for address sub netting in the network.

Semester VII (Fourth Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE401	Cyber Security & Cryptography	3	1	0	4

Total Hrs: 45

UNIT– I: Security Concepts (9 Hrs)

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, steganography, key range and key size, possible types of attacks.

UNIT– II: Symmetric key Ciphers (9 Hrs)

Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4. Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT– III: Cryptographic Hash Functions (9 Hrs)

Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastruct ure

UNIT – IV: Transport-level Security (9 Hrs)

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 (9 Hrs)

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, Crosssite Scripting Vulnerability.

TEXT BOOKS:

1. Cryptography and Network Security – Principles and Practice: William Stallings, PearsonEducation, 6th Edition
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, WileyIndia, 1st Edition.
2. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3rdEdition.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE401	Data Analytics	4	0	0	4

Total Hrs: 45

UNIT-I: INTRODUCTION TO BIG DATA [9 hours]

Introduction to Big Data Platform – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis v/s reporting – Modern data analytic tools, Statical concepts: Sampling distributions, re-sampling, statistical inference, prediction error.

UNIT-II: DATA ANALYSIS [9 hours]

Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesiannetworks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics – Rule induction – Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

UNIT-III: MINING DATA STREAMS [9 hours]

Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream –Estimating moments – Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications – case studies – real time sentiment analysis, stock market predictions.

UNIT-IV :FREQUENT ITEMSETS AND CLUSTERING [9 hours]

Mining Frequent item sets – Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means

– Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.

UNIT-V: FRAMEWORKS AND VISUALIZATION [9 hours]

Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed file systems –

Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications:

TEXT BOOKS:

1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets,CambridgeUniversity Press, 2012.

REFERENCES:

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streamswith advanced analystics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big DataGlossary,
   O‟Reilly, 2011.
3. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier,
   Reprinted 2008.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE402	Parallel and Distributed Algorithm	4	0	0	4

Total Hrs: 45

Unit - I: Fundamentals: (9 Hrs)

Introduction to distributed systems, synchronous / asynchronous network models, leader election problem in ring and general networks; Type of faults, fail safe systems, Byzantine faults, distributed consensus with link and process failures.

Unit- ll: The PRAM Model: (9 Hrs)

Balancing, divide and conquer, parallel prefix computation, pointer jumping, symmetry breaking, list ranking, sorting and searching, graph algorithms, parallel complexity and complexity classes, lower bounds.

Unit - lll: Interconnection Networks: (9 Hrs)

Topologies (arrays and mesh networks, trees, systolic networks, hyper cubes, butterfly) and fundamental algorithms, matrix algorithms, sorting, graph algorithms, routing, and relationship with PRAM models; Asynchronous Parallel Computation; Distributed Models and Algorithms.

Unit- IV: Concepts of Distributed Computation: (9Hrs)

Termination; Failure tolerance; Network topology. Distributed Search: Algorithms for BFS, DFS,shortest paths and spanning trees in distributed systems.

Unit - V: Distributed Networks: (9 Hrs)

Broadcasting; Robust distributed networks. Processor organizations such as mesh andhypercube, embedding of problem graphs into processor graphs.

REFERENCES BOOK:

1. V. Kumar, A. Grama, A. Gupta, G. Kaarypis, Introduction to Parallel Computing, AddisonWesley Press

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE403	Neural Networks and Deep Learning	4	0	0	4

Total Hrs: 45

Unit - I: Introduction: Neuro Computing andNeuroscience (9 Hrs)

Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

Unit - II: Data processing (9 Hrs)

Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, Eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit - III: Multilayered network architecture (9 Hrs)

Back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.

Unit - IV: Deep Learning (9 Hrs)

Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network. Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing.

Unit - V: Deep Learning Search and tools (9 Hrs)

Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques. Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network. Deep Learning research: Object recognition, sparse coding, computer vision, natural language processing.Deep Learning Tools: Caffe, Theano,Torch.

REFERENCE BOOKS:

1.J.A. Anderson, An Introduction to Neural Networks, MIT

2.Hagen Demuth Beale, Neural Network Design, Cengage Learning

TEXT BOOKS:

T1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press,

2016.T2. Bishop, C.,M., Pattern Recognition and Machine Learning, Springer,

2006

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 404	Multi-agent Intelligent	3	0	0	3

Total Hrs: 45

Unit I:- **Introduction to Agents** (9 Hrs)

Agents and Environment; Performance measure; Nature of Environment; Abstract and Concrete Architecture for intelligent agents; Problem solving and planning: Result sharing, Task sharing and Distributed planning

Unit - II: The design of Intelligent Agents (9 Hrs)

Deductive reasoning agents: AgentO, Practical Reasoning Agents: HOMER architecture; Reactive agents: Subsumption architecture; Hybrid agents: Touring Machines, InteRRaP.

Unit - III: Agent Communication and Interaction Protocols (9 Hrs)

Agent Communications: Knowledge Query and manipulation Language (KQML), Knowledge Interchange Format (KIF), Ontology, Coordination protocols, Cooperation Protocols, Contract Net, Blackboard Systems, Negotiation, Multi-agent Belief Maintenance, Market Mechanisms.

Unit - IV: Multi-Agent System Interactions & Agreements (9 Hrs)

Classifying multi-agent interactions: Multi-agent Encounters - Dominant Strategies and Nash Equilibria - Competitive and zero-sum and other interactions; Cooperation: the Prisoner's dilemma and Axelrod's experiments; Reaching Agreements: Interactions between self-interested agentsauctions & voting systems – negotiation - Argumentation; Interactions between benevolent agents: Cooperative Distributed Problem Solving (CDPS), partial global planning; coherence and coordination

Unit -V: Multi-agent Methodologies and Applications (9 Hrs)

Agent Methodologies- Mobile agents; Typical application areas of agent systems: Business Process Management, Distributed Sensing, Information Retrieval and Management, Electronic Commerce, Human-Computer Interfaces, Social Simulation etc.

REFERENCE BOOKS:

1.M. Wooldridge, An Introduction to Multiagent Systems; John Wiley & Sons, New York, NY, 2002.

2.J.M. Vidal, Fundamentals of Multiagent Systems with NetLogo Examples; Lecture Notes, University of South Car olina, Columbia, SC, 2007.

3.St. Preitl, R.-E. Precup, Regulatoare pentru servosisteme: metode de proiectare; Editura Orizonturi Universitare, T imisoara, 2007 (in Romanian + slides in English).

TEXT BOOKS:

1.K.-H. Dietsche, M. Klingebiel, Automotive Handbook; Robert Bosch GmbH, Plochingen, 2007.

2.N.P. Padhy, Artificial Intelligence and Intelligent Systems; Oxford University Press, Oxford,2005.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE405	Internet of Things	3	0	0	3

Total Hrs: 45

UNIT-I: FUNDAMENTALS OF IoT (9Hrs)

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT-II: IoT PROTOCOLS (9Hrs)

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e,
1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks –
Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application
Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT-III:DESIGN AND DEVELOPMENT (9Hrs)

Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.

UNIT-IV: DATA ANALYTICS AND SUPPORTING SERVICES (9 Hrs)

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning
– No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge StreamingAnalytics and Network Analytics
– Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with
NETCONF-YANG

UNIT-V: CASE STUDIES/INDUSTRIAL APPLICATIONS (9Hrs)

Cisco IoT system – IBM Watson IoT platform – Manufacturing – Converged Plantwide EthernetModel (CPwE) – Power Utility Industry – GridBlocks Reference Model – Smart and Connected

Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control Analyze applications of IoT in real time scenario.

TEXTBOOK:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals:
   Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press,2017

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach,Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Keyapplications and Protocols, Wiley, 2012 (for Unit 2).

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE 406	Cloud Computing	3	0	0	3

Total Hrs: 45

Unit-l: Introduction to Cloud Computing (9Hrs)

Virtualization Concepts, Cloud Computing Fundamental: Overview of Computing Paradigm, Evolution of cloud computing, Defining cloud computing, Components of a computing cloud, Essential Characteristics of Cloud Computing, Cloud Taxonomy.

Unit-II: Cloud Computing Architectural Framework (10Hrs)

Cloud architectural principles, Role of Networks in Cloud computing, Role of Web services, Benefits and challenges to Cloud architecture, Cloud Service Models, cloud computing vendors. Cloud Services Management, Performance and scalability of services, tools and technologies used to manage cloud services deployment.

Unit-III: Exploiting Cloud Services (9Hrs)

Software as a Service(SaaS): Introduction to SaaS, Inspecting SaaS technologies, Implementing web services, Deploying Infrastructure as a Service(IaaS): Introduction to IaaS, Scalable server clusters, Machine Image, Virtual Machine (VM). Elastic storage devices, Data storage in cloud computing, Delivering Platform as a Service(PaaS): Introduction to PaaS, Service Oriented Architecture (SOA), Cloud Platform and Management, Hardware-as-a-service: HaaS.

Unit-IV: Cloud Application Development (9 Hrs)

Role of business analyst, Technical architecture considerations, Service creation environmentsto develop cloud based applications, Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages, Cloud Economics.

Unit-V: Cloud Security and Risk Management (9Hrs)

Cloud Security: Understanding cloud based security issues and threats, Data security and Storage, Identity & Access Management, Risk Management in cloud, Governance and Enterprise Risk Management.

TEXT BOOKS:

1. Distributed and Cloud Computing: Clusters, Grids, Clouds, and the Future Internet by KaiHwang, Jack Dongarra & Geoffrey C. Fox., Morgan Kaufmann Publishers, 2012.

2. Cloud Computing Bible, Barrie Sosinsky, WileyIndia, 2010

3. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011

4. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, LeeGillam, Springer, 2012

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 401	Economics Policy in India	3	0	0	3

Total Hrs: 45

Unit – I: Economic Development and its Determinants (9 Hrs)

Approaches to economic development and its measurement – sustainable development; Role of State, market and other institutions; Indicators of development – PQLI, Human Development Index (HDI), gender development indices.

Unit-II: Planning in India (9 Hrs)

Objectives and strategy of planning; Failures and achievements of Plans; Developing grass-root organizations for development – Panchayats, NGOs and pressure groups.Demographic Features, Poverty and Inequality. Broad demographic features of Indian population; rural-urbanmigration; Urbanization and civic amenities; Poverty and

Unit-III: Inequality (9 Hrs)

Resource Base and Infrastructure**.** Energy; social infrastructure – education and health; Environment; Regional imbalance; Issues and policies in financing

Unit-IV: Infrastructure development and Polices (9 Hrs)

The Agricultural Sector, Institutional Structure – land reforms in India; Technological change in agriculture – pricing of agricultural inputs and output; industry; Agricultural finance policy; Agricultural Marketing and Warehousing; Issues Terms of trade between agriculture and in food security – policies for sustainable agriculture. Industrial policy; Public Sector enterprises and their performance; Problem of sick units in India; Privatization and policy – issues in labour market reforms; approaches for employment generation.

Unit-V: Public Finances (9 Hrs)

Fiscal federalism – Centre-State financial relations; Finances of central government; Finances of state governments; Parallel economy; Problems relating to fiscal policy; Fiscal sector reforms in India. Money, Banking and Prices. Analysis of price behavior in India; Financial sector reforms; Interest rate policy; Review of monetary policy of RBI; Money and capital markets; Working of SEBI in India. External Sector Structure and direction of foreign trade; Balance of payments; Issues in export-import policy and FEMA; Exchange rate.

REFERENCE BOOKS:

1. Ahluwalia, I. J. and I. M. D Little (Eds.) (1999), India's Economic Reforms and Development (Essays in honour of Manmohan Singh), Oxford University Press, NewDelhi.
2. Bardhan, P. K. (9th Edition) (1999), The Political Economy of Development in India,Oxford University Press, New Delhi.
3. Bawa, R. s. and P. S. Raikhy (Ed.) (1997), Structural Changes in Indian Economy, GuruNanak Dev University Press.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 402	Reliability & Maintenance engineering	3	0	0	3

Total Hrs: 45

Unit-I Introduction: (9Hrs)

Maintenance Objectives and Functions, Maintenance Systems, Need of planned maintenance, Maintenance policies, Breakdown, time based maintenance, Block replacement, age replacement and periodic replacement policy, Corrective and preventive maintenance, Maintenance planning, Scheduled maintenance, Costof maintenance versus Cost of equipment and production delays.

Inspection: Inspection intervals, Inspection reports, card history system.

Unit-II Predictive Maintenance: (9Hrs)

Equipment wear records, standards, Equipment used in predictive maintenance. Computerized maintenance, Total Productive Maintenance, Methods of conditionmonitoring, Non-destructive testing, Liquid Penetrate, Magnetic particles, Ultrasonic testing, and Vibration analysis, Oil analysis, Radiographic testing.

Unit-III Reliability: (9Hrs)

Definition, failure data analysis, Mean failure rate, mean time to failure(MTTF), mean time between failures (MTBF), hazard rate, Bathtub curve, Use of Weibull probability chart foe assessing characteristics life, guarantee period etc.

Unit-IV System Reliability Improvement: (9Hrs)

Series, parallel and mixed configuration, Simple problems. Techniques, use of Pareto analysis-Design for reliability, redundancy unit and stand by redundancy, Optimization of reliability.

Unit-V Spare Parts Management: (9Hrs)

Spare parts, features and categorization of spares, cost considerations, Techniques of cost reduction, Selective controls used in spare parts control, ABCanalysis, FSN, XYZ, VED and other approaches, Inventory control of spares.

Reference Books

1. Reliability Engineering, Srinath L.S., Affiliated East West Press.
2. Maintainability Principles and Practices, Blanchand, B.S., McGraw Hill

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE 403	Management training & development	3	0	0	3

Total Hours: 45

Unit-I: Training (9 Hrs)

Training: Introduction - Conceptual framework of training - approaches on training – Difference between Training and Development - Training and applied psychology - principles of training - Learning and skills acquisition - Transfer and retention of skills.

Unit-II: Need for Training (9 Hrs)

Methods of Identification of Training needs - Training policy - Planning and organizing the training programmes - Methods of Training - – on the job training – off the job training – choosing optimum method – the lecture –panel discussion – behavior modeling – interactive demonstrations – brain storming – case studies, incident process, in- transactional analysis, exception analysis.

Unit-III: Management Development (9 Hrs)

Management Development (MD) and Organizational Development (OD) - Difference between MD and OD - Aims and objectives of MD and OD - Methods of MD -OD interventions – Succession Planning and Career development.

Unit-IV: Evaluation of training (9 Hrs)

Evaluation of training-need for evaluation, Principles of evaluation, Criterion and Approaches: Return on investment in training, Process of calculating ROI in training; emerging trends in training and development; new perspectives on training- Cross culture training.

Unit-V: Technology in training (9 Hrs)

Technology in training: CBT, Multimedia training, e-learning/Online learning,Distance learn.

TEXT BOOK

1. B.L.Gupta(2011), Management Training and Development, Vrinda Publication, New Delhi.

REFRENCE BOOKS

1. Alan M. Saks, Robert R. Haccoun (2010): Managing Performance Through Training andDevelopment, 5e, Nelson Education ltd. USA.
2. Craig Eric Schneier, Craig J. Russell (1994): The Training and Development Sourcebook
3. 2e, Human Resource Development Press Inc, USA.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE-402	Network Security & Cryptography lab	0	0	2	1

Total Hrs: 20

List of Practical's-

1. Write a program to implement the Caesar Cipher
2. Write a program to implement the Play air Cipher
3. Write a program to implement the Hill Cipher
4. Write a program to implement the Vigenere Cipher
5. Write a program to implement the Rail fence row & Column Transformation
6. Write a program to implement the DES algorithms
7. Write a program to implement the RSA Algorithm
8. Write a program to implement the Diffiee-Hellman algorithms
9. Write a program to implement the MD5 algorithms
10. Write a program to implement the SHA-1 algorithms
11. Implement the SIGNATURE SCHEME -Digital Signature Standard
12. Demonstrate how to provide secure data storage, secure data transmission

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ-CSE-401	Minor Project	0	0	16	8

The minor project work can be a design project, experimental fabrication project or software development project on any of the topics of mechanical engineering interest - it can be allotted as a group project with groups consisting of three or four students The assessment of all the minor projects should be done by a committee consisting of three or four faculty members specialized in the various fields of Mechanical Engineering - the students will present their project work and give a seminar on that topic for about thirty minutes - a committee consisting of at least three faculty members (preferably specialized in different fields of mechanical engineering) will assess the presentation of the seminars before the committee - the relative grading and group average marks for the various projects will be fixed by the committee - the guide will award the marks for the individual students in the project maintaining the group average - each group will prepare the project report and submit one copy of a write up of his minor project to the department through the guide - the Head of the Department will certify the copies and keep them in the departmental library

INSTRUCTIONS FOR PROJECT REPORT/ DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of B.E. (Computer Science engineering).

1. Prepare one spiral Bound Copies of your manuscript
2. Limit your Dissertation report to 50– 60 pages (preferably)
3. The footer must include the following: Institute Name, B.E. (CSE) Times New Roman 10 pt.and centrally aligned.
4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.
5. Print the manuscript using

I. Letter quality computer printing.
II. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.
III. Use 1.5 line spacing.

Semester VIII (Fourth Year) curriculum

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE-403	Advanced Computer Architecture	3	1	0	4

Total Hrs: 45

UNIT-I: FUNDAMENTALS OF COMPUTER DESIGN [9 hours]

Review of Fundamentals of CPU, Memory and IO – Trends in technology, power, energy and cost, Dependability – Performance Evaluation

UNIT-II : INSTRUCTION LEVEL PARALLELISM [9 hours]

ILP concepts – Pipelining overview – Compiler Techniques for Exposing ILP – Dynamic Branch Prediction – Dynamic Scheduling – Multiple instruction Issue – Hardware Based Speculation – Static scheduling – Multi-threading – Limitations of ILP – Case Studies.

UNIT- III : DATA-LEVEL PARALLELISM [9 hours]

Vector architecture – SIMD extensions- Graphics Processing units – Loop level parallelism

UNIT-IV : THREAD LEVEL PARALLELISM [9 hours]

Symmetric and Distributed Shared Memory Architectures – Performance Issues –Synchronization –

Models of Memory Consistency – Case studies: Intel i7 Processor, SMT & CMP Processors

UNIT-V : MEMORY AND I/O [9 hours]

Cache Performance – Reducing Cache Miss Penalty and Miss Rate – Reducing Hit Time – Main Memory and Performance – Memory Technology. Types of Storage Devices – Buses – RAID – Reliability, Availability and Dependability – I/O Performance Measures.

TEXT BOOK:

John L Hennessey and David A Patterson, “Computer Architecture A Quantitative Approach”, Morgan Kaufmann/ Elsevier, Fifth Edition, 2012.

REFERENCES:

Kai Hwang and Faye Briggs, “Computer Architecture and Parallel Processing”, Mc Graw-Hill International Edition, 2000.

Sima D, Fountain T and Kacsuk P, ”Advanced Computer Architectures: A Design Space Approach”, Addison Wesley, 2000.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 404	Artificial Intelligence & Expert System	3	0	0	3

Total Hrs:45

Unit-I: Introduction (9Hrs)

Introduction: Aim and objective of AI, AI problems, AI technique, Production system Characteristics, Basics of problem solving: problem representation paradigms defining problem as a state space representation. Intelligent Agents, Performance Measure, Rationality, Structure of Agents, Problem solving agents, Problem Formulation.

Unit-II: Search Techniques (9Hrs)

Search Techniques: Uninformed Search Strategies Problem size, complexity, approximation and search; depth, breadth and best search; Informed Heuristic Based Search: Informed (Heuristic) Search and Exploration, Greedy best first search, Memory bounded heuristic search, Heuristic functions, inventing admissible heuristic functions, Hill climbing, best-first search, branch and bound And OR Graph: A* algorithm and AO* Algorithm. Simulated Annealing, Online search.

Unit-III: A.I Problems (9Hrs)

Constraint Satisfaction Problems, Backtracking Search, variable and value ordering, constraint propagation, intelligent backtracking, local search for CSPs, Adversarial Search, Games, The minimax algorithm, Alpha-Beta pruning, Imperfect Real-Time Decisions, Games that include an Element of Chance

Unit-IV Structured Knowledge Representation (9Hrs)

Structured Knowledge Representation: Semantic Nets, Frames, and Scripts. Learning: Block architecture of learning system, Types of learning, performance Measures First order logic, Unification, and Resolution in Predicate Logic Uncertainty Treatment: formal and empirical approaches including Exact and Approximate inference in Bayesian Networks, Bayesian theory, belief functions, certainty factors

Unit-V: Inference Techniques (9Hrs)

Inference Techniques: Types of reasoning deductive, inductive, abductive, analogical, common-sense and non-monotonic, types of inference forward and backward chaining, inference using full joint distributions, fuzzy logic. Recent advances in Artificial Intelligence, Algorithms for artificial intelligence, Genetic algorithms. Tools for development of Artificial Intelligence: Open Neural network library. Applications of artificial Intelligence.

Text Books:

1. Artificial Intelligence a Modern Approach: Russel and Norvig , Pearson Education, 2nd
2. 2. Artificial Intelligence – A Practical Approach: Patterson, Tata McGraw Hill, 3rd

Reference Books:

1. Maus, R. and Keyes, J., “Handbook of Expert Systems in Manufacturing”, McGraw Hill, 1991
2. Robert Levine, “A comprehensive guide to artificial intelligence and expert systems",
3. Elain Rich ,”Artificial Intelligence”, PHI Publication
4. Introduction to Artifitial Intelligence by E.Charniack and D. Mcdermott, Pearson Education.
5. Artifitial Intelligence structures and strategies for complex problem solving, 4 th edition, Pearson education.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE407	Optimization Techniques	3	1	0	4

Total Hours: 40

UNIT- I: LINEAR PROGRAMMING (10 Hrs)

Introduction – formulation of linear programming model-Graphical solution–solving LPP using simplex algorithm – Revised Simplex Method.

UNIT- II: ADVANCES IN LPP (10 Hrs)

Duality theory- Dual simplex method – Sensitivity analysis–-Transportation problems Assignment problems-Traveling sales man problem -Data Envelopment Analysis.

UNIT- III: NON LINEAR PROGRAMMING (10 Hrs)

Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions– Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.

UNIT- lV: DYNAMIC PROGRAMMING (10 Hrs)

Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the principle of optimality–Formulation of Dynamic programming–Backward and Forward recursion–Computational procedure– Conversion offinal value problem in to Initial value problem.

TEXT BOOKS:

1.Hillier and Lieberman “Introduction to Operations Research”, TMH, 2000.

2.R.Panneerselvam, “Operations Research”, PHI, 2006

3.Hamdy ATaha, “Operations Research –An Introduction”, Prentice Hall India, 2003.

REFERENCES:

1. Philips, Ravindran and Solberg, “Operations Research”, John Wiley, 2002.
2. Ronald L.Rardin, “Optimization in Operation Research” Pearson Education Pvt. Ltd. New Delhi, 2005.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE408	Human Computer Interaction	3	1	0	4

Total Hours:45

UNIT- I: FOUNDATIONS OF HCI (9Hrs)

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity-Paradigms.

UNIT- II: DESIGN & SOFTWARE PROCESS (9Hrs)

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

UNIT- III: MODELS AND THEORIES (9Hrs)

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT- IV: MOBILE HCI (9Hrs)

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of MobileDesign, Tools.

UNIT- V: WEB INTERFACE DESIGN (9Hrs)

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition,
   Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009 (UNIT –IV)

3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O‟Reilly, 2009.(UNIT-V)

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PEC	PEC-CSE409	Digital Signal Processing	3	1	0	4

Total Hours: 45

UNIT-I: SIGNALS AND SYSTEMS (9 Hrs)

Basic elements of DSP – concepts of frequency in Analog and Digital Signals – sampling theorem – Discrete – time signals, systems – Analysis of discrete time LTI systems – Z transform – Convolution – Correlation.

UNIT – II: FREQUENCY TRANSFORMATIONS (9 Hrs)

Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms - Decimation – in – time Algorithms, Decimation – in – frequency Algorithms – Use of FFT in Linear Filtering – DCT – Use and Application of DCT.

UNIT – III: IIR FILTER DESIGN (9 Hrs)

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF,BPF, BRF) filter design using frequency translation.

UNIT – IV: FIR FILTER DESIGN (9 Hrs)

Structures of FIR – Linear phase FIR filter – Fourier series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques.

UNIT-V: FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS (9 Hrs)

Binary fixed point and floating point number representations – Comparison - Quantization noise – truncation and rounding – quantization noise power- input quantization error- coefficient quantization error – limit cycle oscillations-dead band- Overflow error-signal scaling.

REFRENCES:

1. Emmanuel C..Ifeachor, & Barrie.W.Jervis, “Digital Signal Processing”, Second Edition, Pearson
   Education / Prentice Hall, 2002.

2. Sanjit K. Mitra, “Digital Signal Processing – A Computer Based Approach”, Tata Mc Graw Hill, 2007.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE404	Human Resources Management	3	0	0	3

Total Hours:45

Unit-I: Overview (9 Hours)

Overview of Human Resources, Historical evolution, Integrated HR function, Corporate and HR environment, Strategic environment, Strategic Management

Unit-II: Planning (9 Hours)

HR planning at Enterprise level, Need for systematic planning, Planning process, Operating Environment- Internal & External, Job description, Models & techniques of Manpower demand and Supplyforecasting. Retention-Redeployment and Exit strategies

Unit-III: Career management (9 Hours)

Career management-Recruitment and Selection, Employee Induction Programme, Employee training, Training needs & objective setting, Methods of training, Development & Development needs, Human Resource Development, Development process

Unit-IV: Performance Policies (9 Hours)

Performance planning – Performance appraisal, Measures of appraisal, System components appraisal methods, Ethics of appraisal, Problems & issues

Unit-V: Human Resource Information System (9 Hours)

Human Resource Information System- Concept, Objectives of HRIS, Types of information, Sources of Information, Method of Data collection, Procedure of maintaining HRIS at Micro & Macro level

Recommended Book

1. Praveen Durai (2010), Human Resource Management, Pearson Education, South Asia

Reference Books

1. John Storey, Graeme Salaman, Christopher Mabey(1998): Strategic Human Resource Management: A Reader, SAGE Publications, 1998
2. Christopher Mabey, Rosemary Thomson (2011): Developing Human Resources,Routledge, Taylor and francis group, New York, USA.
3. Dessler & Varkkey, (2010): Human Resource Management 11e, India, Prentice Hall
4. Richard D. Johnson, Michael J. Kavanagh, Mohan Thite (2011): Human ResourceInformation System 2e, SAGE Publications, 2011.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE405	Total Quality Management	3	0	0	3

Total Hours:45

Unit-I (9 Hours)

Quality Concepts Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.
Control on Purchased Product Procurement of various products, evaluation of supplies,capacity verification, Development of sources, procurement procedure.
Manufacturing Quality Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

Unit-II (9 Hours)

Quality Management Organization structure and design, Quality function,decentralization, Designing and fitting

organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.
Human Factor in Quality Attitude of top management, co-operation, of groups, operatorsattitude, responsibility, causes of operators error and corrective methods.

Unit-III (9 Hours)
Control Charts Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.
Attributes of Control Charts Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

Unit-IV (9 Hours)
Defects Diagnosis and Prevention Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

Unit-V (9 Hours)

IS0-9000 and its concept of Quality Management: ISO 9000 series, Taguchi method, JIT in some details.

Text and References Books:

1. Lt. Gen. H.LaI, "Total Quality management", Wiley Eastern Limited, 1990. .
2. Greg Bounds. “Beyond Total Quality Management”. McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
OEC	OEC-CSE406	Industrial Relations	3	0	0	3

Total Hours:45

Unit - I: Industrial Relations (9 Hours)

Industrial Relations- Concept and scope, Stake holders; Approaches to Industrial Relations; Labor Market, Demand and Supply of Labor, Nature and composition of Indian labor, Employment and Unemployment Scenarios.

Unit - II: History (9 Hours)

History: Evolution of Industrial Relations UK), Emergence of Industrial relations/ Trade Union movement in India, Government initiatives, Industrial relations machineries, ILO and its impact on Indian IR scenarios.

Unit - III: Industrial Disputes resolutions (9 Hours)

Industrial Disputes resolutions: Sources – Wages, service conditions and discipline, Concept of wages, Wage theories, wage differentials, Regulations for protection of wages, service conditions and Work discipline. Law of natural justice and domestic enquiries; Workers participation in Management, Works committees, Joint Councils.

Unit - IV: Industrial Conflict (9 Hours)

Industrial Conflict: Negotiation, Mediation/ Conciliation, Arbitration, Adjudication- Labor court, Industrial Tribunal, National Tribunal; Special reference to Pay Commissions.

Unit - V: Trends (9 Hours)

Trends: Globalization and its impact on Industrial Relations, Employee Engagement practices, current trends in Industrial Relations in India, Industrial Relations bill- ifs and buts, Ethics, governance and Industrial Relations.

TEXT BOOKS

1. P. N. Singh, Neeraj Kumar, Employee Relations Management, Pearson.
2. Personnel Management and Industrial Relations, P.C. Tripathi, Sultan chand and sons.

REFERENCE BOOKS

1. Arun Monappa, Industrial Relations, Tata Mc Graw Hill.
2. Michael V P, HRM and Human Relations, Himalaya publications.
3. Mamoria and Mamoria, Dynamics of Industrial Relations in India, Himalaya publications.

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PCC	PCC-CSE 405	Artificial Intelligence & Expert system Lab	0	0	4	2

Total Hours: 20

List of Practical's-

1. Study of facts, objects, predicates and variables in PROLOG
2. Study of Rules and Unification in PROLOG
3. Study of "cut" and "fail" predicate in PROLOG
4. Study of arithmetic operators, simple input/output and compound goals in PROLOG
5. Study of recursion in PROLOG. 6 Study of Lists in PROLOG
6. Study of dynamic database in PROLOG
7. Implement string operations like substring, string position, palindrome etc.)
8. Write a prolog program to maintain family tree.
9. Write a prolog program to implement all set operations (Union, intersection, complement etc.)
10. Write a prolog program to solve "Water Jug Problem".

Category	Code	Course Title	Hours Per Week			Credit
			L	T	P	
PROJ	PROJ-CSE-402	Major Project	0	0	16	8

The major project work can be a Modeling and Simulation, Case study, Design or Experiments in the field of Mechanical Engineering. It can be allotted as a group project with groups consisting of 3 to 4 students. The major project work started in the seventh semester (minor project) may be continued in this semester - the students should complete the project work in this semester and present it before the assessment committee The assessment committee will assess the various projects, fix the relative grading and group average marks - the guides will award the marks for the individual students in a project maintaining the group average - each group should submit three copies of a write up of his major project of the completed project report signed by the department (in the format prescribed by the department) through the guide - the Head of the Department-Dean of School of engineering and Technology will certify the copies and one copy return them to the students - other copy will be kept in the departmental and university library

INSTRUCTIONS FOR PROJECT REPORT/ DISSERTATION WRITING

It is important that the procedures listed below be carefully followed by all the students of B.E. (Mechanical Engineering).

1. Prepare Three Hard Bound Copies of your manuscript and if possible publish at least one international journal paper by each group for value addition of your project.

2. Limit your Dissertation report to 80 – 120 pages (preferably)

3. The footer must include the following: Institute Name, B.E. (Mechanical) Times New Roman10 pt. and centrally aligned.

4. Page number as second line of footer, Times New Roman 10 Pt, centrally aligned.

5. Print the manuscript using

a. Letter quality computer printing.

b. The main part of manuscript should be Times New Roman 12 pt. with alignment - justified.

c. Use 1.5 line spacing.

d. Entire report shall be of 5- 7 chapters.

6.Use the paper size 8.5,,,,× 11,,,,or A4 (210 × 197 mm).

Margin Location	Paper 8.5,,,,× 11,,,,	Paper A4 (210 × 197 mm)
Top	1,,,,	25.4 mm
Left	1.5,,,,	37 mm
Bottom	1.25,,,,	32 mm
Right	1,,,,	25.4mm

7.All paragraphs will be 1.5 line spaced with a one blank line between each paragraph. Each paragraph will begin with without any indentation.

8.Section titles should be bold with 14 pt typed in all capital letters and should be left aligned.

9.Sub-Section headings should be aligning at the left with 12 pt, bold and Title Case (the firstletter of each word is to be capitalized).

10. Illustrations (charts, drawings, photographs, figures) are to be in the text. Use only illustrations really pertinent to the text. Illustrations must be sharp, clear, black and white. Illustrations downloaded from internet are not acceptable.

1. Illustrations should not be more than two per page. One could be ideal
2. Figure No. and Title at bottom with 12 pt
3. Legends below the title in 10 pt
4. Leave proper margin in all sides
5. Illustrations as far as possible should not be photo copied.

11. Photographs if any should of glossy prints

12. Please use SI system of units only.

13. Please number the pages on the front side, centrally below the footer

14. References should be either in order as they appear in the thesis or in alphabetical order bylast name of first author

15. Symbols and notations if any should be included in nomenclature section only

16. Following will be the order of report

i. Cover page and Front page as per the specimen on separate sheet
ii. Certificate from the Institute as per the specimen on separate sheet
iii. Acknowledgements
iv. List of Figures

v. List of Tables
vi. Nomenclature vii. Contents
vii. Abstract

(A brief abstract of the report not more than 150 words. The heading of abstract i.e. word ―Abstract‖ should be bold, Times New Roman, 12 pt and should be typed at the centre. The contents of abstract should be typed on new line without space between heading and contents.

Try to include one or two sentences each on motive, method, key-results and conclusions in bstract

1) Introduction (2-3 pages) (TNR – 14 Bold) Problem statement (TNR – 12)
1.1 Objectives
1.2 Scope
1.3 Methodology
1.4 Organization of Dissertation

2) Literature Review (20-30 pages) Discuss the work done so far by researchers in the domain area and their significant conclusions. No derivations, figures, tables, graphs are expected.

3)This chapter shall be based on your own simulation work (Analytical/ Numerical/FEM/CFD)(15- 20 pages)
4) Experimental Validation - This chapter shall be based on your own experimental work (15-20 pages)
5) Concluding Remarks and Scope for the Future Work (2-3 pages) References ANNEXURE (ifany) (Put all mathematical derivations, Simulation program as Annexure)
17. All section headings and subheadings should be numbered. For sections use numbers 1, 2, 3, …. and for subheadings 1.1, 1.2, …. etc and section subheadings 2.1.1, 2.1.2, …. etc.

18. References should be given in the body of the text and well spread. No verbatim copy orexcessive text from only one or two references. If figures and tables are taken from any reference then indicate source of it.

Please follow the following procedure for references / Reference Books/ Patent/ Internet

- Collier, G. J. and Thome, J. R., Convective boiling and condensation, 3rd ed., Oxford University Press, UK, 1996, pp. 110 – 112.
- 2. Papers from Journal or Transactions Jung, D. S. and Radermacher, R., Transport properties and surface tension of pure and mixed refrigerants, ASHRAE Trans, 1991, 97 (1), pp. 90 – 98.
- Bansal, P. K., Rupasinghe, A. S. and Jain, A. S., An empirical correction for sizing capillarytubes, Int. Journal of Refrigeration, 1996, 19 (8), pp.497 – 505.
- Papers from Conference Proceedings Colbourne, D. and Ritter, T. J., Quantitative assessment of flammable refrigerants in room air conditioners, Proc. of the Sixteenth International Compressor Engineering Conference and Ninth International Refrigeration and Air Conditioning Conference, Purdue University, West Lafayette, Indiana, USA, 2002,

pp. 34 – 40.

Reports, Handbooks etc.

- United Nations Environmental Programme, Report of the Refrigeration, Air Conditioning and Heat Pumps, Technical Option Committee, 2002, Assessment - 2002ASHRAE Handbook: Refrigeration, 1994 (Chapter 44)

Patent

- Patent no., Country (in parenthesis), date of application, title, year.

Internet

- www.(Site) [Give full length URL]

School of Engineering and Technology

Program: B.TECH Electrical Engineering

(4 Years Course)

Programme Educational Objective (PEO)Programme Outcomes (POs) Programme Specific Outcomes (PSOs) Course Outcomes (COs)

RAFFLES UNIVERSITY

RAFFLES UNIVERSITY, NEEMRANA, ALWAR, RAJASTHAN

ABOUT THE PROGRAMMME

Raffles University, Neemrana established in 2011, to produce highly practical oriented personnel in fields of engineering to meet specific manpower requirements of industries. Electrical Engineering Department was started in 2011 and has been conducting B.Tech Course in Electrical Engineering of 4-Years duration since 2011. Students are admitted through university entrance or direct counselling nominated by university management in 1st Year and 2nd year through lateral entry entrance test. The total intake for the programme is 60. The Electrical Engineering Department has been well known for its track record of employment of the pass out students since its inception. The Department has well managed class rooms andfully equipped laboratories and Conference Room. It has excellent and distinguished faculty. The syllabi of programme in Electrical Engineering Department, has been prepared by subject experts with active participation from Industry. The Department is organizing number of expert lectures from industry experts for students in every semester. Summer training/ Industry Internship is mandatory for every student after completion of second year and third year (Two times in 4 years). Emphasis has been given on project work, workshop and Lab Course for skill enhancement of students. Choice based credit system allows students to study the subjects of his/her choice from a number of elective courses /audit courses.

PROGRAMMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: To train students with practical skills and experimental practices related to core and applied areas of Electrical Engineering to expand their knowledge horizon beyond books.

PEO-2: To enable students to design, develop and maintain Electrical equipments which are useful for the society.

PEO-3: To improve team building, team working and leadership skills of the students with high regard for ethical values and social responsibilities.

PEO- 4: To enable students to communicate effectively and demonstrate the knowledge of project management and independent research.

PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

1) Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and Electrical engineering to the solution of engineering problems.

2) Problem Analysis: Identify, formulate, review literature and analyse Electrical engineering problems to design, conduct experiments, analyse data and interpret data.

3) Design /Development of Solutions: Design solution for Electrical engineering problems and design system component of processes that meet the desired needs with appropriate consideration for the public health and safety, and the cultural, societal and the environmental considerations.

4) Conduct Investigations of Complex Problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions in Electrical engineering.

5) Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to mechanical engineering activities with an understanding of the limitations.

6) The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to Electrical engineering practice.

7) Environment and Sustainability: Understand the impact of the Electrical engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Electrical engineering practice.

9) Individual and Team Work: Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in Electrical engineering.

10) Communication: Communicate effectively on complex engineering activities with the engineering committee and with society at large, such as, being able to comprehend and write affective reports and design documentation, make effective presentations in Electrical engineering.

11) Project Management and Finance: Demonstrate knowledge & understanding of the Electrical engineering principles and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments in Electrical engineering.

12) Life - Long Learning: Recognize the need for, and the preparation and ability to engage in independent research and lifelong learning in the broadest contest of technological changes in Electrical engineering.

PROGRAM SPECIFIC OUTCOMES (PSOs):

1) To apply practical skills, knowledge of engineering fundamentals and Electrical engineering, to industries and institutions.

2) To explore, create and develop innovations in various aspects of engineering. The student will be ready to take-up career or to pursue higher studies with high regard to ethical values and social responsibilities.

B.TECH ELCTRICAL ENGINEERING SCHEME CREDITS CALCULATION

S.No.	Category of Course	Abbreviation Used	Credits
1.	Humanities and Social Sciences including Management Courses	HSMC	13
2.	Basic Sciences Courses	BSC	26
3.	Engineering Sciences Courses including workshop, Drawing, Basics of Electrical/ Mechanical/ Computer etc.	ESC	26
4.	Professional Core Courses	PCC	98
5.	Professional Elective C ourses relevant to chosen specialization/ branch	PEC	13
6.	Open Subjects- Electives from other technical and /or emerging subjects	OEC	12
7.	Project Work, Seminar and internship in industry or elsewhere	PROJ	16
8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
Total			**204**

Abbreviations Used:

L -Lectuer

T - Tutorial

P - Practical

IA - Internal Assessment

EA - External Assessment

TA - Teacher's Assessment

MTA - Mid Tern Assessment

ETA - End Term Assessment

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9) Individual and Team Work: Function affectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings in Electrical engineering.

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PROGRAM SPECIFIC OUTCOMES (PSOs):

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2) To explore, create and develop innovations in various aspects of engineering.

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6.	Open Subjects- Electives from other technical and /or emerging subjects	OEC	12
7.	Project Work, Seminar and internship in industry or elsewhere	PROJ	16
8.	Mandatory Courses (Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge)	MC	Non Credit
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L -Lectuer

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TA - Teacher's Assessment

MTA - Mid Tern Assessment

ETA - End Term Assessment

1	PCC-EE	PCC-EE-201	**Electrical Circuit Analysis**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1. Apply network theorems for the analysis of electrical circuits

CO2. Obtain the transient and steady-state response of electrical circuits

CO3. Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
CO4.Analyze two port circuit behavior

CO5. Synthesize networks and filters

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	**PCC-EE**	**PCC-EE-203**	**Analog Electronics**

UNIT	**CONTENT**

Course Outcomes

At the end of this course, students will demonstrate the ability to:

CO1. Understand the working principle of PN junction diode and its applications.

CO2. Understand the working of BJT and its applications.

CO3. Understand the working of JFET and MOSFET

CO4. Analysis and design of Differential, multi-stage and operational amplifiers

CO5. Analysis and design of Linear applications of op-amp. Analysis and design of Nonlinear applications of op-

amp.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-205	**Electrical Machines – I**

UNIT	**CONTENT**

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1. Understand the concepts of magnetic circuits

CO2. Understand the operation of DC machines

CO3. Analyse the differences in operation of different DC machine configurations

CO4. Analyse single phase transformers circuits.

CO5. Analyse three phase transformers circuits.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-207	**Electromagnetic Fields**

UNIT	**CONTENT**

Course Outcomes:

At the end of the course, students will demonstrate the ability:

CO1. To understand the basic laws of electromagnetism

CO2. To obtain the electric and magnetic fields for simple configurations under static conditions

CO3. To analyse time varying electric and magnetic fields

CO4. To understand Maxwell's equation in different forms and different media.

CO5. Investigate behavior of EM waves in different medias and to calculate average power density radiated.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

6	ESC	ESC- 201	Engineering Mechanics
UNIT 9	MC	MC-I	Indian Constitution

CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1. Understand the concepts of co-ordinate systems

CO2. Analyse the three-dimensional motion

CO3. Understand the concepts of rigid bodies

CO4. Explain and solve numerical problems on kinematics of particles and rigid bodies

CO5. Explain and apply work-energy principle, impulse-moment principle to solve numerical problems on linear and angular motion and collision.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Syllabus**for B.Tech (Batch 2022-26)**

4th Semester

S No	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PCC-EE	PCC-EE202	Digital Electronics	3	0	0	3	40	60	100
2	PCC-EE	PCC-EE-204	Electrical Machines – II	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-206	Power Electronics	3	1	0	4	40	60	100
4	PCC-EE	PCC-EE-208	Signals and Systems	3	0	0	3	40	60	100
5	BSC	BSC -201	Mathematics–III	3	0	0	3	40	60	100
6	BSC	BSC -202	Biology-medical instrumentation	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE-210	Digital Electronics Laboratory	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-212	Electrical Machines Laboratory – II	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-214	Power Electronics Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

1	PCC-EE	PCC-EE202	Digital Electronics

UNIT	CONTENT

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1- Understand number systems, basic logic gates, Boolean algebra and derive digital logic circuits

CO2- Classify various minimization techniques and choose the best for designing logic circuit .

CO3- Define characteristics of logic families and calculate their parameters

CO4- Design combinational logic circuits such as adder, subtractor, multiplexer, decoder.

CO5. Classify the different types of flip flops and design counters, registers using flip flops.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-204	**Electrical Machines – II**

UNIT	CONTENT

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1- Understand the construction and working of AC machines .

CO2- Understand the generation of rotating magnetic field in AC machines.

CO3- Solve the performance parameters of AC machines.

CO4- Interpret the behavior of AC machines using phasors, equivalent circuits and its characteristics.

CO5- Examine the performance behavior of AC machines under different loading condition.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2

CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PCC-EE	PCC-EE-206	Power Electronics
UNIT	**CONTENT**		

Course Outcomes:
At the end of this course students will demonstrate the ability to:

CO1-Understand the differences between signal level and power level devices

CO2-Analyse controlled rectifier circuits

CO3-Analyse the operation of DC-DC choppers

CO4-Analyse the operation of voltage source inverters

CO5- Interpret the speed control of DC motors using converters and choppers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PCC-EE	PCC-EE-208	Signals and Systems
UNIT	**CONTENT**		

Course Outcomes:
At the end of this course, students will demonstrate the ability to:

CO1-Understand the concepts of continuous time and discrete time systems.

CO2-Analyse systems in complex frequency domain

CO3-Understand sampling theorem and its implications

CO4- Understand mathematical tools to be able to apply in state variable modeling

CO5- Analyze signal and system properties like stability and causality using Laplace and Z transforms.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2

CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	BSC	BSC -201	Advance Mathematics

UNIT **CONTENT**

Course Objectives: The objective of this course is to familiarize the student with statistical techniques. It aims to equip he students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline

Course Outcomes: At the end of the course, the student will be able to

CO1-Have basics knowledge about measure of central tendency, kurtosis and moments and their applications in engineering fields.

CO2-Familiarize the student with expectations of discrete and continuous random variable

CO3-Familiarize probability techniques and random variables and detailed knowledge of probability distribution with so as to use it with any date of engineering problem formulation

CO4-Have basic idea about statistics including correlation, regression and then up to advanced level with testing of large samples that is important in solving problems related to engineering

CO5- **Use Z-transform and its applications to solve difference equations**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3											2
CO2	3	3	3											2
CO3	3	3	3											2
CO4	3	3	3											2
CO5	3	3	3											2

6	BSC	BSC -202	Bio-medical instrumentation

UNIT **CONTENT**

Course Outcomes

At the end of this course students will demonstrate the ability to

CO 1. understand basic Biomedical Instruments and their functioning

CO2. describe Microelectrodes, Electro conduction systems

CO3. explain ECG, EEG, EMG, ERG, etc.

CO4. understand Ventilators and other important Clinical Instruments

CO5- Outline medical imaging techniques and equipment for certain diagnosis and therapies.														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2021-25)

5th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PCC-EE	PCC-EE-301	Power Systems – I	3	1	0	4	40	60	100
2	PCC-EE	PCC-EE-303	Control Systems	3	1	0	4	40	60	100
3	PCC-EE	PCC-EE-305	Microprocessors	3	0	0	3	40	60	100
4	PEC-EE	PEC-EE-301	Program Elective - 1	3	0	0	3	40	60	100
5	OEC-EE	OEC-EE-301	Open Elective-1	3	0	0	3	40	60	100
6	HSMC	HSMC-301	Engineering Economics	3	0	0	3	40	60	100
7	PCC-EE	PCC-EE307	Power Systems Laboratory - I	0	0	2	2	60	40	100
8	PCC-EE	PCC-EE-309	Control Systems Laboratory	0	0	2	2	60	40	100
9	PCC-EE	PCC-EE-311	Microprocessors Laboratory	0	0	2	2	60	40	100
			Total	**18**	**2**	**6**	**26**			**900**

1	PCC-EE	PCC-EE-301	Power Systems – I

UNIT	CONTENT	No. Of Hrs.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the concepts of power systems.

CO 2 Understand the various power system components.

CO 3 Evaluate fault currents for different types of faults.

CO 4 Understand the generation of over-voltages and insulation coordination.

CO 5 Understand basic protection schemes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-303	Control Systems

UNIT	CONTENT

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the modelling of linear-time-invariant systems using transfer function and state-space representations.

CO 2 Understand the concept of stability and its assessment for linear-time invariant systems. Design simple feedback controllers.

CO3- Formulate different types of analysis in frequency domain to explain the nature of stability of the system.

CO4- Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system

CO5- Design simple Lag, Lead, Lag- Lead network & PID controllers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

	PCC-EE	PCC-EE-305	Microprocessors
UNIT	**CONTENT**		

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Study of 8085 and 8086 Microprocessors.

CO 2 Do assembly language programming.

CO 3 Do interfacing design of peripherals like 8255, 8253,8279,8251 etc

CO4: Acquire the knowledge of synchronous and asynchronous communication and interfacing to protocols like blue-tooth, etc.

CO5: Design electrical circuitry to the microcontroller I/O ports in order to interface the processor to exter

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2

4	PEC-EE	PEC-EE-301 a	Wind and solar Energy Systems

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1-Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.

CO2- Understand the basic physics of wind and solar power generation.

CO3- Understand the power electronic interfaces for wind and solar generation.

CO4- Understand the issues related to the solar technologies and wind topologies.

CO5: Demonstrate the Solar Thermal and PV applications along with its storage systems.

CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-301 b	**Line Commutated and Active PWM Rectifiers**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1-Analyse controlled rectifier circuits.

CO2- Understand the operation of line-commutated rectifiers – 6 pulse and multi-pulse configurations.

CO3- Understand the operation of PWM rectifiers –.

CO4- operation in rectification and regeneration modes and lagging, leading and unity power factor mode

CO5-

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	
CO1	1	3	3	2	1							2	3	2	
CO2	3	3	3	2	1							2	3	2	
CO3	3	3	3	2	2							2	3	2	
CO4	3	3	3	2	2							2	3	2	
CO5	3	3	3	2	2							2	3	2	

4	PEC-EE	PEC-EE-301 c	Electrical Drives

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

(i) Understand the characteristics of dc motors and induction motors.

(ii) Understand the principles of speed-control of dc motors and induction motors.

(iii) Apply the knowledge of power electronics to understand the working of dc-dc converters.

(iv) Apply the knowledge of control system for the speed control of electrical machines.

CO5- Illustrate control of slip ring induction motor (SLIM).

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2

CO2	3	3	3	2	1							2	3	2	
CO3	3	3	3	2	2							2	3	2	
CO4	3	3	3	2	2							2	3	2	
CO5	3	3	3	2	2							2	3	2	

5	OEC-EE	OEC-EE-301a	Electronic Devices
UNIT	**CONTENT**		

Course Outcomes

At the end of this course students will demonstrate the ability to:

1. Understand physics of semiconductors and behavior of charge carriers within semiconductors 2. Understand the working of semiconductor diodes supported with mathematical explanation. 3. Understand the working of BJT and MOSFET with their equivalent small signal models.

4. Understand the chemical processes used in fabrication of integrated circuits.

5	OEC-EE	OEC-EE-301b	Data Structures and Algorithms
UNIT	**CONTENT**		

Course outcomes

Student will be able to:

CO 1. Understand operations like searching, insertion, deletion, traversing on linear Data Structures and to determine their computational complexities

CO2. Understand operations like searching, insertion, deletion, traversing on various non linear Data Structures and to determine their computational complexities

CO3. Write algorithms for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.

CO4. Apply appropriate Data Structure as per specific problem definition CO5-Identify, model, solve and develop algorithms for real-life problems like shortest path and MST using graph theory.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-301c	Analog and Digital Communication

UNIT	CONTENT

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth

CO2. Analyze the behavior of a communication system in presence of noise

CO3. Investigate pulsed modulation system and analyze their system performance

CO4. Analyze different digital modulation schemes and can compute the bit error performance

CO5-Apply time division multiplexing concepts in different pulse modulation techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

6	HSMC	HSMC-301	Engineering Economics

Course Outcomes

At the end of this course students will demonstrate the ability to:

CO1. Understand the basic principles, scope and the applications of Engineering Economics

CO2. Understand and apply the knowledge of elasticity of demand and supply on price determination.

CO 3. Apply the knowledge of demand forecasting to make effective demand forecast.

CO4. Understand the complexity of uncertain market structure and be able to take decisions of price determinations.

CO 5. Understand the various management concepts and thoughts and using for better resource management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

1	PCC-EE	PCC-EE-302	Power Systems – II

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO1- Use numerical methods to analyze a power system in steady state.

CO2- Understand stability constraints in a synchronous grid.

CO3- Understand methods to control the voltage, frequency and power flow.

CO4-Understand the monitoring and control of a power system

CO5- Acquire knowledge about the Regulatory framework, ancillary services, power system economics and power management.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PCC-EE	PCC-EE-304	**Measurements and Instrumentation**

Course Outcomes

After completion of this course, students will be able to –
CO1-Identify various types instrument suitable for specific measurement.
CO2- Classify various errors present in measuring instruments.
CO3- Understand construction, working principle and types of oscilloscopes.
CO4-Comprehend different types of signal generators and analyzers, their construction and operation.
CO5-Describe the working principle, selection criteria and applications of various transducers used in measurem systems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 a	**Electrical Engineering Materials**

UNIT	**CONTENT**

Course Outcomes:
CO 1 To Understand the basic concepts of materials.
CO 2 To use simplified materials selection concepts for design purposes.
CO 3 To Understand the properties of Materials.

CO4 Acquire knowledge of Conductivity of metals Ohm's law and relaxation time of electrons, collision time and mean free path, electron scattering and resistivity of metals.
CO5: Acquire knowledge of Classification of semiconductors, semiconductor conductivity, temperature dependence, Carrier density and energy gap, Trends in materials used in Electrical Equipment.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 b	**Electrical Machine Design**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO 1 Understand the construction and performance characteristics of electrical machines.

CO 2 Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines

CO 3 Understand the principles of electrical machine design and carry out a basic design of an ac machine.

CO 4 Use software tools to do design calculation

CO5 Identify the limitations (assumptions) of traditional designs and need for CAD analysis, synthesis and hybrid models.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	PEC-EE	PEC-EE-302 c	**Power System Protection**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand power system protection.

CO 2 Understand the main components used in power system protection for electric machines, transformers.

CO 3 Understand the bus bars, overhead and underground feeders.

CO 4 Understand the earthing protection.

CO5 Explain the simulation of protection schemes by using Electro-Magnetic Transients (EMT) programs.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 b	**Renewable Energy Sources**

UNIT	**CONTENT**

Course Outcomes:

CO 1 To Understand the Need, importance and scope of non-conventional and alternate energy resources.

CO 2 To understand role significance of solar energy and wind energy

CO 3 To understand the role of ocean energy in the Energy Generation.

CO 4 To get the utilization of Biogas plants and geothermal energy

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

4	PEC-EE	PEC-EE-303 c	**High Voltage Engineering**

UNIT	**CONTENT**

Course outcomes:

At the end of the course, the student will demonstrate

CO1-Understand the basic physics related to various breakdown processes in solid, liquid, and gaseous insulating materials.

CO2- Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.

CO3- Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.

CO4- Knowledge of how over-voltages arise in a power system, and protection against these over-voltages.

CO5- Study and understand the nature of faults happening on both the AC and DC sides of the converters and formulate protection schemes for the same.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 a	**Computer Networks**

UNIT	**CONTENT**

Course Outcomes: The student will be able to:

CO1: Explain the functions of the different layer of the OSI Protocol;

CO2:. Describe the function of each block of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs);

CO3: Develop the network programming for a given problem related TCP/IP protocol; &

CO4: Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available

CO5 ***Analyze*** the features and operations of various application layer protocols such as HTTP, DNS and SMTP.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS(
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 b	Embedded System

Course Outcomes

After completion of this course, students will be able to –
CO1-Define basic operations of embedded microcontroller cores, processors and memories.
CO2-Describe the concept of Embedded System and its design for real life applications.
CO3-Explain the technological aspects of embedded systems through analog and digital blocks, sub systems user interfacing.
CO4-Examine design metrics, design tradeoffs and software aspects of embedded systems.
CO5- Illustrate Real Time Programming Languages and Real Time operating systems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS(
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

5	OEC-EE	OEC-EE-302 c	VLSI Circuits

UNIT	CONTENT

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. understand the process of VLSI fabrication

2. Investigate the Oxidation processes for VLSI/ULSI device fabrication

3. Learn about the environment for VLSI/ULSI technology

4. Understand Lithography and deposition processes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

6	HSMC	HSMC-302	Personality Development Programme

UNIT	CONTENT

Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

7th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PEC-EE	PEC-EE404	Program Elective -4	3	0	0	3	40	60	100
2	PEC-EE	PEC-EE-405	Program Elective -5	3	1	0	4	40	60	100
3	OEC-EE	OEC-EE-403	Open Elective -3	3	0	0	3	40	60	100
4	OEC-EE	OEC-EE-404	Open Elective -4	3	0	0	3	40	60	100
5	PROJ-EE	PROJ-EE01	Project Stage-I	0	0	2	2	180	120	300
6	SI	EE-SI	Summer Internship	0	0	2	2	120	80	200
			Total	**12**	**1**	**4**	**17**			**900**

1	PEC-EE	PEC-EE304a	**Electrical Energy Conservation and Auditing**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the current energy scenario and importance of energy conservation. Understand the concepts of energy management.

CO 2 Understand the methods of improving energy efficiency in different electrical systems.

CO 3 Understand the concepts of different energy efficient devices.

CO4: To analyze, calculate and improve the energy efficiency and performance of electrical and industrial utilities.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304b	**Industrial Electrical Systems**

UNIT	**CONTENT**

Course Outcomes:

CO1-At the end of this course, students will demonstrate the ability to

CO2- Understand the electrical wiring systems for residential, commercial, and industrial consumers, representing the systems with standard symbols and drawings, SLD.

CO3- Understand various components of industrial electrical systems.

CO4- Analyze and select the proper size of various electrical system components.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE304c	**Power System Dynamics and Control**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

CO1- Understand the problem of power system stability and its impact on the system.

CO2- Analyse linear dynamical systems and use of numerical integration methods.

CO3-Model different power system components for the study of stability.

CO4-Understand the need and plan the methods to improve stability.

CO5: Design a mini project on having 2-3 generation sources having 3 generation sources and perform the process of power transfer from source to load with the help of transformers and at least three loads.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305a	**NEURAL NETWORKS**

UNIT	**CONTENT**

Course Outcomes:

At the end of the course, students will demonstrate the ability to

CO1. Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning

CO2. Get the response of an Learning Processes system

CO3 Apply Artificial Neural Network models to handle uncertainty and solve engineering problems.

CO4 Recognize the feasibility of applying a Neuro-model for a particular problem

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305b	**Digital signal Processing**

UNIT	**CONTENT**

Course Outcomes

At the end of this course students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete time and frequency domain

2. Get the response of an LSI system to different signals

3. Design of different types of digital filters for vari ous applications

4 Implement Z transform and inverse Z transform of discrete signals

5 Model IIR and FIR filter using window techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	PEC-EE	PEC-EE-305c	**Computer Architecture**

Course Outcomes:

After completion of this course, students will be able to:
CO1: Understand the basics of computer architecture and its organization.
CO2: Recognize processor models based on their organization, addressing modes and instruction set.
CO3: Understand basics of ALU, control unit and computer organization such as memory & I/O.
CO4: Understand various architectures based on performance, cost and applicability.
CO5: Understand impact of modern techniques like pipelining, express buses processor performance.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403a	**Image Processing**

Course Outcomes:

After completion of this course, students will be able to:

CO1- ***Identify*** the fundamental elements of an image and ***Describe*** the need of digital image processing

CO2- ***Understand*** different types of image transformation techniques and their properties.

CO3- ***Use*** various noise models and ***Calculate*** the values for restoration and degradation models.

CO4- ***Analyze*** and ***Evaluate*** various image compression techniques.

CO5- ***Integrate*** and ***Demonstrate*** various Image Transformation and Segmentation Techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-403b	**Power Quality and FACTS**

Course Outcomes

After completion of this course, students will be able to:

CO1: Acquire knowledge of the advantage of compensation and will learn several aspects such as description, operation and characteristics of Thyristor-based FACTS devices: Static VAR Compensator (SVC), Thyristor Controlled Series Capacitor (TCSC), Thyristor Controlled Braking Resistor and Single Pole Single Throw (SPST) Switch.

CO2: Acquire knowledge of the operation and applicability of Voltage Source Converters and their realization details for implementation in FACTS Devices.

CO3: Analyze different possible applications of FACTS devices in order to improve stability and for achieving better voltage regulation along with the applicability of these as a solution provider for power quality problems in distribution networks.

CO4: Acquire the knowledge of custom power device DSTATCOM, classification of DSTATCOM, different topological realizations, operation control of DSTATCOM and reference current extraction paradigm based on Synchronous Reference Frame Theory.

CO5: Acquire the knowledge of custom power devices for voltage power quality problems (DVR, UPQC) and for current power quality problems (UPQC), different topological aspects of DVR and UPQC, principle of operation of these devices along with control paradigms

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2

CO2	3	3	3	2	1							2	3	2	
CO3	3	3	3	2	2							2	3	2	
CO4	3	3	3	2	2							2	3	2	
CO5	3	3	3	2	2							2	3	2	

3	OEC-EE	OEC-EE-403c	GENERATION OF ELECTRICAL POWER

UNIT	CONTENT

Course Outcomes:

At the end of the course, students will demonstrate the ability to

CO1- Understand the load curves, load-duration Curve.

CO2-Understand the power plant economics and tariff

CO3- Explore the significance of economic operation of steam plants

CO4- Apply techniques to evaluate generation cost, depreciation reserve and Acquire knowledge of different method of energy cost reduction.

CO5- Apply techniques to evaluate tariff and comparative study of various power plants.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

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Raffles University, Neemrana

School of Engineering and Technology

Department of Electrical Engineering

Scheme for B.Tech (Batch 2022-26)

8th Semester

S. No.	Category	Code	Course Title	Hours Per Week			Credits	Examination		
				L	T	P	C	I.A Marks	ESE Marks	Total Marks
1	PEC-EE	PEC-EE-406	Program Elective -6	3	0	0	3	40	60	100
2	OEC-EE	OEC-EE-405	Open Elective -5	3	0	0	3	40	60	100
3	OEC-EE	OEC-EE-406	Open Elective -6	3	1	0	4	40	60	100
4	PROJ-EE	PROJ-EE-02	Project Stage-II	0	0	2	2	360	240	600
			Total	**9**	**1**	**2**	**12**			**900**

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1	PEC-EE	PEC-EE-306a	**MODERN CONTROL THEORY**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand various design specifications.

CO 2 Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).

CO 3 Design controllers using the state space approach.

CO 4-Understand various design Adaptive control sysem

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306b	**Smart grid technology**

UNIT	**CONTENT**

Course Outcomes :

At the end of this course, students will demonstrate the ability to:

CO 1 Understand technologies for smart grid.

CO 2 Appreciate the smart transmission as well distributionsystems.

CO 3 Realize the distribution generation and smart consumption.

CO 4 Know the regulations and market models for smart grid.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

1	PEC-EE	PEC-EE-306c	**Artificial intelligence techniques**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.

CO 2 Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing

CO 3 Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.

CO4 Classify different learning paradigms and its application in Neural Network

CO5 Explain concepts of Natural Language processing and discuss Expert System

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PS
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405b	**Power System Engineering**

course Outcomes

CO1: Understand power stability problems and the basic concepts of modeling and analysis of dynamical systems.
CO2: Analyze the behavior of Steady State, Dynamic and transient stability on power systems.
CO3: Analyze stability of single machine and multi-machine systems.
CO4: Analyze the stability of power system by Modified Euler's and Runge – Kutta method.
CO5: Comprehend various factors affecting steady state and transient stabilities.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

2	OEC-EE	OEC-EE-405a	Testing & Commissioning of Electrical Equipments

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
CO1-Describe the method procurement process and state of the art global practices in maintenance of electrical equipment .
CO2- Analyze and explaining of the requirement common to all equipment
CO3- Analyze and explaining the installation of synchronous machines
CO4-understand the specification and testing of transformer

2	OEC-EE	OEC-EE-405c	**Power System Planning**

Course Outcomes:

After completion of this course, students will be able to:

CO1: Gain information about basic building blocks of Power System planning.

CO2: Understand the basic concept of Power system reliability at generation, transmission and distribution level.

CO3: Analyze the effect of various parameters involved in Generation, Transmission and Distribution systems.

CO4: Understand the impact of demand side planning in deregulated market environment

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406a	**Computer Aided Power System Analysis**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 To introduce computer applications in the analysis of power systems.

CO 2 To understand the solution methods and techniques used in power system studies.

CO 3 To solve numerically the complex IEEE bus networks and the energy flow

Co4- **CO3:** Elaborate the concept of digital protection and signal conditioning

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406b	**Advanced Power Electronics**

UNIT	**CONTENT**

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

CO 1 Understand the operation of power electronic converters and their control strategies.

CO 2 Understand the vector control strategies for ac motor drives

CO 3 Understand the implementation of the control strategies using digital signal processors.

CO4: Acquire knowledge about different AC voltage controllers and their control.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	P
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2

3	OEC-EE	OEC-EE-406c	**Power System Transients**

CO1- To explain the sources and effects of lightning, switching and temporary over voltages.

CO2 -To model and estimate the over voltages in power system

CO3- To develop travelling wave equation and to analyze travelling wave.

CO4- To analyze the insulation coordination of power system and protective devices.
CO5- To develop the modeling of power system for transient over voltages using Electromagnetic Transient Program (EMTP)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	1	3	3	2	1							2	3	2
CO2	3	3	3	2	1							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	2

4	Project Stage-II		Credit
No of Practical	PROJ-EE	PROJ-EE-02	Max. Marks: 600 (IA:360, TE:240) (0L+0T+2P 1)

Course Outcomes:
At the end of this course, students will demonstrate the ability to:
(i) Apply and verify basic scientific principals and technologies.
(ii) Identify the scope of interdisciplinary knowledge
(iii) Make and design a prototype which is preferably a working model

Guidelines
1) A group of 3-4 students under the mentorship of a teacher to make a minor project. Interdisciplinary projects to be encouraged.
2) The project title and scope to be decided and presented in first 2nd/3rd weeks of the semester.
3) The progress of the project to be evaluated (internal) in 8th/9th week of the semester.
4) A draft of the project report to be prepared and the project to be evaluated (internal) 12th/13th week of the semester.
5) The project report and the project to be submitted in the department at the time of external evaluation.

School of Engineering and Technology

Program: BCA (3 Years Course)

Programme Educational Objective
(PEO)Programme Outcomes (POs)
Programme Specific Outcomes
(PSOs) Course Outcomes (COs)

RAFFLES
UNIVERSITY

RAFFLES UNIVERSITY, NEEMRANA, ALWAR, RAJASTHAN

Graduates will be able to:

1) Knowledge: Apply knowledge of mathematics, science, fundamentals and computer application to the solution of engineering problems.

2) Problem Analysis: Identify, formulate, research literature and analyse complex problems reaching substantiated conclusions using first principles of mathematics, natural sciences.

3) Design /Development of Solutions: Design solutions for complex problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

4) Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

5) Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex activities with an understanding of the limitations.

6) Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional practice.

7) Environment and Sustainability: Understand the impact of the professional computer application solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the computer application practice.

9) Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

10) Communication: Communicate effectively on complex computer application activities with the community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

11) Project Management and Finance: Demonstrate knowledge and understanding of computer application and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12) Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change.

Program Specific Objective

1) To collect requirements, analyze, design, implement and test software Systems.

2) To analyze the errors and debug them within minimal time.

SUBJECT NAME: -Basics of Mathematics

SUBJECT CODE: -BCA-101

CO-1: Use the fundamental knowledge of matrix and determinants.

CO-2: Use logical operation and algebra of proposition.

CO-3: Develop knowledge of the fundamental theorem of Arithmetic.

CO-4: Understand how to determine the natural of set and its types.

CO-5: Understand how to determine the nature of use relation and function.

Course Outcome	**Program Outcome**												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO-1	3	3	2	3	1	2	1		2	2	1	2	3	3
CO-2	3	3	3	3	2	2	1		1	1	1	1	3	3
CO-3	3	3	3	3	3	2	2		2	2	2	2	3	3
CO-4	3	3	3	3	3	2	2		2	1	1	1	3	2
CO-5	3	2	1	1	3	3	2		1	1	1	2	3	2

SUBJECT NAME: - COMPUTER FUNDAMENTALS

SUBJECT CODE: -BCA-103

CO 1. Understanding the concept of input and output devices of Computers

CO 2. Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices.

CO 3. Understand an operating system and its working, and solve common problems related to operating systems.

CO 4. Learn basic word processing, Spreadsheet and Presentation Graphics Software skills.

CO 5. Study to use the Internet safely, legally, and responsibly.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	2	1		3	1							2	3	2
CO2	3	2	1	3	3					2	2	3	3	3
CO3	3	3	2	2	3					2	3	3	2	3
CO4	3	3		3	3				2	1	2	3	3	3
CO5	2	2	3	2	3	3	1	3		2	2	3	3	2

SUBJECT NAME: - Programming with C

SUBJECT CODE: -BCA-105

CO1. Demonstrate knowledge on C Programming constructs learn to develop simple applications in C using basic constructs.

CO2. Design and implement applications using arrays and string.

CO3. Develop and implement modular applications in C using functions.

CO4. Develop applications in C using structures and pointers.

CO5.Design applications using sequential and random-access file processing.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3	2	2					2	3	3	3	3
CO2	2	3	2	3	3	2				1	3	3	2	3
CO3	3	2	3	2	3	2	2		1	3	3	3	3	3
CO4	3	3	3	2	3	3				2	3	3	3	2
CO5	2	3	3	3	3	2					3	2	3	3

SUBJECT NAME: - Communicative English

SUBJECT CODE: - BCA-107

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1								3		3		3			2
CO2								3	2	3		3			2
CO3								3	2	3		3			2
CO4								3		3		3			2
CO5								3		3		3			2

SUBJECT NAME: - DATA STRUCTURE

SUBJECT CODE: - BCA-102

Course Outcomes:

CO1: Ability to analyse algorithms and algorithm correctness.

CO2: Ability to summarize searching and sorting techniques.

CO3: Ability to describe stack, queue and linked list operation.

CO4: Ability to have knowledge of tree and graphs concepts.

Course Outcome	**Program Outcome**												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	1		2					2	3	2
CO2	3	3	3	2	1		2					2	3	2
CO3	3	3	3	2	2		2					2	3	2
CO4	3	3	3	2	2							2	3	2
CO5	3	3	3	2	2							2	3	

SUBJECT NAME: - COMPUTER NETWORK

SUBJECT CODE: - BCA-104

Course Outcomes:

CO1: Students will be aware about computer networking.

CO2: Students will know about various layers of OSI Model.

CO3: Students will learn about wired & wireless technologies.

CO4: Students will learn about the services of different layers.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3				3	1			3			3	3	3
CO2	3	2	3		3				3			3	3	3
CO3	3	2	3		3	2			3			3	3	3
CO4	3	2			3				3			3	3	3
CO5	3	2	3	3	3				3			3	3	3

SUBJECT NAME: - OOPs through C++

SUBJECT CODE: - BCA-106

Course Outcomes:

CO1: Able to develop programs with reusability.

CO2: Develop programs for file handling.

CO3: Handle exceptions in programming.

CO4: Develop applications for a range of problems using OOP techniques.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2	2									3		2
CO2	3	2	2									3		2
CO3	3	3	2									2		3
CO4	3	3	3	2	2	1			2		2	3	2	2
CO5	3											2		2

SUBJECT NAME: - Basic Physics

SUBJECT CODE: - BCA-108

Course Outcomes:

CO1: Understand and apply Maxwell's equations, which describe the fundamental laws of electromagnetism, including Gauss's law for electricity, Gauss's law for magnetism, Faraday's law of electromagnetic induction, and Ampère's law with Maxwell's addition.

CO2: Understand, apply, and manipulate Maxwell's equations to describe and analyze electromagnetic phenomena in both static and dynamic situations.

CO3: Understand and describe the impact of solid-state device capabilities and limitation on electronic circuit performance.

CO4: Understand the concepts of X-Rays and Ultrasonics.

CO5: Understand the basic concepts such as Nuclear Detectors, Characteristics of gas filled detectors and properties of Ionization chamber, proportional counter, G. M. Counter and Scintillation Counter.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2	2		1			3				3	3	3
CO2	3	2	1		1			3	2			3	3	3
CO3	3	2	2		1		2	3	1		3	3	3	3

CO4	3	2	1		1		2	3	2			3	3	3
CO5	3	2	3		1			3	2		3	3	3	3

SUBJECT NAME: - Operating System

SUBJECT CODE: - BCA-201

Course Outcomes:

CO1. Identify the role of Operating System. To understand the design of control unit.

CO2. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems.

CO3. Describe the role of paging, segmentation and virtual memory in operating systems.

CO4. Description of protection and security and also the Comparison of UNIX and Windows based OS.

CO5. Defining I/O systems, Device Management Policies and Secondary Storage Structure and Evaluation of various Disk Scheduling Algorithms.

Course Outcome	Program Outcome												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	3	3	2	3	1	2	1		2	2	1	2	3	3	2	2
CO2	3	3	3	3	2	2	1		1	1	1	1	3	3	2	2
CO3	3	3	3	3	3	2	2		2	2	2	2	3	3	2	2
CO4	3	3	3	3	3	2	2		2	1	1	1	3	2	2	1
CO5	3	2	1	1	3	3	2		1	1	1	2	3	2	3	2

SUBJECT NAME: - Software Engineering

SUBJECT CODE: - BCA-203

Course Outcomes:

CO 1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO 2. An ability to work in one or more significant application domains.

CO 3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO 4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO 5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	1	3	1								3	3	3
CO2	3								2			3	3	3
CO3	3								2			3	3	3
CO4	3	3	2	1								3	3	3
CO5	3	2	2	3								3	3	3

SUBJECT NAME: - Management Information System

SUBJECT CODE: - BCA-205

Course Outcomes:

1. Understand basic concept and technologies used in the field of Management Information System.
2. Have the knowledge about the Information. And its role in the organization.
3. Have the knowledge of system, and its elements, objective and type.
4. Understand the importance of planning and decision making in an organization.

Course Outcome	Program Outcome												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1	1	1	3	2	2		1	2	1	2	3	2
CO2	3	1				2			3	1	2	3		
CO3	3	1	1				2			1		2		
CO4	2	3	3	2	3	2	2		2	3	2	3	3	2
CO5	3	2	2	2	3	3	3	2	3	2	3	3	3	3

SUBJECT NAME: - DIGITAL ELECTRONICS

SUBJECT CODE: - BCA-207

Course Outcomes:

CO1: Identify and enumerate different electronic components.

CO2: Illustrate reduction of logical expressions using boolean algebra and implement the functions using logic gates. Design and analyse synchronous and asynchronous sequential circuits using flip-flops.

CO3: Design different types of with and without memory element digital electronic circuits for particular operation, within the realm of economic, performance, efficiency, user friendly and environmental constraints.

CO4: Assess the nomenclature and technology in the area of memory devices and apply the memory devices in different types of digital circuits for real world application.

CO5: Apply the fundamental knowledge of analog and digital electronics to get different types analog to digitalized signal and vice-versa converters in real world with different changing circumstances**.**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	2											2		
CO2	2	3		2	2		3		1	1	1	1		
CO3	1	2	2	2	2	2		3		2		2		
CO4		2		2		2		2			1			
CO5	2		1	1	1		2	1	1	1	1	1		2

SUBJECT NAME: - Unix & Shell Programming

SUBJECT CODE: BCA-202

Course Outcomes:

CO 1. Documentation will demonstrate good organization and readability.

CO 2. File processing projects will require data organization, problem solving and research.

CO 3. Scripts and programs will demonstrate simple effective user interfaces.

CO 4. Scripts and programs will demonstrate effective use of structured programming.

CO 5. Scripts and programs will be accompanied by printed output demonstrating completion of a test plan.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2	1									1		2
CO2	3	2	1									1		2
CO3	3	1	1									1		2
CO4	3	1			1							1		2
CO5	3		1									1		2

SUBJECT NAME: -Database Management System

SUBJECT CODE: - BCA-204

Course Outcomes:

CO 1. Describe the fundamental elements of relational database management systems.

CO 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.

CO 3. Design ER-models to represent simple database application scenarios

CO 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

CO 5. Improve the database design by normalization.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3										1	2		
CO2	3	2	3								2	2	3	3
CO3	3	3	3	2	2	1	1		2	1	2	2	2	2
CO4	3	2		1								1		
CO5	3		2									2	1	

SUBJECT NAME: - Data Communication

SUBJECT CODE: - BCA-206

Course Outcomes:

CO1: Understand the basics of data communication, networking, internet and their importance

CO2: Analyse the services and features of various protocol layers in data networks.

CO3: Differentiate wired and wireless computer networks

CO4: Analyse TCP/IP and their protocols.

CO5: Recognize the different internet devices and their functions.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3											2		
CO2	3	2	3	2								3	2	2
CO3	3	2	3	2								2	2	2
CO4	2	3	3	3								2	2	1
CO5	2											1		

SUBJECT NAME: - Programming in Python

SUBJECT CODE: - BCA-208

Course Outcomes:

CO1: Create your first program in Python IDLE

CO2: Implement OOPs concepts in your programming.

CO3: Use Arrays, and Data structures

CO4: Create an application with the support of graphics in Python.

CO5: Implement error handling.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2	3	2			2			2	3	3	3
CO2	3	3	2		2			2			2	3	3	3
CO3	3	3	2		2			2			2	3	3	3
CO4	3	3	3	3	2			2			2	3	3	3
CO5	3	2	3	3	2			2	3		2	3	3	3

SUBJECT NAME: - Design & Analysis of Algorithm

SUBJECT CODE: BCA-301

Course Outcomes:

CO1.Students will be introduced with algorithm.

CO2.Students will learn to design algorithms.

CO3.Students will learn to implement algorithm for coding.

CO4. Argue the correctness of algorithms using inductive proofs and invariants.

CO5. Analyze worst-case running times of algorithms using asymptotic analysis.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	2	2	2	1	1							1	3	1
CO2	2	1	1	1	1							1	1	1
CO3	2	2	2	1	1							1	3	1
CO4	2	2	2	1	1							1	3	1
CO5	2	1	1	1	1							1	1	2

SUBJECT NAME: - Data warehousing &Mining

SUBJECT CODE: - BCA-303(b)

Course Outcomes:

CO 1 Understand the functionality of the various data mining and data warehousing component.

CO 2. Appreciate the strengths and limitations of various data mining and data warehousing models.

CO 3. Explain the analyzing techniques of various data.

CO 4. Describe different methodologies used in data mining and data ware housing.

CO 5. Compare different approaches of data ware housing and data mining with various technologies.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2		3				3			3	3	2
CO2	3	3	3	2	3				3			3	3	3
CO3	3	3	2	2	3				3			3	3	2
CO4	3	3	2	2	3				3			3	3	2
CO5	3	3	3	2	3				3		3	3	3	3

SUBJECT NAME: - Java Programming

SUBJECT CODE: -BCA-305

Course Outcomes:

CO 1. Learn to apply object-oriented programming features and concepts for solving given problem.

CO2. Learn to use java standard API library to write complex programs.

CO 3. Learn implementation of object-oriented programming concepts using java

CO 4. Able to develop interactive programs using applets and swings.

CO 5. Develop advanced skills for programming in Java.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3						3			3	3	
CO2	3	2	3	2	2				3			3	3	3
CO3	3	1	3	2	2				3			3	3	3
CO4	3	1	3	2	2				3			3	3	3
CO5	3	3	3	2	2				3			3	3	3

SUBJECT NAME: - Organizational Behaviour

SUBJECT CODE: -BCA-307

Course Outcomes:

CO 1. Demonstrate knowledge and skills in the logical foundations of informatics, data representation, models, structures and informatics-centric management.

CO 2. Document experience of their participation in professional organizations that promote responsible computing and service to society.

CO 3. Demonstrate a personal learning strategy for continuing education and lifelong learning that is independent of employer sponsorship.

CO 4. Define terms and explain basic principles, concepts and theories from another domain or discipline in which IT resources will be deployed.

CO 5. Evaluate how legal and ethical technology issues impact business activities including such areas as data access, privacy, confidentiality, security, and intellectual property standards and policies..

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2										3	3	3
CO2	3							2			2	3	3	3
CO3	3	2						2				3	3	3
CO4	3										2	3	3	3
CO5	3	2						1				3	3	3

SUBJECT NAME: - Machine Learning

SUBJECT CODE: -BCA-302

Course Outcomes:

CO1. Develop mathematical thinking and problem-solving skills associated with research and writing proofs.

CO2 Get exposure to a wide variety of mathematical concepts used in computer science discipline like probability.

CO3 Use Graph Theory for solving problems.

CO4 Acquire basic knowledge of sampling and estimation.

CO5 Understand basic concepts of hypothesis.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		2	2								3	3	
CO2	3	3		3								3	3	3

CO3	3	3										3	3	2
CO4	3	3	3	1					3			3	3	2
CO5	3	3	3	2	3				3			3	3	3

SUBJECT NAME: - (WEB & INTERNET TECHNOLOGY (Elective Paper)

SUBJECT CODE: -BCA-304(a)

Course Outcomes:

CO 1. Students will be familiar with Internet.

CO 2. Students will be familiar with different protocols of internet.

CO 3. Students will learn different services of internet.

CO 4. Analyze a web page and identify its elements and attributes.

CO 5. Students will learn HTML, CSS, JAVA Scripts for web designing.

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3					2			1			3	3	
CO2	3		2	2					3			3	3	3
CO3	3		2	2		1			3			3	3	3
CO4	3	3			2				3			3	3	2
CO5	3	3	3	2	2				3			3	3	3

SUBJECT NAME: - Artificial Intelligence

SUBJECT CODE: - BCA-306(a)

Course Outcomes:

CO 1. Design user interfaces to improve human–AI interaction and real-time decision-making.

CO 2. Evaluate the advantages, disadvantages, challenges, and ramifications of human–AI augmentation.

CO 3. Design and develop symbiotic human–AI systems that balance the information processing power of computational systems with human intelligence and decision making.

CO 4. Explain the benefits, limitations, and tradeoffs of designing engaging and ethical conversational user interactions, including those supported by chatbots, smart speakers, and other

AI-driven, voice- based technologies.

CO 5. Design and evaluate conversational interfaces for different users and contexts of use.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO	PSO	PSO
CO1	3	2	3	2	2						3	2	2	3	1
CO2	2	3	2												
CO3	3		3	2	3	1					2	2	3	3	3
CO4		3												3	2
CO5			3	2	3									2	3

SCHOOL OF ENGINEERING & TECHNOLOGY (SOET)

RAFFELS UNIVERSITY,

NEEMRANA

MCA (2 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana

RAFFLES
UNIVERSITY

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Vision

To be a centre of excellence by producing high calibre, competent and self-reliant computer Science engineers, who possess scientific temperament and would engage in activities relevant to industries with ethical values and flair to research.

Mission

- To provide efficient engineers for global requirements by imparting quality education.
- To explore, create and develop innovations in various aspects of engineering through industries and institutions.
- To emphasize on practical skills and socially relevant technology

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: To train students with practical skills and experimental practices related to core and applied areas of Computer Science & Engineering to expand their knowledge horizon beyond books.

PEO-2: Graduate will establish himself/herself as effective professionals by solving real world problems using investigative and analytical skills along with the knowledge acquired in the field of Computer Science and Engineering.

PEO-3: To improve team building, team working and leadership skills of the students with high regard for ethical values and social responsibilities.

PEO- 4: Graduate will embrace professional code of ethics in the profession while deliberately being part of projects which contributes to the society at large without disturbing the ecological balance.

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduates will be able to

PO 1	Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals, and computer science & engineering to the solution of engineering problems.
PO 2	Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO 3	Design /Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PO 4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO 5	Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO 7	Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO 11	Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO 12	Life - Long Learning: Recognize the need for and have the preparation and ability to Engage in independent and life- long learning in the broadest context of technological Change

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1	To collect requirements, analyze, design, implement and test software Systems.
PSO 2	To analyze the errors and debug them within minimal time.

MCA 1ST YEAR

Scheme for MCA (2 Years Course) (2022-24)

Department of Computer Science & Engineering

1st Semester

S. No.	Subject Code	Subject	Teaching Hours			IA	ETE	Total	Credit
			L	T	P				
1	MCA-101	Computer Architecture	3	0	0	40	60	100	3
2	MCA-103	Object Oriented Programming with C++	3	0	0	40	60	100	3
3	MCA-105	Database Systems	3	0	0	40	60	100	3
4	MCA-107	Operating System	3	0	0	40	60	100	3
5	MCA-109	Discrete Mathematics	3	0	0	40	60	100	3
6	MCA-111	Web Technologies	3	0	0	40	60	100	3
7	MCA-P-101	Database Systems Lab	0	0	2	60	40	100	1
8	MCA-P-103	Object-Oriented Programming Lab	0	0	2	60	40	100	1
9	MCA-P-111	Web Technologies Lab	0	0	2	60	40	100	1
Grand Total			18	0	6	420	480	900	21

SUBJECT NAME:-COMPUTER ARCHITECTURE

SUBJECT CODE:-MCA 101

Course Outcomes:

CO1.Demonstrate concepts of parallelism in hardware/software.

CO2.Discuss memory organization and mapping techniques.

CO3.Describe architectural features of advanced processors.

CO4.Interpret performance of different pipelined processors.

CO5.Explain data flow in arithmetic algorithms.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3		2				3		2	3	3	3
CO2	3	3	3		2				3		2	3	3	3
CO3	3	3	2		2				3		2	3	3	3
CO4	3	3	3		2				3		2	3	3	3
CO5	3	3	3		2				3		2	3	3	3

SUBJECT NAME:-OBJECT ORIENTED PROGRAMMING IN C++

SUBJECT CODE:-MCA 103

Course Outcomes:

CO1. Able to develop programs with reusability.

CO2. Develop programs for file handling.

CO3. Handle exceptions in programming.

CO4. Develop applications for a range of problems using OOP techniques

CO5. Demonstrate the use of various OOPs concepts with the help of programs.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2	3	2			2			2	3	3	3
CO2	3	3	2		2			2			2	3	3	3
CO3	3	3	2		2			2			2	3	3	3
CO4	3	3	3	3	2			2			2	3	3	3
CO5	3	2	3	3	2			2	3		2	3	3	3

SUBJECT NAME:-DATABASE MANAGEMENT

SUBJECT CODE:-MCA 105

Course Outcomes:

CO 1. Describe the fundamental elements of relational database management systems.

CO 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.

CO 3. Design ER-models to represent simple database application scenarios

CO 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

CO 5. Improve the database design by normalization.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	2		1			3				3	3	3	3
CO2	3	2	1		1			3	2			3	3	3	2
CO3	3	2	2		1		2	3	1		3	3	3	3	2
CO4	3	2	1		1		2	3	2			3	3	3	2
CO5	3	2	3		1			3	2		3	3	3	3	3

SUBJECT NAME:-OPEARTING SYSTEM

SUBJECT CODE: -MCA 107

Course Outcomes:

CO 1. Identify the role of Operating System. To understand the design of control unit.

CO 2. Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problems.

CO 3. Describe the role of paging, segmentation and virtual memory in operating systems.

CO 4. Description of protection and security and also the Comparison of UNIX and Windows based OS.

CO 5. Defining I/O systems, Device Management Policies and Secondary Storage Structure.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		3	2	2				2			3	3	3
CO2	3	3	3	2	2				3			3	3	3
CO3	3	3	3	2	2				2			3	3	3
CO4	3		3	2	2				3			3	3	3
CO5	3		3	2	2				2			3	3	3

SUBJECT NAME:-DISCRETE MATHMETICS

SUBJECT CODE: -MCA - 109

Course Outcomes:

CO 1. Able to use analogy and abstraction.

CO 2. Able to use set, types of set and relation and function.

CO 3. Able to solve problems using permutation, combination, sequence, series and lattice.

CO 4. Able to use Eulerian graph and Hamiltonian graphs.

CO 5. Able to use normal subgroup and homomorphism of group.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		3	2	2				2			3	3	3
CO2	3	3	3	2	2				3			3	3	3
CO3	3	3	3	2	2				2			3	3	3
CO4	3		3	2	2				3			3	3	3
CO5	3		3	2	2				2			3	3	3

SUBJECT NAME:-WEB TECHNOLOGY

UBJECT CODE: -MCA - 111

Course Outcomes:

CO 1. Students will be familiar with Internet.

CO 2. Students will be familiar with different protocols of internet.

CO 3. Students will learn different services of internet.

CO 4. Analyze a web page and identify its elements and attributes.

CO 5. Students will learn HTML, CSS, JAVA Scripts for web designing.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3					2			1			3	3	
CO2	3		2	2					3			3	3	3
CO3	3		2	2		1			3			3	3	3

CO4	3	3			2				3			3	3	2
CO5	3	3	3	2	2				3			3	3	3

SUBJECT NAME:- OBJECT ORIENTED PROGRAMMING IN C++

SUBJECT CODE: -MCA -P -103

Course Outcomes:

CO 1. Create and explain Basic C++ Program using i/o variables and structures.

CO 2. Apply object oriented programming concepts using class and objects

CO 3. Design and assess the classes for code reuse

CO 4. Analyse and apply the generic classes concepts in programming problem

CO 5. Illustrate and evaluate the file Input Output mechanisms

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3					2			1			3	3	
CO2	3		2	2					3			3	3	3
CO3	3		2	2		1			3			3	3	3
CO4	3	3			2				3			3	3	2
CO5	3	3	3	2	2				3			3	3	3

MCA 1ST YEAR

School of Engineering and Technology

Scheme for MCA (2 Years Course) (2022-24)

Department of Computer Science & Engineering

2nd Semester

S.No.	Subject Code	Subject	Teaching Hours			IA	ETE	Total	Credit
			L	T	P				
1	MCA-102	Java Technologies	3	0	0	40	60	100	3
2	MCA-104	Computer Networks	3	0	0	40	60	100	3
3	MCA-106	Data Structures	3	0	0	40	60	100	3
4	MCA-108	Software Engineering	3	0	0	40	60	100	3
5	MCA-110	Python Programming	3	0	0	40	60	100	3
6	MCA-112	Business Informatics	3	0	0	40	60	100	3
7	MCA-P-102	Java Technologies Lab	0	0	2	60	40	100	1
8	MCA-P-106	Data Structures Lab	0	0	2	60	40	100	1
9	MCA-P-110	Python Programming Lab	0	0	2	60	40	100	1
Grand Total			18	0	6	420	480	900	21

SUBJECT NAME:-JAVA PROGRAMMING

SUBJECT CODE: -MCA 102

Course Outcomes:

CO 1. Learn to apply object oriented programming features and concepts for solving given problem.

CO2. Learn to use java standard API library to write complex programs

CO 3. Learn implementation of object oriented programming concepts using java

CO 4. Able to develop interactive programs using applets and swings.

CO 5. Develop advanced skills for programming in Java

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	3						3			3	3	
CO2	3	2	3	2	2				3			3	3	3
CO3	3	1	3	2	2				3			3	3	3
CO4	3	1	3	2	2				3			3	3	3
CO5	3	3	3	2	2				3			3	3	3

SUBJECT NAME:-COMPUTER NETWORK

SUBJECT CODE: -MCA 104

Course Outcomes:

CO 1. Students will be aware about computer networking.

CO 2. Students will know about various layers of OSI Model.

CO 3. Students will learn about wired & wireless technologies.

CO 4. Students will learn about the services of different layers.

CO 5. Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3				3	1			3			3	3	3
CO2	3	2	3		3				3			3	3	3
CO3	3	2	3		3	2			3			3	3	3
CO4	3	2			3				3			3	3	3
CO5	3	2	3	3	3				3			3	3	3

SUBJECT NAME:-DATA STRUCTURE

SUBJECT CODE:-MCA 106

Course Outcomes:

CO1. Ability to analyse algorithms and algorithm correctness.

CO2. Ability to summarize searching and sorting techniques

CO3. Ability to describe stack, queue and linked list operation.

CO4. Ability to have knowledge of tree and graphs concepts

CO5. Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2	2	2				2			3	3	3
CO2	3	2	2	2	2				1			3	3	3
CO3	3	2	2	2	1				1			3	3	3
CO4	3	2	2	2	1				2			3	3	3
CO5	3	2	2	2	1				3			3	3	3

SUBJECT NAME:-SOFTWARE ENGINEERING

SUBJECT CODE: -MCA 108

Course Outcomes:

CO 1. How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.

CO 2. An ability to work in one or more significant application domains.

CO 3. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.

CO 4. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.

CO 5. Demonstrate an ability to use the techniques and tools necessary for engineering practice.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	1	3	1								3	3	3
CO2	3								2			3	3	3
CO3	3								2			3	3	3
CO4	3	3	2	1								3	3	3
CO5	3	2	2	3								3	3	3

SUBJECT NAME: - PYTHON PROGRAMMING

SUBJECT CODE: -MCA 110

Course Outcomes:

CO1 Create your first program in Python IDLE.

CO2 Implement OOPs concepts in your programming.

CO3 Use Arrays, and Data structures.

CO4 Create an application with the support of graphics in Python.

CO5 Implement error handling.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		2	1	3				1			3	3	3
CO2	3	1	2	1					1			3	3	3
CO3	3		3	1					1			3	3	3
CO4	3	2	2	3	2				3			3	3	3
CO5	3	3	2	3	2				3			3	3	3

SUBJECT NAME:-BUSINESS INFORMATICS

SUBJECT CODE: -MCA 112

Course Outcomes:

CO 1. Demonstrate knowledge and skills in the logical foundations of informatics, data representation, models, structures and informatics-centric management.

CO 2. Document experience of their participation in professional organizations that promote responsible computing and service to society.

CO 3. Demonstrate a personal learning strategy for continuing education and lifelong learning that is independent of employer sponsorship.

CO 4. Define terms and explain basic principles, concepts and theories from another domain or discipline in which IT resources will be deployed.

CO 5. Evaluate how legal and ethical technology issues impact business activities including such areas as data access, privacy, confidentiality, security, and intellectual property standards and policies..

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	2										3	3	3
CO2	3							2			2	3	3	3
CO3	3	2						2				3	3	3
CO4	3										2	3	3	3
CO5	3	2						1				3	3	3

MCA 2ND YEAR

School of Engineering and Technology

Scheme for MCA (2 Years Course)(2022-24)

Department of Computer Science & Engineering

3rd Semester

S. No.	Subject Code	Subject	Teaching Hours			IA	ETE	Total	Credit
			L	T	P				
1	MCA-201	Computer Graphics	3	0	0	40	60	100	3
2	MCA-203	Theory of Computation	3	0	0	40	60	100	3
3	MCA-205	Advanced Database System	3	0	0	40	60	100	3
4	MCA-207	Cyber Security and Cryptography	3	0	0	40	60	100	3
5	MCA-209	Mobile Application Development	3	0	0	40	60	100	3
6	MCA-211	Elective 1	3	0	0	40	60	100	3
7	MCA-P-201	Computer Graphics Lab	0	0	2	60	40	100	1
8	MCA-P-209	Mobile Application Development Lab	0	0	2	60	40	100	1
9	MCA-213	Summer Industrial Training Presentation	0	0	4	60	40	100	2
Grand Total			18	0	8	420	480	900	22

Elective I

Code	Title
MCA-211 (a)	Data Mining and Warehousing
MCA-211 (b)	Information Protection and Security
MCA-211 (c)	Soft Computing

SUBJECT NAME: - COMPUTER GRAPHICS

SUBJECT CODE: -MCA-201

Course Outcomes:

CO 1. Understand the basics of computer graphics, different graphics systems and applications of computer graphics.

CO 2. Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.

CO 3. Use of geometric transformations on graphics objects and their application in composite form.

CO 4. Extract scene with different clipping methods and its transformation to graphics display device.

CO 5. Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	2		2		2				2			3	3	3
CO2	2	3	1		2				2			3	3	3
CO3	2		2		2				2			3	3	3
CO4	2	2	1		2				2			3	3	3
CO5	2	1	3		2				2			3	3	3

SUBJECT NAME: - THEORY OF COMPUTATION

SUBJECT CODE: -MCA-203

Course Outcomes:

CO 1. Will apply knowledge of computing and mathematics appropriate to the discipline.

CO 2. Learn about Automata theory and its application in Language Design.

CO 3. Learn about Turing Machines and Pushdown Automata and understand Linear Bound Automata and its Applications.

CO 4. Discuss key notions of computation, such as algorithm, computability, decidability, reducibility, and complexity, through problem solving.

CO 5. Solve computational problems regarding their computability and complexity and prove the basic results of the theory of computation.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		3	2					1			3	3	3
CO2	3		3	2	2				1			3	3	3
CO3	3		3	2	2				1			3	3	3
CO4	3	2	3	2					1			3	3	3
CO5	3	3	3	2					1			3	3	3

SUBJECT NAME: - ADVANCED DATABASE SYSTEM

SUBJECT CODE: -MCA-205

Course Outcomes:

CO 1. Understand the basic principles of database management systems.

CO 2. Draw Entity-Relationship diagrams to represent simple database application scenarios

CO 3. write SQL queries for a given context in relational database.

CO 4. Discuss normalization techniques with simple examples.

CO 5. Describe transaction processing and concurrency control concepts.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	1	3						3			3	3	
CO2	3	1	3	2	2				3			3	3	3
CO3	3	1	3	2	2				3			3	3	2
CO4	3	1	3	2	2				3			3	3	2
CO5	3	1	3	2	3				3			3	3	3

SUBJECT NAME: - CYBER SECURITY AND CRYPTOGRAPHY

SUBJECT CODE: -MCA-207

Course Outcomes:

CO 1**.** Understand cryptography basics, algorithms and mathematical background for cryptography.

CO 2. Analyze the important cryptographic algorithms.

CO 3. Understand key management issues and algorithms.

CO 4. Understand security issues in Wireless LAN and web.

CO 5. Understand cyber security and need of cyber-Laws.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	1	3						3			3	3	
CO2	3	1	3	2	2				3			3	3	3
CO3	3	1	3	2	2				3			3	3	2
CO4	3	1	3	2	2				3			3	3	2
CO5	3	1	3	2	3				3			3	3	3

SUBJECT NAME: - MOBILE APPLICATION DEVELOPMENT

SUBJECT CODE: -MCA-207

Course Outcomes:

CO 1**.** Identify various concepts of mobile programming that make it unique from programming for other platforms.

CO 2. Critique mobile applications on their design pros and cons.

CO 3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.

CO 4. Program mobile applications for the Android operating system that use basic and advanced phone features.

CO 5. Deploy applications to the Android marketplace for distribution.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	1	3						3			3	3	
CO2	3	1	3	2	2				3			3	3	3
CO3	3	1	3	2	2				3			3	3	2
CO4	3	1	3	2	2				3			3	3	2
CO5	3	1	3	2	3				3			3	3	3

SUBJECT NAME: - DATA MINING AND WAREHOUSING

SUBJECT CODE: -MCA-211 (a)

Course Outcomes:

CO 1**.** Understand what Is Data Mining, what kinds of data can be mined, what kinds of patterns can be mined, and what kinds of applications are targeted.

CO 2. Explain major Issues in data mining.

CO 3. Apply machine learning, pattern recognition, statistics, visualization, algorithm, database

technology and high-performance computing in data mining applications.

CO 4. Identify what kinds of technologies are used for different application.

CO 5. Manipulate data preprocessing, data Warehouse and OLAP technology, data cube technology; mining frequent patterns and association, classification, clustering, and outlier detection.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2		3				3			3	3	2
CO2	3	3	3	2	3				3			3	3	3
CO3	3	3	2	2	3				3			3	3	2
CO4	3	3	2	2	3				3			3	3	2
CO5	3	3	3	2	3				3		3	3	3	3

MCA 2ND YEAR

School of Engineering and Technology

Scheme for MCA (2 Years Course)(2022-24)

Department of Computer Science & Engineering

4th Semester

S. No.	Subject Code	Subject	Teaching Hours			IA	ETE	Total	Credit
			L	T	P				
1	MCA-202	Software Project Management	3	1	0	40	60	100	4
2	MCA-204	Elective II	3	1	0	40	60	100	4
3	MCA-P-202	Seminar -I/ Group Discussion	0	0	4	40	60	100	4
4	MCA-P-206	Major Project and Dissertation	0	0	8	400	200	600	4
Grand Total			6	2	10	520	380	900	16

Elective II

Code	Title
MCA-204 (a)	Principles of Management and Information System
MCA-204 (b)	Machine Learning
MCA-204 (c)	Data Science with R

SUBJECT NAME: - SOFTWARE PROJECT MANAGEMENT

SUBJECT CODE: -MCA-202

Course Outcomes:

CO 1**.** Apply project management concepts and techniques to an IT project.

CO 2. Identify issues that could lead to IT project success or failure.

CO 3. Explain project management in terms of the software development process.

CO 4. Describe the responsibilities of IT project managers.

CO 5. Apply project management concepts through working in a group as team leader.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3	3	2		3						2	3	3	2
CO2	3	3	3	2	3				3		1	3	3	3
CO3	3	3	2	2	3				3		2	3	3	2
CO4	3	3	2	2	3						1	3	3	2
CO5	3	3	3	2	3				3		3	3	3	3

SUBJECT NAME: MACHINE LEARNING

SUBJECT CODE: -MCA-204 (b)

Course Outcomes:

CO 1**.** Learn the basics of learning problems with hypothesis and version spaces.

CO 2. Understand the features of machine learning to apply on real world problems.

CO 3. Characterize the machine learning algorithms as supervised learning and unsupervised learning and apply and analyze the various algorithms of supervised and unsupervised learning.

CO 4. Analyze the concept of neural networks for learning linear and non-linear activation functions. CO 5. Learn the concepts in Bayesian analysis from probability models and methods.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2
CO1	3		2	2								3	3	
CO2	3	3		3								3	3	3
CO3	3	3										3	3	2
CO4	3	3	3	1					3			3	3	2
CO5	3	3	3	2	3				3			3	3	3

SYLLABUS

Semester I

COMPUTER ARCHITECTURE

Paper Code: MCA-101

Unit 1 Combinational Circuit

Combinational Digital Circuits: Gates, Boolean Functions and Expressions, Designing Gate Networks, Useful Combinational Parts, Programmable Combinational Parts, Timing and Control Latches, Flip- Flops and Registers, Sequential Circuits, Useful Sequential Parts, Programmable Sequential Parts, Clocks and Timing of Events.

Unit 2 I/O Peripheral Device

Computer System Technology: Components to Applications, Computer Systems and their Parts, Generations, Processor and Memory Technologies, Peripherals I/O and Communications, Software Systems and Applications. Instruction and addressing, instruction formats, types, addressing modes.

Unit 3 Assembly Language

Assembly Language Programs, Assembler Directives, Pseudo Instructions, Macroinstructions, Linking and Loading, 8085 Instruction Set. Arithmetic/Logic Unit: Number Representation, Arithmetic Operations, Floating-Point Arithmetic.

Unit 4 Memory System

Memory System Design: Main Memory Concepts, Cache Memory Organization, Mass Memory Concepts, Virtual Memory and Paging. Input/Output and Interfacing,

Unit 5 Input/Output Device

Input/Output Devices, Input/Output Programming, Interrupts. Vector And Array Processing, Shared-Memory, Multiprocessing, Distributed Multi Computing. Programming in 8085 Microprocessor.

Suggested readings –

1.	Computer System Architecture	Mano	Pearson
2.	Digital logic & Computer Design	Mano	Pearson

Object Oriented Programming with C++

Paper Code: MCA-103

Unit 1 OOP Paradigm:

Characteristics of OOP, Comparison between functional programming and OOP approach, characteristics of object-oriented language - objects, classes, inheritance,reusability user-defined data types, polymorphism, overloading

Unit 2 Introduction to C++:

Identifier and keywords, constants, C++ operators, type conversion, Variable declaration, statements, expressions, input and output, conditional expression loopstatements, break control statements, Classes, member functions, objects, arrays of class objects, pointers and classes, nested classes, constructors, destructors Inline member functions, static class member, friend functions, and dynamic memoryallocation.

Unit 3 Polymorphism and Inheritance:

Function overloading, operator overloading, polymorphism, early binding, polymorphism with pointers, virtual functions, late binding, pure virtual functions.Single inheritance, types of inheritance, types of base classes, types of derivations, multiple inheritances, container classes, member access control

Unit 4 Exception & Templates

Exception Syntax, Multiple Exceptions, Function Templates, Function Templates with multiple argument, templates

Unit 5 File Handling in C++:

C++ Streams, Console Stream Classes, Formatted And Unformatted Console I/OOperations, manipulators, File Streams, Classes File Modes, File Pointers and
Manipulations File I/O

Text Books:

1. K.R. Venugopal, Raj Kumar Buyya, “Mastering C++", McGraw-Hill, 2017.
2. Rajaram R, Object Oriented Programming and C++”, 2nd Edition, New Age International, 2013.
3. E Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill, 2006

Yahwant Kanetkar, ”C++ Programming”, BPB Publication

DATABASE MANAGEMENT SYSTEM

Paper Code: MCA-105

Unit 1:Introduction

Overview of DBMS, Basic DBMS terminology, data base system v/s file system, data independence. Architecture of a DBMS Introduction to data 0models: entity relationship model, hierarchal model: from network to hierarchical, relational model, comparison of network, hierarchal and relational models.

Unit 2 Data Modelling

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 , extended ER model,relationships of higher degree. Relational model: storage organizations for relations, relational algebra, and relational calculus.

Unit 3 Normalization

Normalization Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD and JDs, alternative approaches to database design.

Unit 4 SQL

Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their
procedure, ,

Unit 5 Views & Indexes

Views and indexes, Queries and sub queries, Aggregate functions, insert, update and delete operations, Joins, Unions, Intersection,
Minus in SQL

Suggested readings –

1.	Database System Concepts	Korth, Sudarshan	TMH
2.	Database Concepts	Elmasri, Nawathe	Pearson

3. Database Management Systems Raghuramakrishan

4. SQL, PL/SQL, Bayross BPB The Programming language Oracle

5. Introduction to Kahate Pearson Database Management Systems

Operating System

Paper Code: MCA-107

Unit 1 Introduction

Introduction: Definition and types of operating systems, Batch Systems, multi programming, timesharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.

Unit 2 Process Management

Process Management: Process concept, Process scheduling, Cooperating processes, Threads, Inter-process communication, CPU scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Real-time scheduling and Algorithm evaluation.

Unit 3 Deadlocks

Process Synchronization and Deadlocks: The Critical- Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

Unit 4 Storage Management

Storage management: Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation,

File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure

Unit 5 Disk Scheduling

Disk scheduling methods, Disk management, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability. 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 : Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface.

Suggested readings –

1.	Operating System Principles	Galvin,Gagne	John Willey & sons
2.	Modern Operating Systems	Tanenbaum	Pearson
3.	Operating Systems	Dhamdhere	MGH
4.	Operating System concepts	Manish k. Sah	Ashirwad, Jaipur

DISCRETE MATHEMATICS

Paper Code: MCA-109

Unit 1 Introduction

Introduction to Discrete Mathematical Structures, Formal Methods: Introduction and Analogy,Abstraction. Fundamentals: Sets & Relations- Sets, Types of Sets, Multi Sets, Operations on Sets.

Unit 2 Relations

Relations and Properties of Relations, Representation of Relations, Equivalence Relation, Closers of Relations, Methods of Proof-Direct Proofs, Indirect Proofs, Mathematical Induction, Method of Contradiction.

Unit 3 Permutation and Combinations

Combinatory: Permutations and Combinations, Pigeon Hole Principle, Principle of Inclusion and Exclusion, Sequence and Series, Generating Functions. Mathematical Logic, Posets and Lattices: Partial Order Set, Bounding Elements, Well-Ordered Set, Topological Sorting, Lattices, Principle of Duality, Bounded, Distributed, and Complemented Lattices, Proposition and Prepositional Calculus.

Unit 4 Graph Theory

Graphs and Group Theory: Basic Introduction of Graphs- Types of Graphs, Path and Circuits, Eulerian Path and Circuits, Hamiltonian Path and Circuits, Shortest Path Algorithms, Group, Definitions and Properties, Coset & Subgroup, Normal subgroup, Homomorphism of groups, Cyclic Group, Permutation Group.

Unit 5 Grammer

Finite State Machines and Languages: Grammar and Languages- Phrase structure Grammar, Types of Grammars and Languages, Finite State Machines and Languages, Minimization of Finite State Machines.

Suggested readings –

1. Discrete Mathematical Structures Kolman, Busby, Ross PHI
2. Discrete Mathematical Structures Chourasiya, Srivastava Genius Publication, Jaipur
3. Discrete Mathematics Olympia Nicodemi CBS, Delhi
4. Discrete Mathematics Akerkar Pearson/PHI

WEB TECHNOLOGIES

Paper Code: MCA-111

Unit 1 Introduction to HTML

The internet: history of the World Wide Web, hardware and software trend, objecttechnology – java script object, scripting for the web-browser portability.

Introduction of HTML: introduction, markup language, editing HTML : common tags, headers, text styles, linking, images, formatting text, horizontal rules and moreline breaks, unordered lists, nested and ordered lists, basic HTML tables : intermediate HTML tables and formatting : basic HTML forms, more complex HTML forms, HTML5: Input Types & Attributes, internal linking, creating and using image maps

Unit 2 Java Script

Introduction to scripting: introduction- memory concepts- arithmetic- decision making. Java script

control structures, Java script functions: introduction – program Units in java script - function definitions, duration of identifiers, scope rules, recursion, java script global functions.
Java script arrays: introduction, array-declaring and allocating arrays, references
and reference parameters – passing arrays to functions, multiple subscripted arrays.Java script objects: introduction, math, string, date, Boolean and number objects

Unit 3 Dynamic HTML

CSS: introduction – inline styles, creating style sheets with the style element, conflicting styles, linking external style sheets, positioning elements, backgrounds,element dimensions, text flow and the CSS box model, user style sheets, Filter andTransitions, HTML DOM, Browser BOM
Event model : introduction, event ON CLICK, event ON LOAD – error handlingwith ON ERROR, tracking the mouse with event, more DHTML events

Unit 4 Introduction to PHP &Web Server Architecture

Overview of PHP Capabilities, PHP HTML embedding tags & syntax, Simple script examples, PHP & HTTP Environment variables. PHP Language Core- Variables, Constants, Data Types, PHP: Operators, Flow Control & Loops, Arrays,String, Functions Include & require statements, Simple File & Directory Access Operations

Unit 5 Error handling

Error handling, Processing HTML form using GET, POST, REQUEST, SESSION,COOKIE variables, Sending E-mail, Database Operations with PHP, Connecting to My-SQL (or any other database), Selecting a db, building & Sending Query, retrieving, updating & inserting data, CMS: Wordpress. Note: XAMMP is used for PHP

Text Books:

1. Jennifer Robbins , “Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Webgraphics”,O’reilly, 2018
2. Adrian W. West ,” Practical Web Design for Absolute Beginners”, 2016
3. Harvey M. Dietel, Paul Dietel& Tem R. Nieto, “, Internet& World Wide Web How to Program”, Pearson,
2011
4. Ivan Bayross. “Web enabled commercial application development using HTML, DHTML,

JavaScript,

PERL-CGI", BPB Publications, 2010

Database Management System Lab

Paper Code: MCA-P-101

Student can use My Sql (preferred open source DBMS) or any other Commercial DBMS tool (MS-Access / ORACLE) at backend and C++ (preferred) VB/JAVA at front end.

1. (a) Write a C++ program to store students records (roll no, name, father name) of a class using file handling. (Using C++ and File handling).

(b) Re-write program 1, using any DBMS and any compatible language.(C++/MySQL) (VB and MS-Access)

2. Database creation/ deletion, table creation/ deletion.

Write a program to take a string as input from user. Create a database of same name. Now ask user to input two more string, create two tables of these names in above database.

Write a program, which ask user to enter database name and table name to delete. If database exist and table exist then delete that table.

3. Write a program, which ask user to enter a valid SQL query and display the result of that query.

4. Write a program in C++ to parse the user entered query and check the validity of query. (Only SELECT query with WHERE clause)

5 - 6. Create a database db1, having two tables t1 (id, name, age) and t2 (id, subject, marks).

(a) Write a query to display name and age of given id (id should be asked as input).

(b) Write a query to display average age of all students.

(c) Write a query to display mark-sheet of any student (whose id is given as input).

(d) Display list of all students sorted by the total marks in all subjects.

7 - 8. Design a Loan Approval and Repayment System to handle Customer's Application for Loan and handle loan repayments by depositing installments and reducing balances.

9 -10. Design a Video Library Management System for managing issue and return of Video tapes/CD and manage customer's queries.

Programming In C Lab

Paper Code: MCA-P-103

1. Write a program to calculate simple and compound interest.
2. Write a program to swap values of two variables with and without using third variable.
3. Write a program to display the size of every data type using "sizeof" operator.
4. Write a program to illustrate the use of unary prefix and postfix increment and decrement operators.
5. Write a program to input two numbers and display the maximum number.
6. Write a program to find the largest of three numbers using ternary operators.
7. Write a program to find the roots of quadratic equation.
8. Write a program to input name, marks of 5 subjects of a student and display the name of the student, the total marks scored, percentage scored and the class of result.

Web Technologies Lab
Paper Code: MCA-P-111

HTML:
- Basics Elements & Attributes, HTML Formatting tags, Links,
- Images, Tables, Forms Elements
- HTML5 Audio and Video, HTML5 Input Types & Attributes
- CSS Syntax, CSS Attribute Selectors
- CSS properties: Fonts, Background, Colors, Links, Lists,
- CSS Box Model, Display, Opacity, Float, Clear
- CSS Layout, CSS Navigation Bar,
  CSS Rounded Corners, CSS Border Images, CSS Animations

JavaScript:
- Displaying Output, Declaring Variables, Operators, Arithmetic, Data Types, Assignment
- JavaScript Functions, Booleans, Comparisons, Conditional ,
- JavaScript Switch, Loops, Break, Type,
- JavaScript Objects, Scope,
- Strings and String Methods
- Numbers and Number Methods, Math, JavaScript Dates: Formats and Methods
- JavaScript Events, JavaScript, JavaScript Forms (API and Validation), Objects, JavaScript Functions, JavaScript DOM, JavaScript Validation, Browser BOM

PHP:
- Installing XAMMP
- Variables, Data Types, Constants, Operators, Programming Loops,
- PHP Functions,
- Arrays
- Strings Functions
- PHP Form Handling, Require & Include PHP with MySQL

Semester II

JAVA TECHNOLOGIES

Paper Code: MCA-102

Unit 1 Introduction to Java Enterprise

Introduction to Java Enterprise APIs, JDBC fundamentals, Multitier architecture, WebApplications in JEE. Introduction to RMI, EJB's and JavaFx.

Unit 2 Servlets

Servlets fundamentals, architecture, life cycle of a servlet, initialization, threads, servlets and HTML, retrieving data in servlet, servicing the GET and POST requests, servlet sessions session tracking, cookies. Inter servlet communication and servlet security.

JDBC and Inter servlet

JDBC and Inter servlet communications JDBC, Driver types, JDBC servlet, JDBCconnection pooling. Introduction to Java Frameworks-Hibernate and Struts.

JSP

JSP fundamentals, architecture, implicit objects, standard actions, JSP errors. Differentpackages of JSP and servlets. Java Mail using JSP.

Introduction to Spring

Introduction to Spring Web MVC, The Dispatcher Servlet , A Simple View Page, Adding a View Resolver, Adding a message bundle, Using JDBC with Spring.

Text Books:

1. "Advanced Java 2 Platform HOW TO PROGRAM" by H. M.Deitel, P. J. Deitel, S. E.Santry, Prentice Hall, 2001
2. "Beginning Java™ EE 6 Platform with GlassFish 3 From Novice to Professional" byAntonio Goncalves – Apress publication, 2009
3. "Beginning Spring" by Mert Caliskan, Kenan Sevindik, Wrox Publication, 2015

References:

1. Perroud, Thierry, Inversini, Reto , "Enterprise Architecture Patterns :Practical Solutions for Recurring IT-Architecture Problems", Springer, 2013

2. Dustine R Callway , "Inside Servlets:Server Side Programming for Java ", Addison-Wesley,1999

3. Kogent Solutions Inc., "Java 6 Programming Black Book", Dreamtech Press, 2007

4. David Flangan, "Java in a Nutshell", Oreilly Publications, 2005

COMPUTER NETWORK

Paper Code: MCA-104

Networking Fundamentals

Introduction, Data & Information, Data Communication-Characteristics of Data Communication, Components of Data Communication, Data Representation, DataFlow- Simplex, Half Duplex, Full Duplex, Computer Network- Categories of a network, Protocol- Elements of a Protocol, Networking Standards, Reference Models- OSI Model, TCP/IP Model, Comparison of OSI and TCP/IP Model

The Physical Layer

Transmission Media- Guided & Unguided, PSTN: Structure of the Telephone System, Data & Signals Data types, Signal types- Analog & Digital, ModulationTechniques, Modem, Cable Modem, Protocols: DSL, ISDN.

The Data Link Layer Design Issues

Framing, Error Control-Error Detection and Correction, Flow Control, Protocols:FDDI, CDDI, Frame Relay, ATM, 802.11, PPP, HDLC.

The Network Layer

Design Issues, Routing Algorithms: Link State Routing, Distance Vector Routing,Flooding, Routing Protocols: RIP, IGRP, EIGRP, OSPF, Internetworking: Tunneling, Fragmentation, IPV4, IPV6 Basics, BGP. The Transport Layer
Protocols: UDP, TCP, Headers

The Application Layer

DNS: The DNS Name Space, Name Servers-Mail: SMTP, POP3, HTTP, FTP, Telnet, Network Management: SNMP.

Network Security

Cryptography: Encryption, Decryption, Private/Public Key, Digital Signatures, SSL, Firewalls, PGP, S/MIME.

Text Books:

1. Andrew S.Tanenbaum, "Computer Networks", Prentice Hall, 5th Edition, January, 2013.
2. A. BehrouzForouzan, "Data Comm. & Netw.5e Global Ed (English)" , McGraw Hill Education (India) Private Limited, 5thEdition, 2013.

DATA STRUCTURE

Paper Code: MCA-106

DATA STRUCTURE: Basic data structures such as arrays, stack and queues and their Applications, linked and sequential representation. Linked list, representation of linked list, multi linked structures. Trees: definitions and basic concepts, linked tree representation, representations in contiguous storage, binary trees, binary tree traversal, searching insertion and deletion in binary trees, heap tree and heap sort algorithm, AVL trees. Graphs and their application, sequential and linked representation of graph adjacency matrix, operations on graph, traversing a graph, Dijkstra's algorithm for shortest distance, DFS and BFS, Hashing. Searching and sorting, use of various data structures for searching and sorting, Linear and Binary search, Insertion sort, Selection sort, Merge sort, Radix sort, Bubble sort, Quick sort, Heap Sort.

Suggested readings –

1. Data Structures Lipschutz Schaum's Outline, TMH
2. Data Structure & program design Kruse Pearson/PHI
3. Data Structures & Algorithms Trivedi, Gupta Ashirwad, Jaipur
4. Data Structures & Algorithms Khanna, Tulli, Chaturvedi Genius, Jaipur using C

Software engineering

Paper Code: MCA-108

Unit 1

Software Engineering Fundamentals Software Engineering - A layered Technology, The importance of software, software myths, software engineering paradigms, Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model Evolutionary Software Process Models: Incremental Model, Spiral Model Component Assembly Model, Formal Methods, Fourth-Generation Techniques

Unit 2

Analysis Concepts and Principles Analysis Concepts and Principles, the Elements of the Analysis Model Data Modifying, Functional Modeling and Information Flow and Behavior Modeling, Mechanics of Structured Analysis, Data Dictionary. Requirement analysis, tasks, analyst, software prototyping, specification principles, representation and the software requirements specification.

Unit 3.

Software Project Planning Software Project Planning, Size Estimation, Cost Estimation, Models, Static, single variable models, Static, Multivariable Models, COCOMO, The Putnam Resource Allocation Model, Risk Identification and Projection: RMMM, Project scheduling and Tracking. Software Design Process, Design Principles, and Design Concepts: Effective ModularDesign, Design Heuristics, Design Documentation, Design Methods: Data Design, Architectural Design, Interface Design, Human Computer Interface Design, Procedural Design. Case Study for Design of any Application Project.

Unit 4

Software Testing S/W Testing Fundamentals, White Box Testing, Black Box Testing, software testing strategies, verification and Validation, System Testing, Unit testing, Integration testing and Debugging. Software Maintenance Maintainability – maintenance Tasks, Characteristics of a good quality software. Case Study for Testing Techniques

Reference Books:

1. Grady Booch, James Rumbaugh, IvarJacobson.," The Unified Modeling Language User Guide", 2nd Edition, 2017.

2. James Rumbaugh. MichealBlaha "Object oriented Modeling and Design with UML", 2011.

3. Ali Behforooz, Hudson, "Software Engineering Fundamentals", Oxford, 2009. 4. Charles Ritcher, "Designing

PYTHON PROGRAMMING

Paper Code: MCA-110

Introduction and Overview

Introduction, What is Python, Origin, Comparison, Comments, Variables and Assignment, Identifiers, Basic Style Guidelines, Python Objects, Standard Types, Other Built-in Types, Internal Types, Operators, Built-in Functions, Numbers and Strings. Introduction to Numbers, Integers, Floating Point Real Numbers, ComplexNumbers, Sequences: Strings, Sequences, Strings, String-only Operators, Built-in Functions, String Built-in Methods, Special Features of Strings, Memory Management, Python Application Examples.

Lists and Dictionaries

Built-in Functions, List type built in Methods, Special Features of Lists, Tuples, Tuple Operators and Built-in Functions, Special Features of Tuples, Introduction toDictionaries, Built-in Functions, Built-in Methods, Dictionary Keys, Conditionals

and Loops: if statement, else Statement, elif Statement, while Statement, for Statement, break Statement, continue Statement, pass Statement, else Statement

Object, Classes and Files

Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, Class variables, Inheritance, Polymorphism, Type Identification, File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, PersistentStorage Units

Regular Expression and Exception Handling

Regular Expression: Introduction/Motivation, Special Symbols and Characters forREs, REs and Python. What Are Exceptions? Exceptions in Python, Detecting andHandling Exceptions, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions

Database Interaction

SQL Database Connection using Python, Creating and Searching Tables, Reading and storing config information on database, Programming using database connections, Python Multithreading: Understanding threads, Forking threads, synchronizing the threads, Programming using multithreading

Text Books:

1. R. NageswaraRao, "Core Python Programming", Dreamtech Press, 2nd Edition, 2018
2. Dr. M. Suresh Anand, Dr. R. Jothikumar, Dr. N. Vadivelan, "Python Programming" , Notion Press, 1stEdition, 2020

Martin C. Brown, "The Complete Reference Python", McGraw Hill Education, 4thEdition, 2018

Business Informatics

Paper Code: MCA-112

Business Environment and Dependence on IT

Introduction to Business Informatics, Organizational Structure and Design, Dependence on Technology, Integrating Technology with Business Environment, IT and Corporate Strategy, Sustaining a Competitive Edge through application of ITin Management Functions.

E-Commerce

Definition, Objectives, Components, Advantages and disadvantages, Scope, E- Commerce Models, E-Commerce Opportunities for Industries, Growth of E- Commerce, e-Commerce Applications- E-Marketing, E-Customer Relationship Management, E-Supply Chain Management, E-Governance, E-Buying, E-Selling, E-Banking, E-Retailing.

E-Payments and Security issues in E-Commerce

Introductions, Special features, Types of E-Payment Systems (EFT, E-Cash, E-Cheque, Credit/Debit Card, Smart Card, Digital Tokens and Electronic Purses/

Wallets), Security risk of E-Commerce, Types of threats, Security Tools, CyberLaws, Business Ethics

ERP

Introduction, Needs and Evolution of ERP Systems, ERP Domain, ERP Benefits, ERP and Related Technologies, Relevance to Data Warehousing and Data Mining,ERP Drivers, Evaluation Criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement Phases, ERP Units, ERP Success & Failure Factors

Information Systems

Introduction, Categories of System: Open, Closed, Physical, Abstract, Dynamic, Static etc., Types of Information Systems: TPS, MIS, DSS, OLAP, OLTP, Expert

System, Internet Based Systems, Learning Management Systems, Business Process Re-Engineering.

Text Books:

1. Ravi Kalakota, “Electronic Commerce: A Manager's Guide”, Addison-Wesley Professional, Edition
2012.
2. Henry C. Lucas, Information Technology for Management, McGraw Hill, International Edition, July 2001.
3. Kenneth C. Laudon& Jane P. Laudon, Management Information System, Global Edition, Pearson Education, 2009.

ERP: A Managerial Perspective Book Description, Sadagopan S, Tata McGraw Hill, 2013

Java Technologies Lab

Paper Code: MCA-P-102

1. Simple java applications for understanding references to an instant of a class
2. Handling strings in JAVA
3. Package creation
4. Developing user defined packages in java
5. Use of Interfaces
6. Threads, Multithreading
7. Exception Handling
8. Dynamic HTML using Servlet
9. Use of get() and Post() methods
10. Cookies in Servlet
11. Session tracking and Management
12. JDBC
13. JSP Actions elements
14. Directives elements in JSP
15. JSP Tags
16. Implement JDBC with JSP
17. Implement JDBC with Servlet

Applications using Spring Web MVC

Data Structures Lab

Paper Code: MCA-P-106

Lab Experiments

1. Array implementation of Stack and Queue
2. Linked list implementation of List, Stack Queue
3. Array implementation of QUEUE
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues.
9. Graph representation and Traversal algorithms
10. Applications of Graphs

Implementation of searching and sorting algorithms

PYTHON PROGRAMMING Lab

Paper Code: MCA-P-110

Lab Experiments

1. Implement a sequential search
2. Create a calculator program
3. Explore String Functions
4. Implement Selection Sort
5. Implement Stack
6. Read and Write into a file
7. Demonstrate usage of basic regular expression
8. Demonstrate use of advanced regular expressions for data validation
9. Demonstrate use of List
10. Demonstrate use of Dictionaries
11. Create Comma separate files(CSV), Load CSV files into internal data structure

Write script to work like a SQL SELECT statement for internal data structure

III Semester

COMPUTER GRAPHICS

Paper Code: MCA-201

Introduction

Elements of graphics workstation. Video Display Devices.Raster Scan Systems. Random Scan systems. Input devices. Graphics Software Coordinate Representations, Fundamental Problems in Geometry.

Algorithms

Line drawing algorithms- DDA Algorithm. Bresenham's Line Algorithm. Frame buffers. Circle and Eclipse generating algorithms. Midpoint Circle Algorithm. Sean-line polygon fill algorithm. Inside-Outside tests. Sean- Line fill of curved Boundary Areas. Boundary fill Algorithm. Flood fill Algorithm. Character generation. Attributes of lines, curves, filling, characters. etc.

Graphics Primitives

Primitive Operations, The display file interpreter-Normalized Device Coordinates. Display- File structure. Display – file algorithm. Display control and Polygons- polygon representation.

Attributes of output primitives

Line attributes - Line type. Line width. Pen and Brush options. Line Color. Color and gray scale levels. Color-tables. Gray scale. Area- Fill Attributes- Fill styles. Pattern fill. Soft fill. Character Attributes. Text attributes

Geometric Transformations

Matrices. Scaling Transformations. Sin and Cos Rotation. Homogeneous Co-ordinates and Translation. Co-ordinate Translations. Rotation about an arbitrary point. Inverse Transformations, Transformations Routines.

2-D Viewing

The viewing pipeline. Viewing co-ordinate, Reference Frame. Windows to view ports . co- ordinate transformation 2-D Viewing functions. Clipping operations point clipping. Line clipping. Cohen-Sutherland. Line Clipping. Polygon clipping. Sutherland Hodge man clipping.

3-D concepts

Three dimensional Display Methods Parallel projection. Perspective projection. Visible line and surface identification. Surface rendering. Three Dimensional Object representations.Bezier curves and surfaces. B-Spline curves and surfaces. Visibility, Image and object precision Z- buffer algorithm.

Floating horizons.

Computer Animation

Design of Animation Sequences. General Computer Animation Functions-Raster Animations. Key Frame Systems. Morphing Simulating Accelerations. Motion Specifications. Kinematicsand Dynamics.

Text Books:

1. Donald Hearn & M. Pauline Baker, “Computer Graphics”, Pearson , 2008
2. James D. Foley, Andries van Dam, Steven K. Feiner & John F. Hughes, “ Computer Graphics: Principles and Practice”, 1997

References:

1. Jeffrey J. McConnell, “Computer Graphics: Theory and Practice”, Jones and Bartlett Publishers, 2006
2. John DiMarco, “Computer Graphics and Multimedia Applications, Problems and Solutions”, Idea Group Publishing, 2004

Theory of Computation

Paper Code: MCA-203

Review of basic concepts

Graphs, Trees, Strings, Mathematical Induction, finite State Machine, types of languages and Grammars. Overview of Theoretical Computer Science (including computationally intractable problems) , Introduction to System software including various phases / Modules inthe design of a typical compiler , Chomsky Classification.

Finite Automata

Finite Automata, Deterministic Finite Automata (DFA), Non-Deterministic Finite Automata (NFA),statement of Kleen's Theorem, Regular Expressions, Equivalence of DFAs, NFAs and Regular Expressions, Closure properties of Regular Language, Non-Regular Languages,Pumping Lemma. Myhill Nerode Theorem, Use of Regular expressions in the Design of scanner (lexical analyzer). Introduction to JFLAP Simulation.

Context Free Languages

Context Free Grammar (CFG), Parse Trees, Push Down Automata (deterministic and nondeterministic) (PDA), Equivalence of CFGs and PDAs, Closure properties of CFLs,Pumping Lemma, Parsing (including LL(1) , SLR and LR(1) Parsing Method).

Turing Machines and Computability Theory

Definition of Turing Machine, Extensions of Turing machines, Non – deterministic Turing machines, Equivalence of various Turing Machine Formalisms, Church – Turing Thesis, Decidability, Halting Problem, Reducibility, Recursion Theorem.

Complexity Theory

Time and Space measures, Hierarchy theorems, Complexity classes P, NP, space complexity ,Savich theorem , L, NL, PSPACE complexity , Post correspondence problem, Probabilistic computation.

Text Books:

1. John C. Martin, “Introduction to Languages and the Theory of Computation”,McGraw-Hill, 2003
Michael Sipser, “Introduction to the Theory of Computation”, Cengage Publication,2003
2. Wayne Goddard, “Introducing the Theory of Computation”, Jones & Bartlett India Pvt.Ltd, 2009.

Advanced Database System

Paper Code: MCA-205

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.

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

Parallel Databases
Introduction,Architecture, I/O Parallelism and Skew, Interquery Parallelism, IntraqueryParallelism, Intraoperation Parallelism (Parallel Sort, Parallel Join), Interoperation Parallelism, Design of Parallel Systems

PL/SQL
PL/SQL basics, blocks, architecture, variables, constants, attributes, character set, PL/SQL control structure, data types, precompiler, conditional and sequential control statements,cursors, exceptions, triggers, procedures and packages.

Introduction to Advanced Database Concepts
Spatial Data Management, Web Based Systems, Multimedia databases, Mobile Database, Deductive Database and Recursive Queries, Information Retrieval and Indexing for Text Search, XML Database, XML Data Model, Xquery, Efficient Evaluation of XML Queries

Text Books:

1. Raghu Ramkrishnan, Johannes Gehrke , "Database Management Systems", McGraw Hill International, 2007
2. Abraham Silberschatz, Henry Korth, S, Sudarshan,, "Database System Concepts", McGraw Hill International, 2005
3. C.J.Date, Longman, "An Introduction to Database System", Pearson Education, 2003

References:

2. Elmasri R and Navathe SB, "Fundamentals of Database Systems", Addison Wesley, 2000.
3. Thomas Connolly, Carolyan Begg,, "Database Systems,: A Practical Approach to Design, Implementation and Management, Addison Wesley, 2014

Cyber Security and Cryptography

Paper Code: MCA-207

Cyber Security Program at Post Graduate Level			
Module	**Module Name**	**Module Contents**	**Learning Outcome**
Practical	1. Platforms for reporting cyber crimes. 2. Checklist for reporting cyber crimes online.		
Module-III	Cyber Law	Cyber crime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies.	Students after completing this module will be able to understand the legal framework that exist in Indiafor cyber crimes and penalties and punishments for such crimes, It will also expose students to limitations of existing IT Act,2000 legal framework that is followed in other countries and legal and ethical aspects related to new technologies.
Module IV	Data Privacy and Data Security	Defining data, meta-data, big data, non-personal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy and security issues.	After completing this module ,students will understand the aspects relate d to personal data privacy and security. They will also get insight into the Data Protection Bill,2019 and data privacy and security issues relate

			dto Social media platforms.
Practical	1. Setting privacy settings on social media platforms. 2. Do's and Don'ts for posting content on Social media platforms. 3. Registering complaints on a Social media platform.		

Cyber Security Program at Post Graduate Level			
Module	**Module Name**	**Module Contents**	**Learning Outcome**
Module V	Cyber security Management, Compliance and Governance	Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.	Students after completing this module will understand the main components of cyber security plan. They will also get insights into risk-based assessment, requirement of security controls and need for cyber security audit and compliance.
Practical	1. Prepare password policy for computer and mobile device. 2. List out security controls for computer and implement technical security controls inthe personal computer. 3. List out security controls for mobile phone and implement technical security controlsin the personal mobile phone. 4. Log into computer system as an administrator and check the security policies in thesystem.		
References	1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. 2. Information Warfare and Security by Dorothy F. Denning, Addison Wesley. 3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities byHenry A. Oliver, Create Space Independent Publishing Platform. 4. Data Privacy Principles and Practice by Natraj Venkataramanan and Ashwin Shriram,CRC Press. 5. Information Security Governance, Guidance for Information Security Managers by W. KragBrothy, 1st Edition, Wiley Publication. 6. Auditing IT Infrastructures for Compliance By Martin Weiss, Michael G. Solomon,2nd Edition, Jones Bartlett Learning.		

Mobile Application on Development

Paper Code: MCA-209

INTRODUCTION

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications, Basics of embedded systems design –Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures.

ADVANCED DESIGN

Designing applications with multimedia and web access capabilities Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications – Achieving quality constraints – performance, usability, security, availability and modifiability.

TECHNOLOGY I ANDROID

Establishing the development environment, Android architecture, Android Application structure, Emulator- Android virtual device, UI design, Fragments, Activity, Services, broadcast Receiver, Intents/Filters, Content provider- SQlite Programming , SQlite Open Helper, SQlite Database, Interaction with server side applications.

Advanced ANDROID

Using Google Maps, GPS and Wi-Fi Integration, Android Notification, Audio manager, Bluetooth ,Camera and Sensor integration, Sending SMS, Phone Calls. Publishing Android Application.

TECHNOLOGY II IOS

Introduction to Objective C, iOS features UI implementation Touch frameworks Data persistence using Core Data and SQLite, Action and Outlets, Delegates, Storyboard, Location aware applications using Core Location and Map Kit , Integrating calendar and address book with social media application Using Wifi iPhone marketplace.

Text Books:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
2. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”,DreamTech, 2012

References:

1. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.
James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
2. Paul Deitel ,Harvey Deitel, Abbey Deitel and Michael Morgano “Android for Programmers An App- Driven Approach” ,Pearson, 2013

Data Mining and Warehousing (elective paper)

Paper Code: MCA-211A

Data Warehousing: Introduction, Definition, Multidimensional data transformation, OLAP operations, Ware house schema, Ware house Server, Other features. Data Mining: Introduction, Definition, KDD vs. DM, DBMS vs. DM, DM Techniques, Issues and Challenges in DM, DM Applications. Association Rules: A Prior Algorithm, Partition, Pincer search, Incremental, Border, FP-tree growth algorithms, Generalized association rule.

Classification: Parametric and non-parametric technology: Bayesian classification, two class and generalized class classification, classification error, Decision boundary, Discriminate functions, Non-parametric methods for classification.

Clustering: Hierarchical and non-hierarchical techniques, K-MEDOID Algorithm, Partitioning, Clara, Clarans. Advanced Hierarchical algorithms

Decision Trees: Decision tree induction, Tree pruning, Extracting classification rules fromdecision trees, Decision tree construction algorithms, Decision tree construction withpresorting.

Techniques for Data mining: Introduction, Learning, Neural Networks, Data mining using neural networks, Genetic algorithms. Web Mining: Web mining, Text mining, Content mining, Web structure mining. Searching Techniques: Optimal, non-optimal, Min-max, α –β pruning.

Text Books:

1. Alex Berson, Stephen J. Smith, Data Warehousing, Data Mining and OLAP,McGrawHill, 2004
2. D. Hand, H. Mannila, and P. Smyth, Principles of Data Mining, MIT Press, 2011
3. Jiawei Han, MichelineKamber, Data Mining: Concepts and Techniques, HarcourtIndia Pvt., 2011

References:

1. W. H. Innmon, Building the Data Warehouse, Wiley Computer Publishing, 2005

Information Protection and Security (elective Paper)

Paper Code: MCA-211B

Introduction

Introduction to Cryptography: Introduction To Security: Attacks, Services & Mechanisms, Security, Attacks, Security Services. Conventional Encryption: Classical Techniques, Conventional Encryption Model, and Stenography, Classical Encryption Techniques.

Modern Techniques:

Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation

Conventional Encryption Algorithms

Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, RC2 Placement & Encryption Function, Key Distribution, Random Number Generation, Placement Of Encryption Function. Public Key Encryption: Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm, Key Management, Fermat's & Euler's Theorem, Primality, The Chinese Remainder Theorem.

Hash Functions

Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS), Proof Of Digital Signature Algorithm.

Network & System Security

Authentication Applications: Kerberos X.509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime, Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles,Trusted Systems.

Text Books:

1. Kaufman, c., Perlman, R., and Speciner, M., Network Security, PrivateCommunication in a public world, 2nd ed., Prentice Hall, 2002
2. Stallings, W., Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall PTR, 2002

References:

1. Pieprzyk Josef and et.al; Fundamentals of Computer Security, Springer-Verlag, 2008.
2. Trappe & Washington, Introduction to Cryptography, 2nd Ed. Pearson.,2006

Soft Computing (Elective Paper)

Paper Code: MCA-211

Overview of Crisp sets and fuzzy sets : Basic concepts of crisp sets and fuzzy sets, Basic types of fuzzy sets, Fuzzy sets verses crisp sets, Representation and extension principle for fuzzy sets, Operations on Fuzzy sets

Fuzzy Relations and Fuzzy Logic: Crisp versus Fuzzy relations, Binary relations on fuzzy sets, Equivalence, compatibility and ordering relations, Morphisms and compositions of relations, Fuzzy relations equations, Fuzzy measures and possibility theory, Classical logic and multivalued logics, Fuzzy propositions and approximate reasoning

Fuzzy systems and neuro fuzzy systems : Relevance of integration between fuzzy sets and neural networks – pros and cons, Fuzzy neurons, Fuzzy neural networks, Neuro fuzzy systems, Fuzzy associative memories

Introduction to Genetic Algorithms : What are genetic algorithms?, Robustness of traditional optimisation and search methods, The Goals of optimisation, How are genetic algorithms different from traditional methods?, A simple genetic algorithm, Genetic algorithms at work – a Simulation by hand, Grist for the Search Mill – Important Similarities, Similarity Templates (Schemata), Learning the Lingo.

Genetic Algorithms Revisited : Mathematical Foundations, Who shall live and who shall die? The fundamental Theorem, Schema processing at work: An example by hand revisited. The two-armed and k-armed bandit problem, How many schemata are processedusefully?, The building block hypothesis, Another perspective: The minimal deceptive problem, Schemata revisited: similarity templates as hyper planes.

Computer Implementation of A Genetic Algorithm : Data Structures, Reproduction, Crossover, and mutation, A Time to reproduce, a time to cross, Get with the main program, How well does it work?, Mapping objective functions to fitness form, Fitness scaling, Codings, A multiparameter, Mapped, Fixed-Point coding, Discretization, Constraints

Introduction To Genetic-Based Machine Learning : Genetics-Based machine learning: whence it came, What is a classifier system?, Rule and message system, Apportionment of credit: The bucket brigade, Genetic algorithm, A simple classifier system in Pascal, Results using the simple classifier system

Text Books:

1. G. Klir and B. Yuan “Fuzzy Sets and Fuzzy Logic: Theory and Applications”, Prentice Hall of India, 1997.
2. B. Kosko “Neural Networks and Fuzzy Systems” A Dynamical Systems Approach

Computer Graphics Lab

Paper Code: MCA-P- 201

Objectives of the Laboratory

- The objective of this course is to get hands-on experience with graphics programming andimplementing the techniques learnt in the theory course.
- Students acquire knowledge about the basic concepts of 2D and 3D graphic functions. Theyalso learn various transformation and clipping techniques.

List of Experiments

1. Implementation of algorithms on line (DDA,Bresenham), circle (Mid-point)
2. Two Dimensional transformations- Translation, Rotation, Scaling, Reflection
3. Composite 2D Transformation
4. 2D Line Clipping- Cohen Sutherland
5. 3D Transformation- Translation, Rotation, Scaling
6. Color Fill Algorithms – Flood Fill, Boundary Fill
7. Drawing 2D & 3D objects
8. Generating images
9. Implementation of programs using following functions. Instructors will instruct students touse different given graphics functions in making graphics programs:
   circle, cleardevice, closegraph, drawpoly, fillpoly, imagesize, line, lineto, linerel, moveto, moverel, outtext, outtextxy, putimage, putpixel, rectangle, sector, setbkcolor, setcolor, setfillstyle, setlinestyle, getarccords, getbkcolor, getcolor, getdrivername, getimage, getmaxcolor, getmaxx, getmaxy, getpixel.

Mobile Application Development Lab

Paper Code: MCA-P- 209

LIST OF EXPERIMENTS

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Write an application that draws basic graphical primitives on the screen.
4. Develop an application that makes use of databases.
5. Develop an application that makes use of Notification Manager
6. Implement an application that uses Multi-threading
7. Develop a native application that uses GPS location information
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message
10. Write a mobile application that makes use of RSS feed
11. Develop a mobile application to send an email.
12. Develop a Mobile application for simple needs (Mini Project)

IV Semester

Software Project Management
Paper Code-MCA -202

1. Introduction
a. What is project?
b. What is project Management
c. The role of project Manager
d. The project Management Profession
e. Project life cycle
2. Technology Context
a. A system view of project management
b. Understanding organizations
c. Stakeholder management
d. Project phases and the project life cycle
e. The context of information technology projects
3. Introduction
a. Developing the project schedule
b. Project management software tools
c. Developing the project budget
d. Finalizing the project schedule and budget
e. Monitoring and controlling the project
f. The project communications plan
g. Project metrics
h. Reporting performance and progress
i. Information distribution
4. The importance of project risk management
a. Risk management planning
b. Common sources of risk on information technology projects
c. Risk identification
d. Qualitative risk analysis
e. Quantitative risk analysis
f. Risk response planning
g. Risk monitoring and control
h. Using software to assist in project risk management
5. The importance of project procurement management
a. Planning purchase and acquisitions
b. Planning contracting

c. Requesting seller responses
d. Selecting sellers
e. Administering the contract
f. Closing the contract
g. Using software to assist in project management
h. Outsourcing
6. Change management
2
a. The nature of change
b. The change management plan
c. Dealing with resistance and conflict
7. Leadership & Ethics in Projects
a. Project leadership
b. Ethics in projects
c. Multicultural projects
8. Introduction
a. Project implementation
b. Administrative closure
c. Project evaluation

References:

1. Information Technology Project Management: Kathy Schwalbe Thomson Publication.
2. Information Technology Project Management providing measurable organizational value Jack Marchewka Wiley India.
3. Applied software project management Stellman & Greene SPD.
4. Software Engineering Project Management by Richard Thayer, Edward Yourdon WILEY INDIA

Elective paper

Principles of management and information system

Paper Code-MCA -204(a)

Block 1: Management Systems

Unit 1: Organisational Overview

- Oraganisation Types
  - Service, Business, Government, Social
  - Industry Types
- Organisational Structure
- Organisational Characteristics
  - Size
  - Location
  - Others
- Organisation functions
- Life cycle of organisation
- Vertical and horizontal organisations

Unit 2: Management Functions and Business Processes

- Overview of management Levels
- Business Processes
  - Sale and orders
  - Finance
  - Human resource
  - Production
  - Marketing
- Information systems requirements
- Requirement analysis
- Tools and methods for requirement analysis

Unit 3: Management Systems

- Management Systems Types
- Management Systems Requirements

- Levels of management activities
- Strategic level
- Management level
- Middle Management Level

Unit 4: Business values of Information System

- Impact of Information Systems
- Empirical studies
- Cost Value Performance
- Total cost of ownership
- Culture for Information Systems
- Decision management with Information Systems

Block 2: Information Systems

Unit 5: Portfolio Management and IT applications

- What is portfolio management
- Portfolio management methods
- Design and implementation of portfolio management
- Risk Management
- Disaster Management
- Portfolio management issues and challenges
- Tools and techniques
- Emerging technologies

Unit 6: Enterprise Information Systems

- Evolution of enterprise information Systems
- Enterprise Resource Planning
- Resource planning management
- ERP Market
- Supply Chain Management
- Customer Relationship Management
- E-CRM Systems

- Emerging technologies

Unit 7: Intelligence Information Systems

- Knowledge Management in organization
- Creating, developing & sharing Knowledge
- Artificial intelligence in business
- Business Analytics
- Business Intelligence
- Role of Business Intelligence
  - Sale and orders
  - Finance
  - Human resource
  - Marketing
- Business Intelligence Tools
- Business Intelligence reports

Unit 8: Social, Ethical and Legal Aspects

- Society in information age
- Moral dimensions and information age
- Technology trends and ethical issues
- Ethical principal and dilemma
- Responsibility, accountability and liability

Information right and acts

Machine Learning (Elective Paper)

Paper Code-MCA -204(b)

Unit-I:

Introduction-Towards Intelligent Machines, Well posed Problems, Example of

Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning, Machine Learning and Data Mining, Basic Linear Algebra in Machine Learning Techniques.

Unit-II:

Supervised Learning- Rationale and Basics: Learning from Observations, Bias and

Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Over fitting Avoidance Heuristic Search in inductive Learning, Estimating Generalization Errors, Metrics for assessing regression, Metris for assessing classification.

Unit-III:

Statistical Learning- Machine Learning and Inferential Statistical Analysis,

Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification, Minimum Description Length Principle.

Unit-IV:

Support Vector Machines (SVM)- Introduction, Linear Discriminant Functions for

Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly seperable data,Linear Soft Margin Classifier for Overlapping Classes, Kernel Induced Feature Spaces, Nonlinear Classifier, Regression by Support vector Machines.

Learning with Neural Networks: Towards Cognitive Machine, Neuron Models, Network

Architectures, Perceptrons, Linear neuron and the Widrow-Hoff Learning Rule, The error

DATA SCIENCE WITH R (Elective Paper)

Paper Code-MCA -204(c)

Unit Details

1. Introduction to R Environment

 History and development of R Statistical computing programming language.

 Installing R and R studio.

 Getting started with R.

 Creating new working directory.

 Changing existing working directory.

 Installing the available packages.

 Calling the installed packages,

 Variable definition in R.

 Simple functions, vector definition and logical expressions

 Matrix calculation and manipulation using matrix data types.

2.Data Structures and Control Statements

 Introduction to different data types, vectors, atomic vectors, types and tests, coercion, lists, list indexing,

 Function applying on the lists, adding and deleting the elements of lists, attributes, name and factors, matrices and arrays,

 Matrix indexing, filtering on matrix, generating a covariance matrix.

 lapply( ) and sapply( ) on data frames,

 Control statements.

3.I/O operations and String Manipulations

Introduction to I/O functions in R • Using of scan( ), readline ( ) function,

Comparison and usage of scan and readline function, • Reading different format files into R: text file, CSV file • Statistical package files, xls and xlsx files. • Converting from one format to another using in built function, • Writing different file format in to the local machine directory, • Basics of string manipulations – grep ( ), nchar ( ), paste( ), sprintf( ), substr( ), regexpr( ), strsplit( ), • Testing of file name with given suffix

4. R for Summary Statistics and Parametric Tests

Descriptive statistics – summary statistics for vectors, making contingency tables, creating contingency tables from vectors. • Testing tables and flat table objects, cross tables, testing cross tabulation, recreating original data from contingency tables, switching class, mean (arithmetic, geometric and harmonic), • Median, mode for raw and grouped data, measure of dispersion – range, standard deviation, variance, coefficient of variation, testing of hypothesis – small sample test, large sample test – for comparing mean, proportion, variance (dependent and independent samples

5. Testing of Hypothesis: Non - Parametric Test

Introduction to graphs,

- Box-Whisker Plot, Scatter plots, pairs plots, line chart, Pie Chart,
- Bar Charts
- Non-parametric test: The Wilcoxon U-Test (Mann-Whitney): One and Two-Sample U-Test, Tests for

association: Chi Square Tests,

- Yates Correction for 2X2 Tables, single category goodness of fit tests,
- Analysis of Variance for one-way variation and two variation

RECOMMENDED STUDY MATERIAL:

Sr. No Book Author Publication

1. Beginning R: The statistical
Programming Language Dr. Mark Gardener John Wiley & Sons, Inc.
2. The art of R programming Norman Matloff no starch Press, San Francisco
3. Introduction to Probability and
Statistics for Engineers and Scientists
Owen Jones, Robert
Maillardet and
Andrew Robinson
CRC Press
4. The R Book Hadley Wickham CRC Press
5. Advanced R Ken Black Sixth Edition, John Wiley & Sons, Inc.

Paper Code-MCA -P-202

Seminar Presentation-I

Objective: To get in depth knowledge of the upcoming trends in the field of Computer Science. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his / her specialization.

Term Paper Presentation:

- Research work / Technical Learning must be done individually.
- Final Evaluation will be done by evaluating the electronic Presentation and the printed report
- The semester end assessment of Seminar Presentation shall be on the basis of Presentation/Seminar Report and Viva Voice.

General Instructions for Preparation of Seminar Presentation Report

The Report should broadly include the following heads / subheads

1. Introduction

1.1 Cover Page
1.2 Title Page
1.3 Certificate
1.4 Acknowledgement
1.5 Table of Contents

2. Research / Technology Description

2.1 Overview/ Introduction
2.2 Objective & Scope of the study
2.3 Description of the Technology

3. Drawbacks and Limitations
4. Proposed Enhancements
5. Conclusion
6. Bibliography

SCHOOL OF HUMANITIES & SOCIAL SCIENCES (SOHSS)

RAFFELS UNIVERSITY, NEEMRANA

B.A. (GENERAL) (3 Years Degree Program)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

Raffles University Neemrana

RAFFLES
UNIVERSITY

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Vision: To evolve as an Institution of Excellence, where scholars develop informed and inquiring minds and broaden the frontiers of pure and applied knowledge.

Mission: In graining the capacity to us usher in change by discovering nurturing and expanding individual skills talents and interests while standing forth as leader and path breaker in their future carrier.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1 To providing subjective and practical knowledge as well as developing practical solutions and connections between theory.

PEO 2 Hearten individual growth among the students and enhance their confidence by providing them an opportunity to become a part of science-industry.

PEO 3 To make Science subjects interesting through technically, scientifically and experimentally.

PEO 4 To develop problem-solving skills through practical applications and research

PROGRAMME OUTCOMES (POS)

On successful completion of Graduate Program, Graduating Students/ Graduateswillbe able to

PO 1	Realizing human values.
PO 2	Becoming a responsible and dutiful citizen.
PO 3	Acquiring critical temper.
PO 4	Inculcating creative ability.
PO 5	Getting well acquainted with the historical events happened in India as well as in the world.
PO 6	Getting acquainted with social transactions, social relations, social formations, social control, social values and culture

PO 7	Working in NGOs and preparing for competitive exams
PO 8	Creating interest in basic Knowledge and major Knowledge in literature.
PO 9	Developing reading, writing, speaking and listening skills in language.
PO 10	To develop better understanding of societal norms and values.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

The School of Humanities and Social Sciences, offers Three Year (comprising 6 semesters) Undergraduate Program in B A (Genral) with objective of empowering students to acquire all- inclusive understanding of Society, Literature, Political System and Economy. The students shall acquire the following skills and competencies.

Programme Specific Outcomes (PSO): B. A. (English)

PSO 1	Basic Knowledge of English as a language.
PSO 2	Major knowledge of English as Literature.
PSO 3	Advanced knowledge of English Grammar
PSO 4	Critical study of English literary studies
PSO 5	Relation between literature and real life.

Programme Specific Outcomes (PSO): B. A. (Geography)

PSO 1	Serving as a Geographer and Work as a teacher in colleges, schools and high schools.

PSO 2	Serving as conserver in forest, Soil, Agricultural Departments and Work in disaster and water resources management.
PSO 3	Serving in cargrapher in map making divisions of government.

Programme Specific Outcomes (PSO): B. A.(Economics)

PSO 1	Understanding how different degrees of competition in a market affect pricing and output.
PSO 2	Understanding the efficiency and equity implications of market interference, including government policy.
PSO 3	Developing research Knowledge in economics and also Developing the skill of data collection & use of sampling techniques in research.

Programme Specific Outcomes (PSO): B.A. (PoliticalScience)

PSO 1	Getting knowledge about political system of the nation.
PSO 2	Studying national and international political affairs.
PSO 3	Studying, from competitive examination point of view.
PSO 4	Understanding the government mechanism, its functions, duties and responsibilities.
PSO 5	Creating appropriate and efficient political leaders.

Programme Specific Outcomes (PSO): B. A.(Sociology)

PSO 1	Knowing the significance of social institution, caste system, religion, nationalism, integrity, equality and justice.
PSO 2	Getting the Knowledge of the works of social reformers all over the nation.
PSO 3	Ability to follow new stream of thoughts and theories of social thinkers.

PSO 4	Getting the deep Knowledge about various social groups like tribal community, women bulk etc.

PSO-PO Mapping

	PO										
PSO		1	2	3	4	5	6	7	8	9	10
	1	√	√	√							
	2	√	√		√	√			√	√	
	3	√	√	√	√	√			√	√	
	4	√	√	√	√	√			√	√	√
	5			√	√	√	√	√	√		√

Raffles University, Neemrana

School of Humanities and Social Sciences

Bachelor of Arts (B.A.)(General)

(For the Session 2021-2024)

First Semester

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
PS-101	Core Discipline	Principles of Political Science	06	20	20	60	100
ENG-101	Core Discipline	English Literature- Poetry & Short Stories	06	20	20	60	100

Compulsory Subjects

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
AE101	Ability Enhancement (Compulsory)	General English-1	02	20	20	60	100
AE102	Ability Enhancement (Compulsory)	Environmental Studies	02	20	20	60	100

Elective Subject

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
SOC-101/ECO-101	Elective	Introduction to Sociology/ Micro Economics	06	20	20	60	100

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

First Semester

I- Principles of Political Science (PS-101)

Course Outcomes:

1- To enumerate the concepts associated with Political Science.

2- To conceptualize the associated concepts of Political Science.

3- To Trace Origin of State concepts.

4- To understand different ideologies of political Science.

II- English Literature- Poetry & Short Stories (ENG- 101)

Course Outcomes:

1. Students will have exposure to the different forms of poetry.
2. Students will be able to understand Shakespearian sonnet and Petrarchan sonnet.
3. Students will gain insight into the development of British poetry.
4. Students will understand the socio political context of Elizabethan age to Modern age.

III- General English-1 (AE-101) (Ability Enhancement)

Course Outcomes:

1- Describe importance of Legal Language.

2- Identify the correct usage of grammar in legal drafting.

3- Draft documents for legal correspondence.

4- Analyse characters of literary texts.

5- Apply skills of interpreting poetry.

IV- Environmental Studies (AE- 102) (Ability Enhancement)

Course Outcome:

1. Learn how to use resources sustainably
2. Develop awareness towards resources conservation and take initiative towards conservation process.
3. Understand the importance of resources in our life.
4. Learn the importance of proper use of resources for sustainable development.

V-I Introduction to Sociology (SOC-101)

Course Outcomes:

1. Students will have gained a solid understanding of the nature and scope of sociology as a discipline.
2. Students will recognize sociology as a scientific field of study and be able to distinguish it from common-sense thinking.
3. Students will develop a critical sociological perspective, enabling them to approach social phenomena scientifically and analytically.
4. Students will comprehensively understand the interrelationship between sociology and other social sciences, including social anthropology, psychology, and history.
5. Students will appreciate how sociology draws insights from and contributes to these related disciplines, fostering an interdisciplinary approach to the study of society.

VI- **Micro Economics (ECO-101)**

Course Outcomes:

1. Understand the demand and supply of goods in the market.
2. Understand the attitude of consumer and producer towards demand, supply and price structure of the market.
3. Learn about the different types of market structure and determination of price and output in different markets.
4. Able to understand the impacts of price and output structure of different markets.
5. Able to understand the concept of cost and revenue and its impact on the economy

CO-PO MAPPING

PS-101	PO									
	1	2	3	4	5	6	7	8	9	10
1	3	3	3	3	2	3	3	1	1	2
2	2	2	2	2	1	2	2	2	2	1
3	2	1	2	1	2	2	1	3	1	2
4	2	2	1	2	2	1	1	2	1	1
5	1	1	2	1	2	1	3	2	2	1

ENG-101	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	3	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	3	2	2	1

AE-101	PO									
	1	2	3	4	5	6	7	8	9	10
CO1	3	3	3	3	2	3	3	1	1	2
CO2	2	2	2	2	1	2	2	2	2	1
CO3	2	1	2	1	2	2	1	3	1	2
CO4	2	2	1	2	2	1	1	2	1	1
CO5	1	1	2	1	1	1	1	2	2	1

AE-102	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1
	CO6	2	2	1	2	1	2	1	2	1	2

SOC-101	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	√	2	2	1
	CO6	2	1	2	1	3	2	2	2	1	2

ECO-101	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

PSO-PO Mapping

	PO-01	PO-02	PO-03	PO-04	PO-05	PO-06	PO-07	PO-08	PO-09	PO-10	PO-11	PSO-01	PSO-02	PSO-03
Average Mapping (M)	3	2	2	1	2	1	2	2	1	1	3	3	3	2
PO / PSO Attainment Level*	2.20	1.59	1.34	0.73	1.34	0.37	1.47	1.10	0.98	0.98	1.96	2.20	1.83	1.10

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

(II semester)

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
PS-201	Core Discipline	Principles of Public Administration and Governance	06	20	20	60	100
ENG-201	Core Discipline	British Poetry, Prose and Drama from 16th to 18th Century	06	20	20	60	100

Compulsory Subjects

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
AE-201	Ability Enhancement(Compulsory)	General English-1	02	20	20	60	100

AE-202	Ability Enhancement(Compulsory)	Environmental Studies	02	20	20	60	100

Elective Subject

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
SOC-201/EC0-201	Elective	Sociology of Indian Society/ Macro Economics	06	20	20	60	100

I- Principles of Public Administration and Governance (PS-201)

Course Outcomes:

1. To enumerate the concepts associated with Public Administration.
2. To understand public and private administration.
3. To conceptualize the associated concepts of Public Administration and Governance.
4. To Trace Origin of the discipline public administration,
5. To understand different concepts of governance.

II- British Poetry, Prose and drama from 16th to 18th Century (ENG-201)

Course Outcomes:

1. Students will be able to differentiate between various forms of poetry, analyze poems in each, and understand how the choice of form influences British poetry's thematic and stylistic elements.
2. Students will have gained a deep understanding of William Shakespeare's "Hamlet," including its complex characters, themes, and historical context. They will be able to critically analyze and interpret the play, recognizing its enduring significance in British drama and world literature.
3. Students will have honed their analytical skills to interpret and appreciate short stories, as demonstrated in Charlotte Perkins Gilman's "The Yellow Wallpaper" and Katherine Mansfield's "Bliss."

III- General English- 1 (AE-201) (Ability Enhancement)

Course Outcomes:

1. Students can read and understand any text in English listening to the inputs given by the teacher in the classroom.
2. Students imbibe the rules of language unconsciously and tune to deduce language structure and usage.

3. Students write paragraphs, essays, and letters.

4. Students decipher the mechanism of language and use it for success in competitive examinations and job related speaking and writing tasks.

IV- Environmental Studies (AE 202) (Ability Enhancement)

Course outcomes:

1. Create awareness about preserving the environment
2. Define the basic rules and concepts of the ecology science.
3. Define the ecology of individual, population, community and ecosystem

V-**Sociology of Indian Society (SOC-201)**

Course Outcomes:

1. Students will understand about the Ancient concepts like Varna, Ashram system, Theory of Karma etc.
2. They will also learn about the cultural diversity prevalent in India, social institutions related with different religions and tribes, changes occurring in the Indian society through the process of Globalization, Liberalization etc. and some social issues and problems of the state of Chhattisgarh.
3. Develop a sociological imagination to make sense of the reality in a more comprehensive manner.
4. Provide basic knowledge of sociological concepts and methods and developing ability to identify the challenges in Sociological field of enquiry.

VI- Macro Economics (ECO-201)

Course Outcomes:

1. Understand the calculation of national income and its aggregates
2. Understand the forms and functions of RBI and commercial banking
3. Learn about the macroeconomic policies and their impact on the economy
4. Able to understand the impacts of changes in money supply

CO-PO MAPPING

PS-201	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ENG-201	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-201	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-202	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SOC-201	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ECO-201	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

(III semester)

Third Semester

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
PS-301	Core Discipline	International Relations	06	20	20	60	100
ENG-301	Core Discipline	British Prose and Novel from 19th to 20th Century	06	20	20	60	100

Compulsory Subject

Subject Code	Course Type	Subject	Credits	Marks 1A	MT	ET	Total
AE-301	Ability Enhancement (Compulsory)	Art of Communication	02	20	20	60	100
AE-302	Ability Enhancement (Compulsory)	Fundamentals of Computers	02	20	20	60	100

Elective Subject

Subject	Course Type	Subject	Credits	Marks

Code				1A 20	MT 20	ET 60	Total 100
SOC-301/ECO-301	Elective	Classical Sociological Theory/ Public Finance and International Economics	06	20	20	60	100

I-International Relations (PS-301)

Course Outcome:

1. To equip students with study of international relations and understand about approaches, methods of International Relations
2. To give glimpse of important actors in international relations
3. To understand concepts of power and diplomacy for understanding international law
4. To give them idea about International Organizations.

II- British Prose and Novel from 19th to 20th Century (ENG-301)

Course outcome:

1. Students would have widened their idea about prose and novels of 19th an 20th century.
2. Students would have grasped the major theme of prose and novels that belong to 19th and 20th century.
3. Students would have understood the socio-political context of the period from 19th -20th century with particular reference to prose and novel.

III- Art of Communication (AE-301) (Ability Enhancement)

Course outcome:

1. The role of Business Communication in running a business and managing an organization.
2. Effective Communication is very important for the successful working of an organization.

3. Communication is both oral and written.
4. Students will be able to develop good and effective communication skills.

IV- Fundamentals of Computers (AE-302) (Ability Enhancement)

Course Outcome:

1. Understanding the concept of input and output devices of Computers
2. Learn the functional units and classify types of computers, how they process information and how individual computers interact with other computing systems and devices.
3. Understand an operating system and its working, and solve common problems related to operating systems
4. Learn basic word processing, Spreadsheet and Presentation Graphics Software skills.
5. Study to use the Internet safely, legally, and responsibly

V- Classical Sociological Theory (SOC- 301)

Course Outcome:

1. Students understood history of social theory, social and political understanding of the society, thoughts of Karl Marx, Emile Durkheim, Max Weber, August Comte, Herbert Spencer
2. To make the student understand the sociological thoughts of Karl Marx, Emile Durkheim, Max Weber, August Comte, Herbert Spencer.
3. Students will be able to understand the history of social theory.

VI- Public Finance and International Economics (ECO- 301)

Course Outcome:

1. Understand working of financial system in an economy
2. Understand the types and effect of public expenditure and public revenue in an economy.
3. Learn about taxation system in India.
4. Able to understand the operation of international trade. Different theories of international trade.
5. Able to understand the concept of balance of trade

CO and PO Mapping

PS-301		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ENG-301		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-301		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-302	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SOC-301	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ECO-301	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	3	2	1	1	1	2	2	2	1

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

(IV semester)

Fourth Semester

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
PS-401	Core Discipline	Contemporary Models of Government	06	20	20	60	100
ENG-401	Core Discipline	British Poetry and Drama from 19th to 20th Century	06	20	20	60	100

Compulsory Subject

Subject Code	Course Type	Subject	Credits	Marks 1A	MT	ET	Total
AE-401	Ability Enhancement(Compulsory)	Art of Communication-1	02	20	20	60	100

AE-402	Ability Enhancement(Compulsory)	Fundamental of Computers-1	02	20	20	60	100

Elective Subject

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
SOC-401/EC0-401	Elective	Indian Social Problems/ Indian Economy	06	20	20	60	100

I- Contemporary Models of Government(PS-401)

Course Outcome:

1. Student will be able to compare different constitutions.
2. Student will be able to compare different governments.
3. Student will understand major Constitution.
4. Student will know about Indian Constitution.
5. Student will be able to understand salient features of world Major constitution.

II- British Poetry and Drama from 19th to 20th Century (ENG-401)

Course Outcome:

1. Students will have exposure to the different forms of poetry and drama.
2. Students will be able to understand dramatic monologue and war poetry
3. Students will gain insight into the development of British poetry. III-Art of Communication-1 (AE-401) (Ability Enhancement)

Course Outcome:

1. Understanding different approaches to development, its problems and issues
2. Knowledge about characteristics of developing societies and finding gaps between developed and developing societies
3. Knowledge about meaning, concept, definition about several paradigms
4. Understanding the role of developmental and rural extension agencies in development
5. Understanding the role of media in development

IV- Fundamental of Computers-1 (AE-402)

e:

1. Converse in basic computer terminology
2. Formulate opinions about the impact of computers on society
3. Possess the knowledge of basic hardware peripherals
4. Know and use different number systems and the basics of programming
5. Solve basic computational problems with C language

V-I ndian Social Problems (SOC-401)

Course Outcome:

1. It enables students to understand various social problems that prevail in the Indian society.
2. The major problems like family disorganization, crime, juvenile delinquency, child labour and problems of aged possible are discussed and possible solutions are suggested
3. Students are able to understand concepts and theories underlying social problems in India and social problems.

VI-I ndian Economy (ECO-401)

Course Outcome:

1. Understand working of an economy
2. Understand the features and trends of Indian economy.
3. Learn about importance of agriculture, industries and services etc. in India.
4. Able to understand the operation of credit system in Indian agriculture.

CO-PO MAPPING

PS-401	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ENG-401	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-401	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-402		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SOC-401		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ECO-401		PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

(V semester)

Fifth Semester

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
PS-501	Core Discipline	Western Political Thought	04	20	20	60	100
ENG-501	Core Discipline	Indian English Literature	04	20	20	60	100
ECO-501/SOC-501	Core Discipline	Statistics/ Classical Sociological Theories	04	20	20	60	100
RM-501	Core Discipline	Research Methodology	04	20	20	60	100

Compulsory Subject

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
AE-501	Compulsory	Ethics and Human Values	02	20	20	60	100

I- Western Political Thought (PS-501)

Course Outcome:

1. To understand the salient features of Greek and Medieval Political thought.
2. Evaluate Plato's theory of education, communism and justice. Analyse Aristotle's Classification of governments and his concept of State.
3. To learn about the Machiavellian theory of State-Craft.
4. To Describe the Social Contract Theory, utilitarianism and Marxism.

I- ndian English Literature (ENG-501)

Course Outcome:

1. Students would have widened their idea about different genres of Indian English Literature.
2. Students would have grasped the major theme of poetry, novel, short story and novellas that belong to Indian Writings in English.
3. Analyse how the sociological, historical, cultural and political context impacted the texts selected for study.
4. Evaluate critically the contributions of major Indian English poets, dramatists, and novelists.

III- Statistics (ECO-501)

Course Outcome:

1. Understand basic calculation of different statistical measures.
2. Understand the use of different methods of statistics in real world.
3. Students will summarize data visually and numerically.
4. Students will build and assess data-based models.
5. Students will learn and apply the tools of formal inference.
6. Students will execute statistical analyses with professional software.

IV- Classical Sociological Theories (SOC-501)

Course Outcome:

1. It enables the learners to understand social thought and sociological theories.
2. The founding fathers of sociology and their contribution for the development of sociology as an independent science
3. Students understood Major Sociological Perspectives.

V- Research Methodology (RM-501)

Course Outcome:

1. Students who complete this course will be able to understand and comprehend the basics in research methodology and applying them in research/ project work.
2. This course will help them to select an appropriate research design.
3. With the help of this course, students will be able to take up and implement a research project/ study.
4. The course will also enable them to collect the data, edit it properly and analyse it accordingly. Thus, it will facilitate students' prosperity in higher education.
5. The Students will develop skills in qualitative and quantitative data analysis and presentation.
6. Students will be able to demonstrate the ability to choose methods appropriate to research objectives.

VI- Ethics and Human Values (AE- 501)

Course Outcome:

1. Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
2. Identify the multiple ethical interests at stake in a real-world situation or practice
3. Articulate what makes a particular course of action ethically defensible
4. Assess their own ethical values and the social context of problems
5. Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
6. Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work

CO-PO MAPPING

PS-501	PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ENG-501	PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-501	PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-502	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SOC-501	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ECO-501	PO									
		1	2	3	4	5	6	7	8	9	10
CO	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

School of Humanities and Social Sciences

Bachelor of Arts (B.A.) (General)

(For the Session 2021-2024)

(VI semester)

Sixth Semester

Core Discipline

Subject Code	Course Type	Subject	Credits	Marks			
				IA 20	MT 20	ET 60	Total 100
PS-601	Core Discipline	Indian Social and Political Thinkers	04	20	20	60	100
ENG-601	Core Discipline	Literary and Critical Movements, Critical Terms and Practical Criticism	04	20	20	60	100
SOC-601/ECO-601	Core Discipline	Mathematical Economics/Classical Sociological Thinkers	04	20	20	60	100
DSOHSS	Core Discipline	Dissertation (Inter-disciplinary topic)	04	20	20	60	100

Compulsory Subject

Subject Code	Course Type	Subject	Credits	Marks			
				1A 20	MT 20	ET 60	Total 100
AE-601	Compulsory	Gender Studies	02	20	20	60	100

I Indian Social and Political Thinkers (PS-601)

Course Outcome:

1. To develop a general understanding of Indian Political Thinkers.
2. To discuss the basic concepts of state, sovereignty, liberty, equality, rights and justice which are summarise and explained by Indian Political and Social Thinkers.
3. To assess the applications and practices of thought of Indian Political Thinkers.
4. To compare traditional idea of state with modern political system in day-to-day life.

II- Literary and Critical Movements, Critical terms and Practical Criticism (ENG-601)

Course Outcome:

1. Students would have widened their idea about American Literature
2. Students would have grasped the major theme of works of American Literature

III Classical Sociological Thinkers (SOC- 601)

Course Outcome:

1. It enables the learners to understand social thought and sociological theories.
2. The founding fathers of sociology and their contribution for the development of sociology as an independent science
3. Students understood Major Sociological Perspectives.

IV- Mathematical Economics(ECO-601)

Course Outcome:

1. Understand basic calculation of different mathematical measures.
2. Students will able to understand economics better and numerically.
3. Students will build and assess data-based models.

I- Dissertation (Interdisciplinary)(DOSSHS)

Course Outcome:

1. Research Proficiency: Students will demonstrate a high level of proficiency in conducting independent research, including the ability to formulate research questions, design appropriate

methodologies, and collect and analyze data effectively.

2. Critical Thinking and Analysis: Students will develop advanced critical thinking skills, enabling them to critically evaluate existing literature, synthesize information from multiple sources, and offer well-founded arguments and insights within their chosen field of study.
3. Writing and Communication Skills: Through the process of dissertation writing, students will refine their academic writing and communication skills, ensuring the ability to articulate complex ideas and findings clearly and concisely, adhering to academic conventions and standards.
4. Original Contribution: Students will be able to make an original contribution to knowledge within their chosen subject area, either by extending existing research or by addressing a previously unexplored aspect of their field.

II- Gender Studies (AE 601)

Course Outcome:

1. Identify and analyze the links among gender, sexuality, identity, power, and social justice
2. Identify and analyze intersections among gender and sexuality and other categories of difference, such as class, race, religion, nationality, and physical ability
3. Situate gender and sexuality in broader historical and geopolitical contexts
4. Write or otherwise present (depending on field of study) analyses of gender and sexuality in specific works (visual, literary, theoretical)
5. Design and execute a senior project that demonstrates these competencies within a theoretical framework of gender and sexuality

CO-PO MAPPING

PS-601	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ENG-601	PO										
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

SOC-601	PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

ECO-601	PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

AE-601	PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

DOHSS-601	PO									
CO		1	2	3	4	5	6	7	8	9	10
	CO1	3	3	3	3	2	3	3	1	1	2
	CO2	2	2	2	2	1	2	2	2	2	1
	CO3	2	1	2	1	2	2	1	3	1	2
	CO4	2	2	1	2	2	1	1	2	1	1
	CO5	1	1	2	1	1	1	2	2	2	1

B.A General Syllabus

(2022-2025)

RAFFLES
UNIVERSITY

School of Humanities and Social Sciences

RAFFLES UNIVERSITY
Japanese Zone, National Highway-48, Neemrana-301705,
District: Alwar, RAJASTHAN, INDIA www.rafflesuniversity.edu.in

RAFFLES UNIVERSITY

B.A (General)
POLITICAL SCIENCE
1st Semester

Unit-I: Introduction
Political Science: meaning Definition Nature and Scope
Relationship of Political Science with History, Economics and Sociology
Methods of Political Science: Historical, Comparative and Philosophical
Modern Approach to Study of Political Science: Behavioral and System

Unit-II: The Concept of State
The State: Meaning, Definition and Elements
Theories of Origin of State: Social Contract (Hobbes, Locke, Rousseau) and Evolution Theory
Sovereignty: Meaning Characteristics and Theories (Monistic and Pluralist)
Law: Meaning, Definition, Sources and Kinds

Unit-III: Concepts of Political Theory
Liberty: Meaning and Dimentions (Negative and Positive)
Equality: Meaning, Dimension and Kinds
Justice: Meaning and Dimensions: Procedural and Substances
Right: Meaning and Kinds for Natural Rights Political Rights and Legal Rights

Unit-IV: Post-Modern Theory
Feminism
Ecologism
Communalism
Post-Modernism

Reading list

1. A. Leftwich, *what is politics: the Activity and Its Study*, Polity, 2004.
2. John Hoffman and Paul Graham, *Introduction to Political Theory*, Pearson (latest edition).
3. Barrie Axford et. al., *Politics: An Introduction*, Routledge (latest edition)
4. Ernest Barker, *Principles of Political and Social Theory*
5. Harold A. Laski, *Grammar of Politics*
6. J.W. Garner, Political Science and Government
7. Catriona McKinnon, Issues in Political Theory, Oxford 2008.
8. Sushila Ramaswamy, Political Theory: Ideas and Practices, Macmillan (latest edition).
9. O.P. Gauba, *An Introduction to Political Theory*, 5th edition, Macmillan.

RAFFLES UNIVERSITY

English (ENG-101)

Semester- 1st

Introduction to British Poetry

UNIT-1

Forms of Poetry- Sonnet, Elegy, Epic, Ballad, Lyric, Ode

UNIT-2

Stanza Forms- The Heroic Couplet, The Blank Verse, The Spenserian Stanza, Terza Rhyme

UNIT-3

William Shakespeare: Sonnet no. 116 John Donne: Canonization Michael Drayton: Since There's No Help Left

UNIT-4

William Blake: A Poison Tree William Wordsworth: The World is Too Much With Us P.B. Shelley: Ozymandias

Recommended Readings:

1) Blamires, Harry. A Short History of English Literature. Routledge,2003. 2) Bradbury, Malcolm and James McFarlane. Modernism: A Guide to European Literature (1890-1930). Penguin, 1978. 3) Ellman Richard and C. Fidelson, eds. The Modern Tradition: Background of Modern Literature. OUP, 1965. 4) Fraser, G.S. The Modern Writer and His World. Penguin Books, 1964

RAFFLES UNIVERSITY

Micro Economics (ECO 101)

Semester- I

Micro Economics

UNIT-I –

Introduction Nature and Scope of economics. Methodology- micro and macroeconomics, Positive and normative, static and dynamic, Problem of scarcity and choice: scarcity, choice and opportunity cost; production possibility frontier; economic systems.

UNIT-II – Demand and Supply Demand, Law of Demand, Demand Function, Determinant of Demand, Individual and Market Demand, Elasticity of Demand: Price, Income and Cross Elasticity od Demand. Supply, Law of Supply, Individual and Market Supply, Determinants of Supply, Elasticity of Supply. Factors Affecting Price Elasticity of Demand, Substitute and Complementary Goods.

UNIT-III – Theory of Consumer Behaviour Utility Analysis: Cardinal and Ordinal (Indifference Curves, Budget Line, Consumer's Equilibrium, Price Effect, Substitution Effect, Income Effect, Normal, Inferior and Giffin Goods), Consumer's Equilibrium.

UNIT-IV – Theory of Production, Cost and Market Structure Production Function, Law of Variable Proportion, Three Stages of Production Function. Law of Returns to Scale, Iso-Quant and Iso-Cost, Optimum Factor Combination Theory. Theory of Cost, Short Run and Long Run Cost Curves. Market Structure; Perfect Competition (Basic Features, Short Run and Long Run Equilibrium), Monopoly; (Basic Features, Short Run and Long Run Equilibrium, Comparison with Perfect Competition), Price Discrimination, Monopolistic Competition (Basic Features, Short Run and Long Run Equilibrium)

References:

1. Principles of Microeconomics by Gregory Mankiw

2. Salvatore, D. 2003. Microeconomics; Theory and Applications. Oxford University Press, New Delhi.

3. Principles of Microeconomics by H.L.Ahuja., S.Chand Publication. Latest Edition.

RAFFLES UNIVERSITY

SOCIOLOGY (SOC-101)

SEMESTER-1st

Introduction to Sociology

1. *Sociology: Discipline and Perspective*
   - Nature and Scope of Sociology
   - Sociology as a science
   - Sociology and Common Sense

2. *Sociology and Other Social Sciences*
   - Sociology and Social Anthropology
   - Sociology &Psychology
   - Sociology &History

3. *Basic Concepts*
   - Individual and Group
   - Associations and Institutions
   - Culture and Society
   - Social Change

Readings:

1. A. Beteille : Sociology—Essays on Approach and Method (OUP)
2. Alex Inkeles: What Is Sociology?
3. Alex Thio: Sociology
4. Andre, Beteille, 2009, *Sociology: Essays in Approach and Method*, Delhi: OxfordUniversity Press, Chapter 1, 'Sociology and Common Sense', Pp. 13-27
5. Anthony Giddens : Sociology
6. G. Rocher: A General Introduction to Sociology
7. George Ritzer : Encyclopaedia of sociology
8. Gilles Ferreol& Jean-Pierre Noreck: An Introduction to Sociology(PHI Learning)
9. Gordon Marshal : Dictionary of Sociology (OUP)
10. Harry M. Johnson : Sociology
11. Henry Tischler: Introduction to Sociology
12. J Ross Eshleman& B.G. Cashion: Sociology an Introduction
13. M. Haralambas&R. M. Heald: Sociology Themes and Perspectives.
14. P. Worsely: New Introducing Sociology
15. T. Bottomore : Sociology—A Guide to Problems and Literature

RAFFLES UNIVERSITY

Geography (GEO-101)

Semester- 1st

PHYSICAL GEOGRAPHY

UNIT-I:

PHYSICAL GEOGRAPHY Definition and Scope; Components of Earth System.

UNIT-II:

ATMOSPHERE Heat Balance; Global Circulation Pattern; Tropical Cyclones; Monsoon; Climatic Classification (Koppen).

UNIT-III:

LITHOSPHERE Internal Structure of Earth based on Seismic Evidence; Plate Tectonics and its Associated Features.

UNIT-IV:

FLUVIAL CYCLE OF EROSION Davis and Penck.

UNIT-V: HYDROSPHERE Hydrological Cycle; Ocean Bottom Relief Features; Tides and Currents.

REFERENCE:

1. Conserva H. T., 2004: Illustrated Dictionary of Physical Geography, Author House, USA.

2. Gabler R. E., Petersen J. F. and Trapasso, L. M., 2007: Essentials of Physical Geography (8th Edition), Thompson, Brooks/Cole, USA.

3. Garrett N., 2000: Advanced Geography, Oxford University Press.

4. Goudie, A., 1984: The Nature of the Environment: An Advanced Physical Geography, Basil Blackwell Publishers, Oxford.

5. Hamblin, W. K., 1995: Earth's Dynamic System, Prentice Hall, N.J.

6. Husain M., 2002: Fundamentals of Physical Geography, Rawat Publications, Jaipur.

7. Monkhouse, F. J. 2009: Principles of Physical Geography, Platinum Publishers, Kolkata.

8. Strahler A. N. and Strahler A. H., 2008: Modern Physical Geography, John Wiley & Sons, New York.

RAFFLES UNIVERSITY

POLITICAL SCIENCE

2nd Semester

Principles of Public Administration and Government

Unit-I: FOUNDATION OF PUBLIC ADMINISTRATION

Meaning, Nature Scope and Significance of Public Administration;
Evolution of the Discipline and its present status; Difference between Public and Private Administration
New Public Administration and its characteristics; New Public Management and its characteristics. New Public Services and Good Governance
Relationship of Public Administration with Political Science, Law, Economics, Sociology and Psychology

Unit-II: ORGANISATION PF PUBLIC ADMINISTRATION AND ADMINISTRATIVE BEHAVIOUR

Principles of Hierarchy Unity of Command, Span of Control Division of Labor and Centralization or Decentralization;
Line,Staff and Auxiliary agencies: Definition and Distinction.
Decision Making: Meaning, Process, Types and Conditions Decision Making.
Communication: Meaning, Process, Channels and Barriers of Communication

Unit-III: The Concept of Government

Government: Definitional Characteristic
Legislature: Meaning and Types
Executive: Meaning and Functions
Judiciary: Importance and Functions

Unit-III: THEORIES OF ORGANISATION (Classical or Neo-Classical)

Scientific Management theory of F.W. Taylor
Bureaucratic Theory of Max Weber
Administrative theory or Classical Theory
Herbert Simon's Decision Making Theory

Unit-IV: GOVERNANCE: CONCEPTAND DEVELOPMENT

Role of State in the Era of Globalisation
State, Market and Civil Society
Changing Dimensions of Development Strengthening Democracy through Good Governance
Democratic Decentralisation People's Participation in Governance

RAFFLES UNIVERSITY

English (ENG-201)

Semester- 2nd

Introduction to British Drama

UNIT-1

Forms of Drama- Tragedy, Comedy, History, Romance

UNIT-2

William Shakespeare: Hamlet

UNIT-3

GB Shaw: Pigmalion

UNIT-4

Harold Pinter: Birthday Party Recommended

Readings:

1) Bradley, AC. Shakespearean Tragedy: Lectures on Hamlet, Othello, King Lear, Macbeth. Penguin, 1991.

2) Elam, Keir. The Semiotics of Theatre and Drama. Routledge, 2002.

3) Evans, G. Blakemore, ed. Elizabethan-Jacobean Drama: The Theatre in Its Time. New Amsterdam Books, 1998.

4) Sanger, Keith. The Language of Drama. Routledge, 2001

Macro Economics (ECO 201)

Semester- II

Macro Economics

UNIT-I –

Introduction Introduction, nature and scope, Difference between Micro and Macro Economics, Various macroeconomics Concepts: Stock, Flow, Endogenous and Exogenous variables.

UNIT-II –

Aggregates of National Income Circular Flow of Income, Concepts of GDP and National Income; measurement of national income and related aggregates; nominal and real income;

UNIT-III –

Output, Employment and Money Aggregate Demand, Aggregate Supply, Classical Theory of Income, Output and Employment, Consumption Function- APC, MPC; Investment Analysis- Meaning, Types, Factors Determining Investment, Factors Affecting MPC. Keynesian Theory of Income and Employment, Concept of Multiplies and Accelerator.

UNIT-IV –

Money and Banking Functions of Money, Reserve Bank of India: Organizational Set-up and Functions of RBI, Qualitative and Quantitative measures to control Credit creation by RBI, Commercial Bank: Functions. Monetary Policy: Objectives, Targets and Indicators.

References:

1. Shapiro.E. 2005. Macro-economic Analysis (5th Edition). Galgotia Publications. New Delhi.
2. Mankiw, N. (2016). Macroeconomics, 9th ed. Worth Publishers.
3. Dornbusch, R., Fischer, S., Startz, R. (2018). Macroeconomics, 12th ed. McGraw-Hill.
4. H.L Ahuja, Macroeconomics, Theory and Policy. S.Chand & Co. ltd. New Delhi.

RAFFLES UNIVERSITY

Geography (GEO-201)

Semester- 2nd

HUMAN GEOGRAPHY

UNIT-I: INTRODUCTION

Definition; Nature; Major Subfields; Contemporary Relevance.

UNIT-II: SPACE AND SOCIETY

Cultural Regions; Race; Religion and Language

UNIT-III: POPULATION AND DEMOGRAPHY

Population Growth and Demographic Transition Theory; World Population Distribution and Composition (Age, Gender and Literacy).

UNIT-IV: SETTLEMENTS

Types and Patterns of Rural Settlements; Classification of Urban Settlements; Trends and Patterns of World Urbanization

REFERENCE:

1. Chandna, R.C. (2010) Population Geography, Kalyani Publisher.

2. Daniel, P.A. and Hopkinson, M.F. (1989) The Geography of Settlement, Oliver & Boyd, London.

3. Johnston R; Gregory D, Pratt G. et al. (2008) The Dictionary of Human Geography, Blackwell Publication.

4. Jordan-Bychkov et al. (2006) The Human Mosaic: A Thematic Introduction to Cultural Geography. W. H. Freeman and Company, New York.

5. Kaushik, S.D. (2010) Manav Bhugol, Rastogi Publication, Meerut.

6. Maurya, S.D. (2012) Manav Bhugol, Sharda Pustak Bhawan. Allahabad.

7. Ghosh, S. (2015) Introduction to settlement geography. Orient Black Swan Private Ltd., Kolkata

8. Hussain, Majid (2012) Manav Bhugol. Rawat Publications, Jaipur

RAFFLES UNIVERSITY

SEMESTER-IInd

SOCIOLOGY (SOC-201)

Introductory Sociology

1. *On the Plurality of Sociological Perspective*
2. **Functionalism**
   General arguments;
   Contributions of Parsons and Merton;
   Critical overview.
3. *Interpretive Sociology*
   General arguments;
   Contributions of Weber
4. *Conflict Perspective*
   General arguments;
   Contributions of Dahrendorf and Coser;
   Critical overview
5. *Structuralism*
   General arguments;
   Contributions of Levi-Strauss
6. *Feminist Perspective*
   General arguments;
   Stages of development of feminism;
   Varieties of feminist sociology**.**

Readings:

1. Anthony Elliot and Charles Lemert, 2014. Introduction to Contemporary Social theory, Routledge.
2. Bert N. Adams and R.A. Sydie. 2002. Sociological Theory. Sage, Vistara
3. Baert, Patrick. 1998. Social Theory in the Twentieth Century. New York. NYU Press.
4. Bottomore, T. B. 1971. *Sociology: A Guide to Problems and Literature*, London:Allen and Unwin, Chapter 2, Pp. 29-47
5. Bottomore, Tom and Nisbet, Robert. 2004. A History of Sociological Analysis. Jaipur: Rawat
6. Bottomore, Tom. 2002. The Frankfurt School. London: Routledge
7. Collins, Randall. 1994. Four Sociological Traditions. New York. OUP

RAFFLES UNIVERSITY

POLITICAL SCIENCE

3rd Semester

International Relations

Unit: INTRODUCTION TO INTERNATIONALR
Meaning, Nature and Scope of International Relations
History and IR: Emergence of International State System
Pre-Westphalia, Westphalia and Post-Westphalia
Unit-II: THEORIES OF IR
Classical Realism & Neo-Realism
Liberalism & Neo-liberalism
Marxism Approaches/Dependency Theory
Feminist Perspectives
Euro-centrism and Perspective from the Global South
Unit-III: HISTORY IN MODERN ERA OF IR
World War I & II: Causes and Consequences.
Significance of the Bolshevik Revolution and Rise of Fascism/Nazism.
Cold War: Different Phase and Collapse of the USSR and the End of Cold War.
Emergence of the Third World: Uni-Polar, Multi-Polar or Bi-Polar
Unit-IV: FOREIGN POLITICS IN IR
Power Management: Diplomacy
Balance of Power and Collective Security
Foreign Policy: Meaning, Kinds & Methods
National Power: Meaning, Nature and Determinates

English (ENG-301)
Semester- 3rd
British Prose and Novel
UNIT-1
Personal Essay, Modern Essay, Types of Novel, Short Stories
UNIT-2
Charles Lamb: New Year's Eve William Hazlitt: On the Pleasure of Hating
UNIT-3
Jane Austen: Pride and Prejudice William Golding: Lord of the Flies
UNIT-4
Charlotte Perkins Gilman: The Yellow Wallpaper Katherine Mansfield: Bliss
Recommended Readings:
1. Raymond Williams, 'Introduction', in The English Novel from Dickens to Lawrence (London: Hogarth Press, 1984) pp. 9–27.
2. Virginia Woolf, A Room of One's Own (New York: Harcourt, 1957) chaps. 1 and 6.
3. Showalter, Elaine. The Female Malady: Women, Madness, and English Culture, 1830-1980, 1st ed., New York: Pantheon Books, 1985
4. Deirdre David ed. Companion to the Victorian Novel. New York: CUP,2001

Geography (GEO-301)

Semester- 3rd

GEOGRAPHY OF INDIA

UNIT-I: PHYSICAL

Relief; Drainage; Climate; Vegetation

UNIT-II:

MINERAL AND POWER RESOURCES

Distribution and production: iron ore, manganese; Distribution and production: coal and petroleum; Multipurpose projects: DVC; Mahanadi, Bhakra Nangal;

UNIT-III:

AGRICULTURE

Major agricultural types; Distribution and production of rice, wheat, cotton, tea; Green revolution, white revolution; Agricultural regions.

UNIT-IV:

TRANSPORT SYSTEM

Road; Railways; Water ways; Air

UNIT-V:

POPULATION

Growth; Distribution and density; Population growth and related problems; Population policy of India

REFERENCE:

a. Nag, P., & Sengupta, S. (1992). Geography of India. Concept Publishing Company.

b. R,Tirtha and Gopal Krishan 2002: Geogrpagy of India, Rawat Publication, new Delhi

c. Singh R L: Regional Geography of India

d. Pal, Saroj K. (1998) Physical Geography of India. Orient BlackSwan,

e. Qazi, Shaz Sharqi Qazi (2007): Natural Resource Conservation. APH Publishing

f. Shovan Ray (2007): Handbook of Agriculture in India. Oxford University Press,

RAFFLES UNIVERSITY

SEMESTER-III[rd]

SOCIOLOGY (SOC-301)

Sociology of India – I

1. *India: An Object of Knowledge*

The Colonial Discourse

The Nationalist Discourse

The Subaltern Critique

2. *Indian Society: Concepts and Institutions*

Caste: Concept and Critique

Varna & Jati; Dominant Caste

Jajmani System; Caste Mobility: Sanskritization

Agrarian Classes

Nature of Agrarian Class

Tribe: Profile and Location

Features

Regional Distribution

Village: Structure and Change

Village Solidarity

Internal Regulation

Kinship: Principle and Pattern

Religion and Society

Role of Religion

Readings:

1. A. R. Desai. Bharatiya Jatiatabader SamajikPatabhumi (Social Background of IndianNationalism).
2. A. R. Desai. Rural sociology
3. A. Beteille. Caste, Class and Power: Changing Patterns
4. Amartya Sen. Argumentative India (Chs. 10, 11)
5. Bernard Cohn, Colonialism and its forms of knowledge, Princeton University Press
6. Aniruddha Choudhury. 2016. "Bharater Samaj Prasange"Chatterjee Publishers.
7. David Mandelbaum – Society in India

RAFFLES UNIVERSITY

POLITICAL SCIENCE

4th Semester

MAJOR CONSTITUTION(S)

Unit-I:

INDIA

Salient features of Indian Constitution
Preamble
Citizenship
Fundamental Rights and Duties
Directive Principles of State Policy
President, Prime Minister, Council Of Ministers
Parliament
Judiciary

Unit-II:

THE UNITED KINGDOM

Salient Features of the Constitution: Conventions, Parliamentary Government, Sovereignty of Parliament, Unitary Government, Rule of Law
Parliament: The House of Commons and the House of Lords- Composition and Powers
Executive: Monarchy-Functions and Position
Prime Minister and the Cabinet: Powers and Position

Unit-III:

The United State of America

Salient Feature of the Constitution: Supremacy of the Constitution, Presidential System, Federalism, Separation of Powers and Checks and Balances, Judicial Review
The Congress – The Senate and the house of representative – Composition and Powers
Executive - The President – Methods of Election, Powers and Position
Judiciary – The Supreme Court: Composition, Jurisdictions and Role

Unit-IV:

THE SWITZERLAND

Salient Feature of the Constitution: Federalism Direct Democracy
Federal Legislature: The National Council and Council of State: Composition and Powers
Plural Executive- Composition and Functions
Federal Tribunal- Compositions Jurisdictions

English (ENG-401)

Semester- 4th

British Poetry and Drama: 19th and 20th Century

UNIT-1

Forms of Poetry: Dramatic Monologue Forms of Drama: Problem Play

UNIT-2

Robert Browning: My Last Duchess Lord Alfred Tennyson: Ulysses

UNIT-3

W.B.Yeats: The Second Coming Philip Larkin: Deception

UNIT-4

Henrik Ibsen: A Dolls House John Osborne: Look Back in Anger

Recommended Readings:

1. Karl Marx and Friedrich Engels, 'Mode of Production: The Basis of Social Life', 'The Social Nature of Consciousness', and 'Classes and Ideology', in A Reader in Marxist Philosophy, ed. Howard Selsam and Harry Martel (New York: International Publishers,1963) pp. 186–8, 190–1, 199–201.

2. Charles Darwin, 'Natural Selection and Sexual Selection', in The Descent of Man in The Norton Anthology of English Literature, 8th edn, vol. 2, ed. Stephen Greenblatt (New York: Northon, 2006) pp. 1545–9.

3. John Stuart Mill, The Subjection of Women in Norton Anthology of English Literature, 8th edn, vol. 2, ed. Stephen Greenblatt (New York: Norton, 2006) chap. 1, pp. 1061–9.

4. T.S. Eliot, 'Tradition and the Individual Talent', in Norton Anthology of English Literature, 8th edn, vol. 2, ed. Stephen Greenblatt (New York: Norton, 2006) pp. 2319–25

Geography (GEO-401)

Semester- 4th

ECOLOGY AND ENVIRONMENT

UNIT-I:

ENVIRONMENTAL GEOGRAPHY: CONCEPTS AND APPROACHES; ECOSYSTEM Concept and Structure; Ecosystem Functions.

UNIT-II:

HUMAN Environment Relationship in Equatorial; Desert, Mountain and Coastal Regions.

UNIT-III:

ENVIRONMENTAL PROBLEMS AND MANAGEMENT Air Pollution; Biodiversity Loss; Solid and Liquid Waste. UNIT-IV:

ENVIRONMENTAL PROGRAMMES AND POLICIES Countries; Developing Countries. New Environmental Policy of India; Government Initiatives.

REFERENCE:

1. Casper J.K. (2010) Changing Ecosystems: Effects of Global Warming. Infobase Pub. New York.

2. Hudson, T. (2011) Living with Earth: An Introduction to Environmental Geology, PHI Learning Private Limited, New Delhi.

3. Miller, G.T. (2007) Living in the Environment: Principles, Connections, and Solutions, Brooks/ Cole Cengage Learning, Belmont.

4. Singh, R.B. (1993) Environmental Geography, Heritage Publishers, New Delhi.

5. UNEP (2007) Global Environment Outlook: GEO4: Environment For Development, United Nations Environment Programme. University Press, Cambridge.

Indian Economy (ECO 401)

Semester- IV

Indian Economy

UNIT-I

Basic Features of Indian Economy, Demographic Features and Major Trends, Human Resource Development. Agriculture: Role and Importance of Agriculture in India, Institutional and Structural reforms in Agriculture in India. Agriculture Financing: Institutional Credit, Microfinance. Flagship schemes of government for Agriculture.

UNIT-II

Industry: Role, Strategy and Challenges, Growth of MSMEs, Industrial Policy 1991, New Economic Policy and Disinvestment. Service Sector in India: IT, Education and Health.

UNIT-III

Poverty and Unemployment: occupational structure in the organised and unorganised sectors; open-, under- and disguised- unemployment (rural and urban); employment schemes and their impact.

UNIT-IV

Planning in India: Objectives and Achievements. Macroeconomic policies and their impact: fiscal policy; financial and monetary policies. NITI Ayog, Rural Development Programmes and Policy in India.

References:

1. Mishra & Puri. Indian Economy, Himalaya Publication House, 38th revised and Updated Edition.
2. Datt and Sundaram. Indian Economy, S.Chand, 65th Edition (2020)
3. Indian Economy since Independence by Uma Kapila Published by Academic Foundation, New Delhi
4. The Indian Economy by Sanjiv Verma Published by Unique Publishers, New Delhi.

SOCIOLOGY (SOC-401)

Sociology of India – II

1. *Ideas of India*

Gandhi and Ambedkar
Gandhi on Harijan
Ambedkar: Dalit &Hindu Society
Indological and Ethnographic Approaches

2. *Resistance, Mobilization, Change*

Dalit Politics
Mobility and Change
Women's Movement
Peasant Movements
Ethnic Movements
Middle Class Phenomenon

3. *Challenges to Civilization, State and Society*

Communalism: Factors and Control measures
Secularism: Significance, Issues and Challenges
Nationalism: Concept and Growth Factors

Readings:

1. Aniruddha Chaudhury. ed. "Bharater Samajtatta"2016, Chatterjee publishers
2. Deshpande, S., 2003, Contemporary India: A Sociological View, New Delhi: PenguinBooks
3. Dhanagare, D. N. (1993). Themes and Perspectives in Indian Sociology.RawatPublication, Jaipu
4. Ganguly, Ramanuj. Tatwa O Chintadarshe Samakalin Samajtatwa, Bani/ReenaPrakashan, Kolkata
5. Ganguly, Ramanuj and S. A. H. Moinuddin. 2008. SamakaleenBharatiyaSamaj. PHI.Learning.

POLITICAL SCIENCE

5th Semester

WESTERN POLITICAL THOUGHT

Unit-I:

NATURAL-RATIONAL TRADITION OF THE GREEKS

Salient features of Greek Political Thought
Plato's Ideal State: Justice, Philosopher King, Education and Communism
Aristotle's Polity: Classification of Governments, Revolution, The Best Practicable State.

Unit-II:

MEDIEVAL-CHRISTIAN TRADITION

Salient Features of Medieval Political Thought
St. Thomas Aquinas: Theory of Law, Relationship between Church and State
Machiavelli: Separation of Ethics and Politics, Theories of State-Craft

Unit-III:

SOCIAL CONTRACTUALISTS

Thomas Hobbes: State of Nature, Social Contract, Sovereignty
John Locke: State of Nature, Social Contract, Natural Rights, Limited Government
Rousseau: State of Nature, Social Contract, General Will.

Unit-IV:

UTILITARIANISM AND MARXISM

Jeremy Bentham: Utilitarianism, Political and Legal Reforms
J.S. Mill: Utilitarianism, Liberty, Representative Government.
T.H. Green- Theory of State, Rights and Political Obligation
Immanuel Kant: Theory of Moral Freedom, the Civil State
George Wilhelm Fredrick Hegel: Dialectical Methods, theory of State,
Karl Marx: Dialectical Materialism, Historical Materialism, Theory of Class-Struggle.

RAFFLES UNIVERSITY

English (ENG-501)

Semester- 5th

Indian English Literature

UNIT-1

Nissim Ezekiel: Background Causally Kamala Das: My Grandmother's House Jayant Mahapatra: Dhauli Tabish Khair: Amma

UNIT-2

Gandhi: As a School Master Ruskin Bond: The Blue Umbrella

UNIT-3

Mulk Raj Anand: Untouchable

UNIT-4

Anita Desai: Fire on the Mountain Recommended

Readings:

1. Salman Rushdie, 'Commonwealth Literature does not exist', in Imaginary Homelands (London: Granta Books, 1991) pp. 61–70.

2. Meenakshi Mukherjee, 'Divided by a Common Language', in The Perishable Empire (New Delhi: OUP, 2000) pp.187–203.

3. Bruce King, 'Introduction', in Modern Indian Poetry in English (New Delhi: OUP, 2nd edn, 2005) pp. 1–10.

Geography (GEO-501)

Semester- 5th

DISASTER MANAGEMENT

UNIT-I:

INTRODUCTION Disasters: Definition and Concepts: Hazards, Disasters; Risk and Vulnerability; Classification

UNIT-II:

DISASTERS IN INDIA Flood: Causes, Impact, Distribution and Mapping; Landslide: Causes, Impact, Distribution and Mapping; Drought: Causes, Impact, Distribution and Mapping.

UNIT-III:

DISASTERS IN INDIA Earthquake and Tsunami: Causes, Impact, Distribution and Mapping; Cyclone: Causes, Impact, Distribution and Mapping.

UNIT-IV:

MANMADE DISASTERS Manmade disasters: Causes, Impact, Distribution and Mapping

UNIT-V:

RESPONSE AND MITIGATION TO DISASTERS Response and Mitigation to Disasters: Mitigation and Preparedness, NDMA and NIDM; Indigenous Knowledge and Community-Based Disaster Management; Do's and Don'ts During and Post Disasters

REFERENCE:

1. Government of India. (1997) Vulnerability Atlas of India. New Delhi, Building Materials & Technology Promotion Council, Ministry of Urban Development, Government of India.

2. Kapur, A. (2010) Vulnerable India: A Geographical Study of Disasters, Sage Publication, New Delhi.

3. Modh, S. (2010) Managing Natural Disaster: Hydrological, Marine and Geological Disasters, Macmillan, Delhi.

4. Singh, R.B. (2005) Risk Assessment and Vulnerability Analysis, IGNOU, New Delhi. Chapter 1, 2 and 3

5. Singh, R. B. (ed.), (2006) Natural Hazards and Disaster Management: Vulnerability and Mitigation, Rawat Publications, New Delhi.

RAFFLES UNIVERSITY

Statistics (ECO 501)

Semester- V

UNIT-I

Meaning, Nature and Importance of Statistics, Census and Sample Survey, Collection of Data, Tabulation, Diagrammatic and Graphical Representation of Data, Measure of Central Tendency: Arithmetic Mean, Mode, Median, Geometric Mean, Harmonic Mean. Measure of Dispersion (Quartile Deviation, Mean Deviation, Standard Deviation, Coefficient of Variation) and Skewness (Karl Pearson's Coefficient).

UNIT-II

Probability – Basic concepts and calculation. Sampling Theory: probability and Non probability sampling.

UNIT-III

Simple Correlation: Karl Pearson and Ranks Correlation. Regression analysis. Analysis of Time Series (Components and determination of Seasonal variations), Index Numbers (Cost of Living Index, Fisher's Ideal Index, and Test of Ideal).

References:

1. S.C. Gupta. Statistical Method. S. Chand & Sons. New Delhi.
2. K.N. Nagar. Funadamental of Economics. Latest Edition.
3. S.C. Gupta and V.K. Kapoor. Fundamentals of Applied Economics. S. Chand, New Delhi.

SOCIOLOGY

SEMESTER-Vth

Classical Sociological Theories

Unit-I: AUGUSTE COMTE

1. Positivism
2. Hierarchy of Sciences
3. Statics and Dynamics

Unit-II: KARL MARX

1. Historical Materialism
2. Dialectical Materialism
3. Class and Class Struggle

Unit-III: EMILE DURKHEM

1. Social Fact
2. Division of Labour
3. Collective Conscience (Theory of Religion)
4. Theory of Suicide

Unit-IV: MAX WEBER

1. Ideal Types and Social Action
2. Types of Authority, Status and Role
3. Bureaucracy

Reading(s):

Calhoun, J. Craig, 2007, Classical Sociological Theories, 2nd Edition Blackwell, pp. 73-130.
Jayapalan, N. 2001. Sociological Theories, Atlantic Publisher, pp. 35-69.

RAFFLES UNIVERSITY

POLITICAL SCIENCE

6th Semester

INDIAN SOCIAL AND POLITICAL THINKER

Unit-I:
PRE-COLONIAL POLITICAL THOUGHT

Kautilya-Theory of State
Barani-Ideal Polity
Abu Fazal-Monarchy
Kabir-Syncretism

Unit-II:
POLITICAL COHESIVE AND SEPARATIST THOUGHT
Sir Syad Ahmed Khan- Muslim Uplift and Political Views
Genesis of Muslim League and Separatism
Mohammad Ali Jinnah- Political Views and Role in Indian national Movement

Unit-III:
SOCIO-ECONOMIC AND POLITICAL THOUGHT
Mahatma Gandhi- Social, Economic, and Politicall Thought
Jawahar Lal Nehru- Economic and Political Ideas
B.R. Ambedkar- Social and PoliticalIdeas

Unit-IV:
SOCIAL REFORM AND THOUGHT
Aurobindo Ghosh- Social and Political Ideas
Ranade-
Political Ideas, Theory of Social Reforms
Jay Prakash Narayan-The Concept of Sarvodaya, Total Revolution and Social Thought

English (ENG-601)

Semester- 6th

Introduction to American Literature

UNIT-1

Walt Whitman: O Captain My Captain Robert Frost: Mending Walls

UNIT-2

Edgar Allan Poe: The Purloined Letter William Faulkner: Dry September

UNIT-3

Arthur Miller: Death of a Salesman

UNIT-4

Ernest Hemingway: The Old Man and the Sea Recommended

Readings:

1. Howard, Zinn. A People's History of the United States: 1492 to Present, New York: Harpercollins,1980.

2. Stephen A. Black. Eugene O'Neill: Beyond Mourning and Tragedy, New Haven: Yale University Press, 2002.

3. Russ Castronovo (ed.), The Oxford Handbook of Nineteenth-Century American Literature, Oxford: Oxford Handbooks, 2012

4. Malcolm Bradbury and Richard Ruland. From Puritanism to Postmodernism: A History of American Literature, New York: Penguin Group (USA) , 1992

Geography (GEO-601)

Semester- 6th

SUSTAINABLE DEVELOPMENT

UNIT-I:

INTRODUCTION Definition, Components, Historical Background and Scope; The role of higher education in sustainable development.

UNIT-II:

THE MILLENNIUM DEVELOPMENT GOALS National Strategies and International Experiences.

UNIT-III:

SUSTAINABLE REGIONAL DEVELOPMENT Need and examples from Cities and Mountains; The human right to health; Poverty and disease; The Challenges of Health Coverage in High-Income Countries.

UNIT-IV:

INCLUSIVE DEVELOPMENT Education, Health; Climate Change: Policies and Global Cooperation for Climate Change; Sustainable Development Policies and Programmes: The proposal for SDGs at Rio+20; Illustrative SDGs; Goal-Based Development; Financing for Sustainable Development; Principles of Good Governance; National Environmental Policy.

REFERENCE:

1. Ayers, Jessica and David Dodman, “Climate change adaptation and development I: The state of the debate”, in Progress in Development Studies 10 (2): 161-168.

2. Baker, Susan, Sustainable Development, Milton Park, Abingdon, Oxon; New York, N.Y.: Routledge.

3. Brosius, Peter, “Endangered forest, endangered people: Environmentalist representations of indigenous knowledge”, Human Ecology 25: 47-69.

4. Lohman, Larry, “Re-imagining the population debate”. Corner House Briefing 28.

Mathematical Economics (ECO 601)

Semester- VI

UNIT-I

Differentiation – Simple and Partial, Simple Integration. Theory of Consumer behaviour- utility Function, Maximization of utility. Elasticity of Demand.

UNIT-II

Production Function- A well Behaved Production Function, Cobb Douglas Production Function, Homogeneous Production Function. Optimization Behaviour of a Firm – Profit Maximization and Output maximization.

UNIT-III

Perfect Competition- Market Demand and Supply Function, Determination of price and Output. Monopoly: Profit Maximization and Sales Revenue Maximization.

UNIT-IV

Macro - Economic Model, Keynesian Theory of Income Determination, Derivation of IS-LM Functions.

References:

1. S.C. Gupta. Statistical Method. S. Chand & Sons. New Delhi.

2. K.N. Nagar. Fundamental of Economics. Latest Edition.

3. S.C. Gupta and V.K. Kapoor. Fundamentals of Applied Economics. S. Chand, New Delhi.

SOCIOLOGY
Classical Social Thinkers
Semester- VIth

UNIT – I – VILFREDO PARETO:
Vilfredo Pareto: Logico-Experimental Method. Logical and Non-Logical Actions. Residues and Derivations. Circulation of Elites.

UNIT – II – GEROGE SIMMEL:
George Simmel: Formal Sociology. Sociology of Conflict. Theory of Domination. Concept of Social Mobility.

UNIT – III – PITIRIM A SOROIKIN:
Pitirim A Sorokin: Integralist Sociology. Theory of Socio-Cultural Dynamics. Theory of Social Revolution. Concept of Social Mobility.

UNIT – IV – TALCOTT PARSONS:
Talcott Parsons: Theory of Action. Pattern Variables. Theory of Social System.

UNIT – V – ROBERT K. MERTON:
Robert K. Merton: Role Set Theory. Reference group theory. Social structure and anomie. Functional analysis: Manifest and Latent Functions. Dysfunctions

Reading(s):
1. Coser, Lewis A. Masters of Sociological Thought: Ideas in Historical and Social context 2 nd Ed. New York: Harcourt Brace Jovanovich, 1997.
2. Wallace, Ruth A and Wolf Alison. Contemporary Sociological Theory, Englewood Cliffs New jercy, Prentice Hall, 1980
3. Timasheff, Nicholoas S.Sociological Theory: Its Nature and Growth, 3rd Ed. New York: Random house,1967.
4. Nisbet, Robert A. The Sociological Tradition, London: Heinemann, 1967.
5. Abraham Francis, M. and Morgan, John Henry, Sociological Thought. Madras: Macmillan India, 1985. 6. Merton, Robert k., Sociological Theory and Social Structure.Indian Ed. New Delhi: Ameirnd Publishing co., 1968.

M.A. (English Literature)
Semester I
Paper I: English Society, Literature and Thought
(Chaucer to 16th Century)
Course Outcome:

1. To enhance the social and intellectual background of classical writers.
2. To inculcate the understanding of poetry and to widen the area of knowledge.
3. To Increase the comprehensive study of literature and to develop critical thinking.
4. To have an ethical study of human behavior through different plays.
5. Uplifting writing skills and developing the flare for creative writing.

Program Outcome:

1. Cultural and ethical understanding which would help the student to develop in all the spheres.
2. Writing proficiency will increase with the new courses and literary devices.
3. English language would be enhanced by following the structural learning of LSRW.
4. Advanced level of literary understanding which develops through different literary analysis and critical theory.
5. The program would help to deliver the speech in effective way and would help in communicative English.
6. Strong research will be developed which would further contribute to literary studies.
7. Comprehensive knowledge of criticism and literary movements.
8. The program would prepare different academic writing and publishing research articles.
9. The analytical and communication skill will develop to enhance the comprehensive understanding of stylistics.

Paper II: English Society, Literature and Thought
(17th and 18th Century)

Course Outcome:

1. To have a comprehensive understanding knowledge of literary works from various periods.
2. To develop students' ability to analyze and interpret literature.
3. To think critically about themes, characters and literary techniques.
4. To develop historical and cultural context which helped the students to appreciate the influence of literature.
5. To foster appreciation for authors from various backgrounds and perspectives.

Paper III: English Society, Literature and Thought
(19th Century)

Course Outcome:

1. To be well-acquainted with significant authors of the 19th century authors and their major works.
2. To understand historical and cultural context which influences literary production.

3. To develop the ability to analyze and interpret including exploration of themes, characters and narrative techniques.
4. To enhance critical thinking skill and the ideas are expressed effectively.
5. To study the development of the novel as a literary form during 19th century.

Paper IV:
Introduction to Linguistics and Phonetics
Course Outcome:

1. To develop a fundamental linguistic concept such as phonetics and phonology.
2. An Understanding of the articulation and acoustic properties of speech sounds.
3. To analyze and describe the sound system of different languages.
4. To explore regional, social and stylistic variation in language.
5. To develop research skills in linguistics including data collection analysis.

Semester II:
Paper I : English Society, Literature and Thought
(20th Century)
Course Outcome:
Develop a deep understanding of significant British authors and their major literary works from 20th century.

1. To understand the historical, social and cultural context of major events.
2. To explore major literary movements of 20th century and shape the literary creativity.
3. To compare different authors for understanding of common themes and different styles.
4. To enhance critical thinking skills and ability to conduct research on 20th century literary topics.

Paper II: Readings in Literary Criticism
Course Outcome:

1. To familiarize students with major literary theories and critical approaches.
2. To develop the ability to analyze and interpret literary texts from various genres using different critical lenses.
3. To analyze specific literary works and gain insights into their narrative techniques and cultural significance.
4. To enhance critical writing skills and enabling students to articulate their interpretations and argumenta effectively.
5. To explore the importance of diverse voice in literary criticism.

Paper III: Language Acquisition and Language Learning

1. To increase fluency and accuracy for effective communication in target language.
2. Students should acquire broader vocabulary to express wider range of ideas.
3. A deeper understanding of the target language's grammar and syntax rule.
4. Improve ability to understand spoken language, media and real-life situations.
5. The ability to continue learning and improve language skills independently as language acquisition is an ongoing process.

Paper IV: Literature and Gender
Paper I:

1. A deeper understanding of how gender roles, identities and power dynamics are represented in literature.
2. Insight into the historical and cultural context of literary works.
3. Empowering to engage in discussions about gender equality, diversity and social justice.
4. Development of research and analytical skills in exploring gender-related topics in literature.
5. Enhancing ability to see literature from different viewpoints and consider how gender influences interpretation.

Semester III
Paper I: American Literature
Course Outcome:

1. To improve skills in analyzing and interpreting American literary works including poetry, essay and plays.
2. Understanding the historical, cultural and social contexts of American literature.
3. Familiarity of key literary movements in American literature.
4. Cultivating an appreciation for the richness and diversity of American literary traditions.
5. The ability to engage in the thoughtful discussions and debates about American literature.

Paper II: New Literatures in English
Course Outcome:

1. Enhanced understanding of cultures from around the world though exposure to literature.
2. Improved skills in analyzing and interpreting literary works from different parts of the world.
3. The ability to compare literary themes, styles and techniques across different cultures.
4. Encouraging critical thinking by examining the cultural, political and social contexts.

Paper III: Forms of Popular Literature
Course Outcome:

1. Better understanding of its cultural and societal significance.
2. Enhancing critical evaluation of popular literature and its impact.
3. Exploring complexities and nuances within popular literature.
4. Exploring creative writing and encouraging study of popular literature.

Paper IV: Indian Literature in English
Course Outcome:

1. Comprehensive understanding of the rich and diverse literary traditions within India.
2. Analyse how the sociological, historical, cultural and political context impacted the texts selected for study.
3. Analyse the strength and constraints of Indian English as a literary medium.

4. Evaluate critically the contributions of major Indian English poets and
5. Dramatists.

Semester IV:
Paper I : Stylistics and Discourse Analysis
Course Outcome:

1. To understand the concept of style in literature.
2. To understand the linguistic basis of literary criticism (stylistics as an input to literary criticism).
3. To understand the concept of discourse and the principles of discourse analysis .
4. To understand the use of stylistic approach in teaching literature.
5. To understand the impact of stylistic analysis on academic writing.

Paper II: Colonial and Post-Colonial Literature

Course Outcome:

1. Identify key questions, authors, and literary forms in postcolonial literature
2. Think critically about these texts in relation to postcolonial theory
3. Situate these works in their larger cultural contexts
4. Develop interpretative skills of close reading
5. Offer nuanced interpretations, articulate coherent arguments, and develop research skills through your written essays

Paper III: African and Caribbean Literature:

Course Outcome:

1. Identify and discuss important literary figures and texts from the Caribbean and its diaspora.
2. Understand, identify, and analyse different definitions of Caribbean identity and culture.
3. Understand Caribbean history, culture, and identities and how they are represented in literary canons using academic texts, cultural texts, and other sources.
4. Distinguish the strengths, weaknesses, and point of view in sources and texts of the course.

Paper IV:

Translation: Theory and Practice

Course Outcome:

1. Evolution of Translation in global perspective and its development in the domain of Urdu
2. language and literature.
3. Exposure to some basic concepts related to Translation.
4. Introduction of some Important Institutions of Urdu Translation and their contributions.

5. Introduction of Translation Studies.

M.A. POLITICAL SCIENCE

PROGRAMME OUTCOME:
The two years M.A. in Political Science programme is designed to enable the students to:
PO1: Develop conceptual clarity of major theories and concepts of Political Science and related sub-fields.
PO2: Comprehend how power operates at different levels: personal/social/domestic and international and their inter-connectedness.
PO3: Analyse public policy formulations, implementation, problems and available public policy choices.
PO4: Develop critical thinking, articulate arguments on key issues of public policy and politics.
PO5: Demonstrate competency in basic social science research techniques and methods including qualitative and quantitative methods of research design and techniques

PROGRAMME SPECIFIC OUTCOME:
The two year M.A. in Political Science programme is specifically designed to cater to the following needs of the students:
PSO1: Prepare the students to understand the working of the Indian constitution and its operation at the central and state level
PSO2: Make students understand and analyze the operation of power politics at state, national, regional and global levels
PSO3: Give the students career options in higher studies in fields related to public policy, international politics and law, gender studies, development studies, Environmental and sustainable development, law and survey research.
PSO4: The programme prepares the students the undertake research projects/surveys.
PSO5: Formulate socially relevant research proposals and presentations.
PSO6: Provides opportunities to undergo various competitive exams of administrative services, law, and public policy.

SEMESTER – I
(DEBATES IN POLITICAL THEORY)

Course Outcomes
On completion of the course the student will be able to:
CO1: Understand the development of political theories.
CO2: Discern and comprehend various democratic virtues
CO3: Understand political values with respect to current democratic scenario.

CO4: Analyse the political theories present in the contemporary political debates

SEMESTER – I
COMPARATIVE POLITICAL ANALYSIS
.**Course Outcome**
On completion of the course the students will be able to:
CO1: Compare the different nation states and their working.
CO2: Understand the concept of State.

CO3: Identify the historical origin of various states.
CO4: Discern and comprehend the concept and theories of State and its various features

SEMESTER – I
POLITICS IN INDIA
Course Outcome
On completion of the course the students will be able to:
CO1: Understand the basic concept of state politics in India.
CO2: Analyze the functioning and interrelationship between various socio-political dynamics of India
CO3: Discuss the nature of Indian politics
CO4: Comprehend the party-politics in India.

SEMESTER – I
THEORIES OF INTERNATIONAL RELATIONS
Course Outcome
On completion of the course the students will be able to:
CO1: Identify comprehensive paradigm of multi-disciplinary nature of international relations

CO2: Interpret the external and internal dynamics of foreign policy decision-making processes

CO3: Discuss the nature of International relations
CO4: Understand comparative theories of International relation.

SEMESTER – I
(Ability Enhancement Compulsory Course) Course Outcome
On completion of the course the students will be able to:
CO1: Identify the ways of promoting sustainable development.
CO2: Understand the idea of clean and healthy environment.
CO3: Promote the idea of Swachch bharat through practicing the same.
CO4: Analyse the relationship between Environment, ethics and development.

SEMESTER – II
ADMINISTRATIVE THEORY
Course Outcomes:
On completion of the course the student will be able to:
CO1: Understand the core concepts of Public Administration.
CO2: Discern and comprehend various theories and paradigms of Public Administration.
CO3: Understand the basics of Public Policy Process and Governance.
CO4: Analyze the major approaches and recent trends in Public Administration.

SEMESTER – II
THEMES IN INDIAN POLITICAL THOUGHT
Course Outcomes:
On completion of the course a student will able to:
CO1: Understand several theories of Indian political thought

CO2: Analyze the evolution and nature of Indian state and its principles
CO3: Discuss and debate about the theories pertaining to modern India through its evolution.
CO4: Identify the role Indian political thought and their contribution in shaping the contemporary idea of India.

SEMESTER – II
KEY CONCEPTS IN POLITICAL PHILOSOPHY Course Outcomes:
On completion of the course a student will able to:
CO1: Understand several classical political philosophies.
CO2: Analyze the evolution and nature of political philosophy.

CO3: Discuss the various ideologies as given by the thinkers.

CO4: Compare several classical and modern political philosophies.

SEMESTER – II
(COMPARATIVE GOVERNMENT AND POLITICS-(UK, USA, China, Nigeria)
Course Outcomes:
On completion of the course a student will able to:
CO1: Understand governmental institutions of the countries.
CO2: Compare the working of the governmental machineries.
CO3: Discuss ways of building better relations of the countries.
CO4: Comprehend the diversity of political structure of different countries.

SEMESTER – II
POLITICAL SOCIOLOGY
Course Outcomes:
On completion of the course a student will able to:
CO1: Discern major theoretical perspectives and debates in the study of political sociology.
CO2: Elaborate on the primary concepts of- political culture, socialisation and political mobility.
CO3: Comprehend ways to use sociological theories and empirical research to analyze socio- political phenomena.
CO4: Establish the relationship between social movements, political parties, and voting and social change.

SEMESTER – II
On completion of the course a student will able to:
CO1: Understand several ways of developing an opinion about features of Indian constitution.
CO2: Comprehend the Parliamentary debates and ethics.
CO3: Understand the evolution of several constitutional principles through constituent Assembly debates.
CO4: Analyse the rules and procedures of Parliamentary debates.

SEMESTER – III
INTRODUCTION TO INTERNATIONAL LAW

Course Outcomes
On completion of the course the student will be able to:
CO1: Understand the origin, development and codification of the International Laws
CO2: Discern and comprehend various laws related to Statelessness and recognition.
CO3: Analyze the major international laws in case of different warfare.
CO4: Understand international laws related to savagery and war-crimes.

SEMESTER – III
DEMOCRACY AND POLITICAL INSTITUTIONS IN INDIA
Course Outcome
On completion of the course the students will be able to:
CO1: Identify the historical origin and the development of Indian Constitution.
CO2: Understand the concept of constitutionalism.
CO3: Analyze the functioning and interrelationship between judiciary, executive and legislature in India.
CO4: Discuss the nature of Federalism in India and how it affects the Centre-State relationship.

SEMESTER – III
Democracy and Human Rights in India
Course Outcomes:
On completion of the course the student will be able to:
CO1: Understand the core concept of Human Rights in Western as well as Indian context.
CO2: Comprehend the contribution of various constitutional frameworks like Fundamental Rights and Directive Principles in assuring human rights in India.
CO3: Discuss the issue of Human Rights with Disables, Women, and Castes etc.
CO4: Identify various roles of State and Civil Societies in solving the issue of Human Rights.

SEMESTER – III
INDIA AND THE WORLD

Course Outcomes:
On completion of the course the student will be able to:
CO1: Understand the domestic determinants of the Indian Foreign Policy.
CO2: Identify the changing perspective of security from traditional and non-traditional security in context of India.
CO3: Analyze the India's relationship with the neighboring countries and regional blocks.
CO4: Comprehend India's relationship with the U.S.A and Russia post- Cold war.

SEMESTER – III
PARTIES, ELECTIONS AND POLITICAL PROCESS IN INDIA Course Outcomes:
On completion of the course a student will able to:
CO1: Discuss about the party system in India and impact of coalitional politics on the party system.

CO2: Understand the changing nature of national party and the regional parties.
CO3: Analyze the role of gender, caste, religion etc on the voting behavior in

particular and on electoral politics in general.

CO4: Identify the impact of several non-party movements and Non-governmental Organizations on the party system in India.

Gender Sensitization
Course Outcomes:
On completion of the course a student will able to:
CO1: Understand several principles of Ethics and Morality like integrity, empathy, self- confidence etc.
CO2: Analyze the evolution and nature of corporate and professional ethics.

CO3: Comprehend the definition and evolution of "gender".

CO4: Identify the concept of Corporate Ethics and Professional Ethics.

SEMESTER – IV
RESEARCH WRITING SKILLS AND ACTIVITIES Course Outcomes:
On completion of the course a student will able to:
CO1: Understand and apply the knowledge about research design and methods gained from the taught components to develop the dissertation project.
CO2: Discuss the ethical dimensions of research and obtain appropriate ethical approval if needed
CO3: Synthesize knowledge and skills previously gained and apply these to an in-depth study
CO4: Establish links between theory and methods within your field of study

PAPER: Internship /Dissertation/ Project/ Seminar
Course Outcome
On completion of the course the students will able to:

CO1: Comprehend the detailed analysis, critical evaluations and discussion of concepts, theories and ideas.
CO2: Develop certain qualities that will help them in the working of real world such as problem-solving, communication, specialist information etc.

CO3: Understand the ways of asking questions through research questions. 33
CO4: Emphasize on the empirical study.

SEMESTER – IV
Generic Elective Course (GE)
Social Movements and Revolutions

Course Course Outcome :
On completion of the course the student will be able to:
CO1: Identify the difference between Revolution and Social Movement.
CO2: Understand the ideology, strategy and social base used by different

revolutions.
CO3: Comprehend the means, ideology and social base used in different social movements.
CO4: Analyse the revolutions and Social movements in the South Asian context.

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MA ECONOMICS(CO and Po complied)

M.A. (Semester-I) Principles of Micro Economics

Unit-I

Nature and scope of Economics and Microeconomics. Positive and normative analysis. Role of assumptions in economic analysis. Circular flow of economic activity. Concepts of: household, firm, factors of production, equilibrium – partial and general, static, comparative static and dynamic analysis, margin and slope.

Elasticity – need and measures – Relationship between revenue and elasticity.

Unit-II

Analysis of consumer behaviour, demand function, law of demand – cardinal, ordinal and revealed preference approaches, income-consumption curve, Engel curve, substitute and complimentary goods.

Market demand curve; consequences of Bandewagon, Snob and Veblen effect. Concept of consumer surplus.

Unit-III

Laws of Production: short run and long run. Internal and External economies and diseconomies. Concept of cost, derivation of short and long run cost curves. Optimum input combination Simple case of a multiproduct firm. Technical progress and production function – Hick's classification. Elasticity of substitution. Properties of Cobb-Douglas and CES production function.

Unit-IV

Pricing process and equilibrium of firm and industry under perfect competition, monopoly (including discriminating and bilateral monopoly), monopolistic competition. Welfare effects of price control, price support and production quota.

Reading List:

- Koutsoyiannes. A. “Modern Microeconomics” (Macmillan)
- Lipsey, R.G. and Chrysal, K. Alec “An Introduction to Positive Economics” (OUP)-
  Salvatore, D. “Microeconomics Theory” (Schaum’s Outline series, Tata McCraw Hill)

MA (Economics) Semester- I Principles of Macro Economics-

Course Outcomes:

CO1. Students will be able to explain the concept of opportunity costs, trade – off and benefits of economics.

CO2. Students will learn the concept of fiscal and monetary policies and their effect on economy.

CO3. It will demonstrate knowledge of laws of supply and demand and equilibrium.

CO4. Students will be familiar about a clear picture of circular flow model.

Unit-I

Determination of Output and Employment: Classical Approach – Output and Employment in Classical Theory; The Quantity Theory of Money and the Price Level; Classical Model without saving and investment; Classical Model with saving and investment;

Keynesian Approach _ Two Sector Model, Three Sector Model and Four Sector Model.

Unit-II

Determination of Output and Employment: The Extended Model (Hicks-Henson Synthesis): Fixed Price Level – The goods Market and The Money Market; Equilibrium in Goods Market and Money Market; Changes in Aggregate Demand; Govt. spending, Taxation and Aggregate Demand; The IS-LM Elasticities and Monetary Fiscal Policies.

Unit-III

The Extended Model: Variable Price Level – Deviation of Aggregate Demand Curve and Determinination of equilibrium price and output levels; wage-price flexibility and the Full Employment equilibrium; Monetary – Fiscal policies and the Full-Employment Equilibrium.

Unit-IV

Behavioral Foundation: Theories of consumption – The Absolute Income Hypothesis, The Relative Income Hypothesis; The Permanent Income Theory of Consumption; The Life cycle theory of consumption; Theories of Investment – The Present Value of Criterion for investment; The Marginal Efficiency of Capital and Investment; the accelerator theory; financial Theory of investment.

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Reading List:

- Ackley, G (1978), *Macroeconomics: Theory and Policy*, Macmillan, New York.
- Banson, W.A. (1989), *Macroeconomic Theory and Policy, (3rd Edition)*, Harper and Row, New York.
- Dorn Busch, R. and F. Stanley (1997), *Macroeconomics*, McGraw Hill, Inc. New York.
- Heijdra, B.J. and V.P. Fredericck (2001), *Foundation of Modern Macroeconomics*, Oxford University Press, New Delhi.
- Jha, R. (1991), *Contemporary Macroeconomic Theory and Policy*, Wiley Eastern Ltd., New Delhi.
- Shapiro, E. (1996), *Macroeconomic Analysis*, Galgotia Publication, New Delhi.
- Survey, M.J.C. (Ed.) (1976), *Macroeconomic Themes*, Bo and Reed Geoffrey (1994), *International Economics*, Macmillan Press Ltd.
- Peterson, W.C. (1978), Income, Employment and Economic Growth, Norton, New York.
- Sheffrin, Steven M. (1996), Rational Expectations, 2nd edition, Cambridge University Press.

MA (Economics) Semester-I Mathematics for Economists-I

Course Outcomes:

CO1. Students will learn different types of functions and their applications.

CO2 Students will be familiar with the maxima and minima of functions.

CO3 it will impart knowledge about the use of lagrange multiplier methods.

CO4 Students will gain knowledge about the use of net present value and other related concepts.

Unit-I

Basics: real number system, sets and set operations, relations and functions, inverse functions; solution of linear equations in two variables, solution of quadratic equations, logarithms and exponents; exogenous and endogenous variables.

Unit-II

Fundamentals of Matrices; Determinants. Solution of a system of upto 3 equations by matrix inversion and Cramer's rule. Input-Output analysis – Static open model.

Unit-III

Differentiation – idea of limit (but not its evaluation) meaning and economic interpretations of derivative. Rules of differentiation including logarithmic and exponential functions. Unconstrained optimization – single choice variable, global and local.

Unit-IV

Calculus of multivariable functions, higher order derivatives, constrained optimization with upto 2 equality constraints

Reading List:

- Chiang, Alpha C. "Fundamental Methods of Mathematical Economics" (Mc-Graw Hill)
- Dowling, Edward T "Mathematics for Economists" (Schaum's outline Series, Tata Mc-Graw Hill)

M.A. (Semester- I) Economic Development and Policy in India

Course Outcomes

CO1 To have knowledge about the issues in Indian Economy like planning, poverty, unemployment etc.

CO2 To know about relationship between monetary policy, fiscal policy and economic development.

CO3 To know about framework of policy making for the development of Indian economy

CO4 To know about the preparation of budgeting and its utilization for Indian economy.

Unit-I

Features of Indian economy; Nature and Characteristics of Indian economy; Planning; objectives and strategies; failures and achievements of plans.

Basic economic indicators-National income, performance of different sectors. Trends in prices and money supply.

Unit-II

Institutional structure: Land-reforms in India; Agricultural marketing and warehousing; Issues in food security - policies for sustainable agriculture; Agricultural finance policy; Agricultural price policy.

Unit-III

Malthusian theory of population, optimum theory of population, theory of demographic transition, population as 'Limits to Growth' and as 'Ultimate Source'

Concepts of Demography- Vital rates, life tables, composition and uses.

Measurement of fertility - Total fertility rate, gross and net reproduction rate - Age pyramids, population projectionnstable, stationary and quasi-stationary population; Characteristics of Indian population through recent census.

Unit-IV

Financial Sector: Monetary policy of RBI; Money and Capital markets; Growth and problem; Role of commercial banks in India; Banking sector reforms since 1991

Reading List:

- Bardhan. P.K. (9th Edition) (1999), The Political Economy of Development in India,

Oxford University
Press, New Delhi. .
- Brahmadanda, P.R. and V.R. Panchmukhi (Eds.) (2001), Development Experience in the Indian Economy:
Inter-State Perspectives, Bookwell, Delhi.
- Datta, R. and KP.M. Sundhram (2003), Indian Economy. S. Chand & Company Ltd. New Delhi.
- Government of India, Economic Survey, (AnnuaJ), Ministry of Finance, New Delhi.
- Mishra, S.K and V.K Puii Indian Economy- 151 Development Experience, Himalaya Publishing House, Mumbai, Latest Edition.
- Rudra Ashok, Indian Plan Models.
- Todaro, P. Development Planning: Models and Methods.
United Nations, Guidelines for Project Evaluation.

MA (Economics) Semester-II –Open Economy Macro Economics

Course Outcomes:

CO1. It will help the students to apply supply and demand models to analyze responses of market to external events.

CO2 It will help students to describe ISLM model.

CO3 The course will illustrate the role of financial institutions in the economy.

CO4 Students will be able to explain concept of gross domestic product, inflation and unemployment.

Unit-I

The Demand for and supply of money: Classical Approach to Demand for Money – Quantity Theory Approach; ;Fisher's equilibrium; Cambridge Quantity theory; Keynes Liquidity Approach – Transaction; Precautionary and Speculative Demand for Money Aggregate Demand for Money; Friedman, Patinkin Baumol and Tobin.

Determinants of money supply, High-powered money, Money multiplies.

Unit-II

Inflation: Definition of Inflation; Economics effects of Inflation – The effect of Inflation of the distribution of Income and Wealth, The effect of Inflation on output, Employment and the Growth Rate; Demand Side and Supply Side theories of inflation.

Unit-III

Inflation and unemployment: The Phillips Curve, The Inflationary Pressure Curve: Phillips Curve, Inflationary Pressure Curve and the Rate of Inflation. The Phillips Curve; Trade off and Non Trade Off. Adaptive Expectation and Rational Expectation Keynesianism Vs Monetarism.

Unit-IV

Trade Cycles – Models of Samuelson, Hicks and Kaldor, Economic Growth: Harrod- Doman Model; Neo-Classical Model (with money & without money). International Adjustment: The Determination of National Income in Open Economy; The International Transmission of Disturbance: Transmission under Fixed Exchange Rate; Transmission under Floating Exchange Rate (Mudel Fleming Model).

Reading List:

- Ackley, G (1978), *Macroeconomics: Theory and Policy*, Macmillan, New York.
- Banson, W.A. (1989), *Macroeconomic Theory and Policy, (3rd Edition)*, Harper and Row, New -York.
- Dorn Busch, R. and F. Stanley (1997), *Macroeconomics,* McGraw Hill, Inc. New York.
- Heijdra, B.J. and V.P. Fredericck (2001), *Foundation of Modern Macroeconomics*, Oxford University Press, New Delhi.
- Jha, R. (1991), *Contemporary Macroeconomic Theory and Policy*, Wiley Eastern Ltd., New Delhi.
- Shapiro, E. (1996), *Macroeconomic Analysis*, Galgotia Publication, New Delhi.
- Survey, M.J.C. (Ed.) (1976), *Macroeconomic Themes,* Bo and Reed Geoffrey (1994), *International Economics*, Macmillan Press Ltd.
- Peterson, W.C. (1978), Income, Employment and Economic Growth, Norton, New York.
- Sheffrin, Steven M. (1996), Rational Expectations, 2nd edition, Cambridge University Press.

MA (Economics) Semester-II

General Equilibrium and Welfare Economics

Course Outcomes:

CO1. It will familiarized the students with different types of equilibrium..

CO2 Students will get to know the different welfare approach.

CO3 Students will get to know about the welfare economics.

Unit-I

Pre-Paretian Welfare Economics: Measurement of Economic Welfare - Definition - Benthamite Approach to Aggregate Welfare - Optimum Resource Allocation and Welfare Maximization - Issue of Interpersonal Comparisons of Utility Principles of Compensating Variation - Hick's Consumer's Surpluses - Concept of Consumer's Surplus - Consumer's Surplus and Tax-Bounty analysis.

Unit-II

Utilitarian Economics. Paretian Welfare Economics: Pareto-Optimality and Market Equilibrium - Arrow's Impossibility Theorem - Externalities and Market Failures - Welfare Economics and Social Choice Theory - Pigouvian Welfare Economics - Second Best Optima - Sen's Contributions to Welfare Economics - Collective Choice and Social Welfare

Unit-III

Compensation Criteria- Contributions of Barone, Kaldor and Hicks; Scitovsky Double Criterion - Bergson's Social Welfare Function -Welfare and General Equilibrium - Pareto-Optimality and Market Equilibrium - Samuelson's Utility Possibility Curve - Value Judgments and Welfare Economics. Choice Theory, Theory of Public Choice and Policy implications of Public Choice Theory

Unit-IV

Divergence between Private and Social Costs - External Economies and Diseconomies Problem of Public Goods; Attempts to Develop Dynamic Welfare Analysis - Collective Choice and Social Welfare - Social Choice and Political Decision Making.

Reading List:

- Koutsoyiannes. A. "Modern Microeconomics" (Macmillan)
- Lipsey, R.G. and Chrysal, K. Alec "An Introduction to Positive Economics: (OUP)
- Salvatore, D. "Microeconomics Theory" (Schaum's Outline series, Tata McCraw Hill)

M.A. (Semester-II) Economics of Growth

Course Outcomes:

CO1 Students would be acquainted with the various perspectives of economic growth and its relevance.

CO2 Students would become familiar with factors affecting economic growth and development.

CO3 Students would understand the conceptual bases of income measurement, physical quality of life index, poverty, inequality and development gap and role of various institutions in economic growth and development.

CO4 Students would have knowledge about the nature and classical theories of development. Students would be able to apply economic theories and concepts to contemporary social issues, as well as formulation and analysis of policy and recognize the role of ethical values in economic decisions.

CO5 Students would learn the key tools to analyse agricultural economies, with an eye towards understanding a wide array of impacts, from agricultural policies to trade and climate change and what the role agriculture and industry have in economic development.

Unit 1

Economic Growth and Development

Factors affecting Economic Growth: capital, labour and technology; Historical Perspective of Economic Growth and its relevance; Structural Diversity and common characteristics of developing nations.

Unit-II

Development and Underdevelopment

Measuring Development: Income Measures, Basic Needs Approach, PQLI and HDI and Capabilities Approach; Poverty, Inequality and Development: Measurement, Impact and Policy options; Development Gap: concepts and measurement. **Unit-III**

Classical Theories of Development

Contributions of Adam Smith, Ricardo, Karl Marx and Schumpeter.

Unit-IV

Growth Models

Harrod and Domar: Instability of equilibrium; Neo Classical Growth Models: Solow and Meade; Growth Models of Joan Robinson and Kaldor. **Basic Reading List**

- Adelman, I. (1961), Theories of Economic Growth and Development, Stanford University Press, Stanford.
- Barro, R. and X. Salai- Martin, Economic Growth, McGraw Hill, New York.
- Behrman, S. and T.N. Srinivasan (1995), Handbook of Development Economics, Vol. 3, Elsevier, Amsterdam.
- Brown, M. (1966), On the Theory and Measurement of Technical Change, Cambridge, University Press, Cambridge, Mass.
- Chakravarti, S. (1982), Alternative Approaches to the Theory of Economic Growth, Oxford University Press, New Delhi.
- Chenery, H. and T.N. Srinivasan (Eds.) (1989), Handbook of Development Economics, Vols. 1 & 2, Elsevier, Amsterdam.
- Ghatak, S. (1986), An Introduction to Development Economics, Allen and Unwin, London.
- Gillis, M., D.H. Perkins, M. Romer and D.R. Snodgrass (1992), Economics of Development, (3rd Edition), W.W. Norton, New York.
- Higgins, B. (1959), Economic Development, W.W. Norton, New York.
- Jones, HG.(1975), An Introduction to Modern Theories of Economic Growth, Nelson, London.
- Kindleberger, C.P. (1977), Economic Development, (3rd Edition), McGraw Hill, New York.

- **Reading List:**

- Meir, G.M. (1995), Leading Issues in Economic Development, Oxford University Press, New Delhi.
- Mishra S.K. and V.K. Puri, Economics of Development and Planning, Himalaya Publishing House, Mumbai.
- Todaro, M.P. Economic Development, Latest Edition, Longman, London.
- Thiwal, A.P. (2003), (6^{th} Edition), Growth and Development, Seventh Edition, Macmillan, New York.
- Hogendorn, J. (1996), Economic Development, Addison, Wesley, New York.

MA (Economics) Semester-II

MONETARY ECONOMICS

Course Objective:

Students after the completion of this course are expected to identify the intensive but diversified role of money and monetary policy in the process of economic transformation and development which is required to uplift the quality of life. They will also be able to take systematic policy decision when it is required.

Unit I:

Basic Concept The function, Advantage and Definition (Theoretical and Empirical) of Money

Unit II:

Development of Monetary Theories a. Classical and Neo-Classical Theories b. Keynesian Monetary Theory c. Patinkin's Theory of Real Balance Effect d. Monetarism e. New Classical School

Unit III:

Supply of and Demand for Money a. Money Supply Analysis: Monetary Base Model of Money Supply Analysis (Money Multiplier), Decomposition of High Power Money. b. Demand for Money: Classical Neo-Classical, Keynes's, Friedman's, Inventory theoretic approach, Portfolio Balance Approach and McKinnon's Approach.

Unit IV:

Theories of Inflation a. Concept and Measurement of Inflation. b. Demand Pull Inflation, Cost Push Inflation. c. Inflation Theories: Classical and Neo-Classical Theories, The Inflationary Gap Model, The Phillips Curve, Lipsey's Version, Samuelson Solow Modification of Phillip Curve.

M.A. (ECONOMICS) SEM.-III

Public Finance

Course Outcomes

CO1 The students would learns of the feature the federal structure and financial relationship among them.

CO2 The course would develop the analytical ability of students to distinguish between beneficial and detrimental effects of a government policy and their effect on macroeconomics framework of an economy.

CO3 It will helps students to critically analyse the fiscal reforms and policy choices of the government in developed and developing countries.

Unit-I

Economic rationale of government, fiscal functions; market failures: imperfections, decreasing costs, externalities and public goods; concepts of private goods, pure public goods, mixed goods and merit goods; theory of public goods; free Rider's problem, the optimal provision of public goods, contributions of Samuelson arid Musgrave. Lindhal equilibrium; public choice and fiscal decision making, voting systems, majority voting.

Unit-II

Budgeting: various concepts, reforms in expenditure budgeting, zero based budgeting and performance budgeting. Budgets of the Union Government in India, budget making process in India; public expenditure in India: trends and issues.

Unit-III

Public Expenditure: structure and growth of public expenditure; Wagner's hypothesis, Peacock-Wiseman hypothesis; economic effects of public expenditure; criteria for public investment, social cost-benefits analysis: valuation of benefits and costs, discount rate.

Unit-IV

Theory of Taxation: Various approaches to taxation, neutrality, equity, ability to pay, benefit principle, revenue maximization, income maximization; analysis of incidence of taxes, elasticity, buoyancy and taxable, capacity, efficient tax design: optional taxation, effects of taxation on work effort, savings, investment and growth; classification of taxes: direct and

indirect taxes, progressive, proportionate and regressive taxes, Advalorem and specific taxes; tax systems in India; structure, composition and various economic issues..

Reading List:

- Musgrave R.A and Musgrave P.B., Public Economics in Theory and Practice, McGraw Hill.
- Stiglitz, J,E., Economics o/Public Sector, J.W. Norton & Company.
- Singh, S.K., Public Finance in Theory and Practice, S. Chand & Co.

Government of India, Ministry of Finance: Economics Survey (of various years).

- Raja J. Challiah, Towards Sustainable Growth, Essays in Fiscal and Financial Sector Reforms in India, ○ Oxford University

  Press, Delhi, 1996
- Deena Khatkhate (ed.), Money and Finance: Issue, Institutions, Policy, Sameeksha Trust, Orient Longman, 1998.
- Kunal Sen & Rajendra R. Vidya (ed.), Process of Financial Liberalization in India, Oxford

  University ○

  Press, 1997.
- Mundel Sudipto (ed.) Public Finance: Policy Issue of India.
- Brown C.V. and Jackson P.M. (1990), Public Sector Economic, Basil Balackwell, Oxford.
- M. Govindia Rao and Tapan Sen (1998), Financial Federalism in India.
- Atkinson A.B. and Stightz, J.E. (1980), Lectures on Public Finance, Tata Mcgraw HilL
- Auerbach, A.J. and M. Feldstern (ed.) (1985), Handbook of Public Economics, Vol-I, North Holland,

  ○ Amsterdam.
- Raghabendra Jha (1999), Modern Public Economics, Rotledge, London.
- Srivaslava D.K. (ed.) (2000), Fiscal Federalism in India, Har-Anand Publication Ltd., New Delhi.
- Bhargava P.K. (1991), India's Fiscal Critics, Ashish Publishing House, New Delhi.

Govt. of India, Ministry of Finance (1988), Sarkaria Commission Report on Centre-State Finance Relations.

M.A. (Semester-III) Statistical Methods

Course Outcomes:

CO1. Students would learn the common statistical techniques and terminologies used in the course and understand the concept of a frequency distribution for sample data, and able to summarise the distribution by diagrams and statistics.

CO2 Students would be able to apply fundamental concepts and use appropriate software tools for data summary and exploratory data analysis.

CO3 Students would gain knowledge to interpret examples of methods for summarising data sets, including common graphical tools and summary statistics.

CO4 Students would develop an understanding of the basic concepts of probability, random variables, and sampling distribution of a statistic.

CO5 Students would learn the measurement of central tendency, hypothesis testing, analysis of variance and multiple regression and correlation analysis.

CO5 Students would become familiar with the sources of vital statistics data, how to interpret such data and how to perform basic tests to evaluate them which will help students in their doctoral research.

Unit –I

Diagrammatic and graphic representation of statistical data. Measures of central tendency: A.M.,

G.M., H.M., Median, quartiles, deciles, percentiles, mode, relationship between A.M., G.M. and

H. M., Selection of an average, Limitations of Averages.

Unit-II

Measures of dispersion: range, interquartile range, quartile deviation, mean deviation, standard deviation, standard deviation of the combined series, variance, coefficient of variation, relation between various measures of dispersion, Lorenz curve, skew ness and Kurtosis, moments

Unit-III

Index numbers: Problems and methods of construction of various types of indices, Laspeyres,

Pasche's and Fisher's ideal index numbers, Time reversal, factor reversal and circular tests; chain base indices, base shifting splicing and deflating the index nos., costs of living index numbers and consumer price index numbers. Time series: components of time series and their decomposition, Methods of measuring trend, cyclical, seasonal and irregular variation.

Unit-IV

Random experiment, random variable, sample space, events, fundamental principles of counting, classical, relative frequency and axiomatic approaches to probability, basic results on probability, conditional probability, Baye's thereon.

Reading List:

- Gupta S.C. "Fundamentals of Statistics" S. Chand & Sons New Delhi (1993)
- Spiegel, Murry R "Theory and problems of Statistics" (Schaum's outline series, McGraw Hill, 1992)
- Karmal P.H. and Polasek M. "Applied Statistics for Economists (4^{th} edition), Pitman, Australia.

M.A. (Semester- III)
Indian Economy (optional)

Course Outcomes

CO1 To have knowledge about the issues in Indian Economy like planning, poverty, unemployment etc.

CO2 To know about relationship between monetary policy, fiscal policy and economic development.

CO3 To know about framework of policy making for the development of Indian economy

CO4 To know about the preparation of budgeting and its utilization for Indian economy.

Unit-I

Features of Indian economy; Nature and Characteristics of Indian economy; Planning; objectives and strategies; failures and achievements of plans.

Basic economic indicators-National income, performance of different sectors. Trends in prices and money supply.

Unit-II

Institutional structure: Land-reforms in India; Agricultural marketing and warehousing; Issues in food security - policies for sustainable agriculture; Agricultural finance policy; Agricultural price policy.

Unit-III

Malthusian theory of population, optimum theory of population, theory of demographic transition, population as 'Limits to Growth' and as 'Ultimate Source'

Concepts of Demography- Vital rates, life tables, composition and uses.
Measurement of fertility - Total fertility rate, gross and net reproduction rate -
Age pyramids, population projectionnstable, stationary and quasi-stationary population; Characteristics of Indian population through recent census.

Unit-IV

Financial Sector: Monetary policy of RBI; Money and Capital markets; Growth and problem; Role of commercial banks in India; Banking sector reforms since 1991

Reading List:

- Bardhan. P.K. (9th Edition) (1999), The Political Economy of Development in India, Oxford University
  Press, New Delhi. .
- Brahmanada, P.R. and V.R. Panchmukhi (Eds.) (2001), Development Experience in the Indian Economy:
  Inter-State Perspectives, Bookwell, Delhi.
- Datta, R. and KP.M. Sundhram (2003), Indian Economy. S. Chand & Company Ltd. New Delhi.
- Government of India, Economic Survey, (AnnuaJ), Ministry of Finance, New Delhi.
- Mishra, S.K and V.K Puii Indian Economy- 151 Development Experience, Himalaya Publishing House, Mumbai, Latest Edition.
- Rudra Ashok, Indian Plan Models.

- Todaro, P. Development Planning: Models and Methods.
- United Nations, Guidelines for Project Evaluation.

M.A. (Semester-IV)

International Economics

Course Outcomes

CO1	Students would know the country's position regarding international trade, payments and foreign exchange.
CO2	The students would learn the methods regarding improvement in terms of trade, international debt and balance of payments positions.
CO3	Students would know about the policies regarding increase in exports, to deal with international institutions and to maintain relation with other countries. Since globalization and international relations can increase the rate of growth and solve domestic problems like inflation, unemployment and value of currency etc.

Unit-I

The pure theory of international trade - Theories of absolute advantage, comparative advantage and opportunity costs, modem theory of international trade; Theorem of factor price equalization; Empirical testing of the theory of absolute cost and comparative cost-Heckscher-Ohlin theory of trade. Kravis and Linder theory of trade Role of dynamic factors, i.e. change in tastes, technology and factor endowments in explaining the emergence of trade;

Unit-II

The Rybczynski theorem-concept and policy implications of immiserizing growth; Causes of emergency and measurement of intra-industry trade and its impact on developing economies. Measurement of gains from trade and their distribution; Concepts of terms of trade, their uses and limitations for less developed countries; Trade as an engine of economic growth; Welfare implications - empirical evidence and policy issues;

Unit-III

The Theory of interventions (Tariffs, Quotas and non-tariff barriers); Economic effects of tariffs and quotas on national income, output, employment, terms of trade, income distribution and Balance of payments on trading partners both in particle and general equilibrium analysis. The political economy of non-tariff barriers and their implications; Trade under imperfectly competitive market.

Unit-IV

Meaning and components of balance of payments; Equilibrium and disequilibrium in the balance of payments; The process of adjustment under system of gold standard, fixed exchange rates and flexible exchange rates; Expenditure-reducing and expenditure-switching policies and direct controls for adjustment; Policies for achieving internal and external equilibrium simultaneously under alternative exchange rate regimes; a critical review of the Absorption and monetary approaches to the theory of balance payment adjustment;

Reading List:

- Bhagwani, J. (Ed.) (1981), International Trade, Selected Readings, Cambridge University press, Massachusetts.
- Carbouth, M. (1999), International Economics, International Thompson Publishing, New York.
- Chacholiades, M. (1990), International Trade: Theory and Policy, McGraw Hill, Kogakusha, Japan.
- Dana, M.S. (2000), International Economics: Study Guide and Work Book (5th Edition), Rutledge Publishers, London.
- Dunn, R.M. and J.H. Mutt (2000), International Economics, Rutledge Publishers, London.

- Kenen, P.B. (1994), The international Economy, Cambridge University Press, London.
- Kindleberger, C.P. (1973), International Economics, R.D. Irwin, Homewood.
- King, P.G. (1995), International Economics and International Economic Policy: A Reader, McGraw Hill International, Singapore.
- Krufrnan, P.R. and M. Obstfeld (1994), International Economic: Theory and Policy, Glenview, Foresman.
- Salvatore, D. (1997), International Economics, Prentice Hall, Upper Saddle River, N.J. New York.
- Soderston, BO (1991), International Economics, The Macmillan Press Ltd., London

M.A. (Semester-IV)

Financial Institutions and Markets

Course outcomes

CO1 Students would have knowledge regarding money market, capital market, stock exchange i.e. Indian Financial System which is the backbone of the country.

CO2 To familiar students about the relationship between financial development and economic development.

CO3 To impart knowledge to students about controller of financial system, e.g. RBI, SEBI, IRDA and TERI.

Unit-I

Nature and Role of Financial System and Structure of Interest Rates - Money and finance-Money and near-money-Financial intermediation and financial intermediaries - The structure of the financial development.

Unit-II

Equilibrium in Financial Markets - Financial System and Economic Development Criteria to evaluate assets: Risk and financial assets, types of risk, return on assets, Risk - Return trade off Valuation of securities.

Unit-III

Theories of interest rate determination - Level of interest rates - Long period and Short period rates Term Structure of Interest rates - Theories of interest rates structure - Expectational theory Segmentation theory; Administered interest rates - Appropriate interest rate policy.

Unit-IV

Banks, Monetary Policy and Non-Bank Financial Interest diaries: Functions of Central Bank The aims and objectives of the monetary policy in developed and developing countries.

Reading List:

- Bhole, L.M. (1999), Financial Institutions and Markets, Tata McGraw Hill Company Ltd., New Delhi.
- Bhole, L.M. (2000), Indian Financial System, Chugh Publications, Allahabad.
- Edminster, R.O. (1986), Financial Institutions, Market and Management, McGraw Hill, New York.
- Goldsmith, R.W. (1969), Financial Structure and Development, Yale, London.
- Hanson, J.A. and S. Kathuria (Eds.) (1999), India: A Financial Sector for the Twenty-first Century, Oxford University Press, New Delhi.
- Karker, P.T. and S.A. Zenios (2000) (Ed.), Performance of Financial Institutions, Cambridge University Press, Cambridge.
- Johnson, H.J. (1993), Financial Institutions and Markets, McGraw Hill, New York.
- Khan M. Y. (1996), --Indian Financial Systems, Tata McGraw Hill, New Delhi.
- Machiraju, M.R. (1999), Indian Financial System, Vikash Publishing House, New Delhi.

  Ohlson, J.A. (1987), The Theory of Financial Markets and Institutions, North Holland, Amsterdam.
- Prasad, -K.N. (2001), Development of India's Financial System, Sarup & Sons, New Delhi.
- Robinson, R.I. and D. Wrightman (1981), Financial Markets, McGraw Hill, London.
- Smith, P.F. (1978), Money and Financial Intermediation: The Theory and
- Structure of Financial System, Prentice Hall, Englewood-Cilffs, New Jersey.

M.A. Economics Semester-IV

Agricultural Economics (optional)

Course Outcomes

CO1 Course provides knowledge agricultural background , farm and agro business activities, agri finance and management.

CO2 It introduces learner applied part of economics instead theoretical, which deals with allocation of land under various crops, specialization, diversification and other policy amplifications.

CO3 Course offer relevant production and various techniques to understand agri production, cost benefit analysis and enhance learner to make frontier-production function at least cost.

Unit-I

Land Reforms in India: Agricultural Development and Tenurial conditions: Land Reforms - The

Theoretical Issues (Meaning, Important changes caused by Land Reform and Objectives of Land

Reforms); Land Reforms; Ceiling on Land Holdings; Implementation of Land Reforms in India.

Strategy for Development of Indian Agriculture; The Green Revolution; Factors responsible for Green Revolution; Economics Benefits of Green Revolution; Measures for making Green Revolution all pervasive; Regional disparities created by Green Revolution; Inter-farm disparity in Income; Green Revolution and Employment. Trends in Migration and Labour markets; Minimum Wages Act.

Unit-II

Terms of Trade between Agriculture and Industry: Meaning; Impact of change in terms of trade in favour of and against agriculture; changes in terms of trade between agriculture and industry during the course of economic development; Terms of trade between agriculture and industry in India since Independence; Agricultural Marketing: Need for an efficient system of agricultural marketing; Efficiency of agricultural Marketing system in India; Measures to improve the efficiency of agricultural marketing in India. Cooperative movement in India - organization structure and development of different types of cooperatives in India.

Unit-III

Agricultural Credit: Importance of agricultural credit; Sources (formal and informal), problems and Government policies since Independence. Capital formation in the rural sector - savings, assets and credits. Issues in Agriculture price policy: objectives of Agricultural Price Policy; Main elements of Agricultural Price Policy; Agricultural Price Policy in India: Its evolution; objectives of Price policy in India; Important constitution of Agriculture Price Policy in India; Critical Evaluation of India's Agriculture Price Policy; Need for Revision of Agricultural Price Policy in India.

Unit-IV

The New Economic Policy and Indian Agriculture: Macro Economic Stabilization measures; structural Adjustments in the Agricultural Sector. World Trade Organization and Indian Agriculture; Model of Production Debate: Private V /s Public investment in Agriculture; Trends in public and private investment in Indian Agriculture.

M.A. Economics Semester-IV

International Finance (optional)

Course Outcomes

CO1 Students would know the country's position regarding international trade, payments and foreign exchange.

CO2 The students would learn the methods regarding improvement in terms of trade, international debt and balance of payments positions.

CO3 Students would know about the policies regarding increase in exports, to deal with international institutions and to maintain relation with other countries. Since globalization and international relations can increase the rate of growth and solve domestic problems like inflation, unemployment and value of currency etc.

Unit-I

Foreign trade multiplier with and without foreign repercussions and determination of national income and output; Relative merits and' demerits of fixed and flexible exchange rate in the

context of growth and development in developing countries. Forms of economic cooperation; Static and Dynamic effects of a custom union and free trade areas.

Unit-II

International Monetary System and Trade Policies in India: Multilateralism and WTO; Rise and fall off gold standard and Bretton-Wood system; Need, adequacy and determinants of international reserves; Conditionality clause of IMP; Emerging International Monetary System with special reference to Post Maastrishit developments and developing countries; Reforms of the International Monetary System, Theory of regionalism at global level - collapse of Brettonwood system. Optimum currency Areas - Theory and impact in the developed and developing countries.

Unit-Ill

Indian and developing countries; Functions of GATT/WTO (TRIPS; TRIMS); Recent changes in the direction and composition of trade and their implication; Rationale and impact of trade reforms since 1991 on balance of payments, employment and growth. **Unit-IV**

Problems of India's International debt; Working and regulations of MN9 in India, Instrument of export promotion and recent import and export policies and agenda for future.

Reading List:

- Bhagwani, J. (Ed~) (1981), International Trade, Selected Readings, Cambridge University press, Massachusetts.
- Carbouth, M. (1999), International Economics, International Thompson Publishing, New York.

  Chacholiades, M. (1990), International Trade: Theory and Policy, McGraw Hill, Kogakusha, Japan.
- Dana, M.S. (2000), International Economics: Study Guide and Work Book (5'/1 Edition), Rutledge Publishers, London.'
- Dunn,R.M. and I.H. Mutt (2000), International Economics, Rutledge Publishers, London.
- Kenen, P.B. (1994), The International Economy, Cambridge University Press, London.

Lesson Plan

BA I Semester

Principles of Political Science - PS 101

Credit- 4

Unit I: Introduction

Week 1: Political Science: Meaning, Definition, Nature, and Scope

- **Objective:** Understand the foundational concepts of Political Science and its scope.
- **Activities:**
  - Lecture on the meaning, definition, and scope of Political Science.
  - Discuss the nature of Political Science as an academic discipline.
  - Read and discuss selected excerpts from foundational texts.
- **Assessment:** Short quiz on definitions and scope of Political Science.

Week 2: Relationship of Political Science with History, Economics, and Sociology

- **Objective:** Explore how Political Science interacts with other social sciences.
- **Activities:**
  - Lecture on the interdisciplinary nature of Political Science.
  - Group discussion on examples of interdisciplinary research.
  - Case studies illustrating the integration of Political Science with History, Economics, and Sociology.
- **Assessment:** Write a brief essay on how Political Science is related to one of the mentioned disciplines.

Week 3: Methods of Political Science: Historical, Comparative, and Philosophical

- **Objective:** Examine different methods used in Political Science research.
- **Activities:**
  - Lecture on historical, comparative, and philosophical methods.
  - Comparative analysis of case studies using different methods.
  - Workshop on identifying and applying these methods in research.
- **Assessment:** Class activity where students identify the method used in various political studies.

Week 4: Modern Approaches to the Study of Political Science: Behavioral and System

- **Objective:** Understand modern approaches such as Behavioral and Systems Theory.
- **Activities:**
  - Lecture on Behavioral and Systems approaches.
  - Discussion on the impact of these approaches on Political Science research.
  - Readings from key theorists in these approaches.
- **Assessment:** Group presentation on how Behavioral and Systems approaches can be applied to contemporary political issues.

Unit II: The Concept of State

Week 5: The State: Meaning, Definition, and Elements

- **Objective:** Define the state and its essential elements.
- **Activities:**
  - Lecture on the definition and elements of the state.
  - Class discussion on the role and functions of the state.
  - Case studies of different state structures.
- **Assessment:** Quiz on the meaning, definition, and elements of the state.

Week 6: Theories of Origin of State: Social Contract and Evolution Theory

- **Objective:** Analyze the major theories regarding the origin of the state.
- **Activities:**
  - Lecture on Social Contract Theory (Hobbes, Locke, Rousseau) and Evolution Theory.
  - Comparative analysis of the theories.

    - Group debate on the validity of each theory.
- **Assessment:** Short essay comparing Social Contract Theory with Evolution Theory.

Week 7: Sovereignty: Meaning, Characteristics, and Theories

- **Objective:** Explore the concept of sovereignty and its theoretical perspectives.
- **Activities:**
    - Lecture on the meaning, characteristics, and theories of sovereignty (Monistic and Pluralist).
    - Discussion on contemporary issues related to sovereignty.
- **Assessment:** Case study analysis on a recent sovereignty dispute.

Week 8: Law: Meaning, Definition, Sources, and Kinds

- **Objective:** Understand the concept of law in political context.
- **Activities:**
    - Lecture on the meaning, definition, sources, and types of law.
    - Discussion on the role of law in political systems.
- **Assessment:** Quiz on the meaning, sources, and kinds of law.

Unit III: Concepts of Political Theory

Week 9: Liberty: Meaning and Dimensions

- **Objective:** Explore the concept of liberty and its dimensions (Negative and Positive).
- **Activities:**
    - Lecture on the meaning and dimensions of liberty.
    - Case studies on different applications of liberty.
- **Assessment:** Comparative essay on Negative vs. Positive Liberty.

Week 10: Equality: Meaning, Dimension, and Kinds

- **Objective:** Examine the concept of equality in political theory.
- **Activities:**
    - Lecture on the meaning, dimensions, and types of equality.
    - Group discussion on how different types of equality impact political systems.
- **Assessment:** Group project on equality issues in different political contexts.

Week 11: Justice: Meaning and Dimensions

- **Objective:** Analyze the concept of justice and its dimensions (Procedural and Substantive).
- **Activities:**
    - Lecture on justice and its dimensions.
    - Case studies on justice in various political systems.
- **Assessment:** Short essay on the application of procedural vs. substantive justice in current events.

Week 12: Rights: Meaning and Kinds

- **Objective:** Understand different types of rights: Natural Rights, Political Rights, and Legal Rights.
- **Activities:**
    - Lecture on the meaning and types of rights.
    - Discussion on the significance of rights in political theory.
- **Assessment:** Quiz on the different types of rights and their implications.

Unit IV: Post-Modern Theory

Week 13: Feminism

- **Objective:** Explore feminist theory and its impact on political science.
- **Activities:**
  - Lecture on key feminist theories and thinkers.
  - Discussion on feminist critiques of traditional political theories.
- **Assessment:** Presentation on a specific feminist theory and its influence on political discourse.

Week 14: Ecologism

- **Objective:** Examine the principles of ecologism and its relevance to political theory.
- **Activities:**
  - Lecture on the foundations of ecologism.
  - Case studies on environmental policies influenced by ecologism.
- **Assessment:** Group project on the impact of ecologism on contemporary political issues.

Week 15: Communalism

- **Objective:** Analyze the concept of communalism and its implications for political systems.
- **Activities:**
  - Lecture on communalism and its historical and contemporary contexts.
  - Discussion on communalism's impact on state policies and social harmony.
- **Assessment:** Essay on the role of communalism in shaping political conflicts and policies.

Week 16: Post-Modernism

- **Objective:** Understand post-modernism and its influence on political theory.
- **Activities:**
  - Lecture on key concepts of post-modernism.
  - Discussion on how post-modernism challenges traditional political theories.
- **Assessment:** Critical analysis essay on post-modernism's effect on contemporary political thought.

Reference:

10. A. Leftwich, *what is politics: the Activity and Its Study*, Polity, 2004.
11. John Hoffman and Paul Graham, *Introduction to Political Theory*, Pearson (latest edition).
12. Barrie Axford et. al., *Politics: An Introduction*, Routledge (latest edition)
13. Ernest Barker, *Principles of Political and Social Theory*
14. Harold A. Laski, *Grammar of Politics*
15. J.W. Garner, Political Science and Government
16. Catriona McKinnon, Issues in Political Theory, Oxford 2008.
17. Sushila Ramaswamy, Political Theory: Ideas and Practices, Macmillan (latest edition).
18. O.P. Gauba, *An Introduction to Political Theory*, 5th edition, Macmillan.

RAFFLES
UNIVERSITY

TEACHING PLAN: INTRODUCTION TO BRITISH POETRY

SCHOOL OF HUMANITIES AND SOCIAL SCIENCES	ACADEMIC SESSION- 2023-24	FOR BATCH (BA I Sem): 2023-2026
1 COURSE CODE		ENG 101
2 COURSE TITLE		Introduction to British Poetry

3	**CREDITS**	**4**
4	**LEARNING HOURS**	**CONTACT HOURS 60** **PRACTICAL TEACHING 20** **PROJECT, TUTORIAL, ASSESSMENT 20** **TOTAL HOURS 100**
5	**COURSE OBJECTIVE**	The subject of poetry is designed for students of humanities having English Literature as a subject equip them with basic outlines of different forms of poetry and their application in form of selected texts from British Literature.
6	**COURSE OUTCOMES**	After completing the course, the students shall be able to: 1. Students will have exposure to the different forms of poetry. 2. Students will be able to understand Sonnet, Elegy, Ballad, Ode, Lyric and Epic and stanza form like Heroic Couplet, Blank verse, Spenserian Stanza and Terza Rhyme. 3. Students will gain insight into the development of British poetry. 4. Students will understand the socio-political context of Elizabethan age to Modern age.

7 OUTLINE OF THE SYLLABUS:

7.00	PAPER CODE	UNIT	INTRODUCTION	REFERENCES	TEACHING METHODS
7.01	DC I	1.	FORMS OF POETRY • Sonnet • Elegy • Epic • Ballad • Lyric • Ode	*English Literature by William J. Long*	Detailed class room discussion and reading of texts in class, Question and Answers Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings, and clearing of students' doubts in class
7.02	DC I	2.	Stanza Forms • Heroic Couplet • Blank Verse • Spenserian Stanza • Terza Rhyme	*A Glossary of Literary Terms by M.H. Abrams*	Detailed class room discussion and reading of texts in class, Question and Answers Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings
7.03	DC I	3.	• William Shakespeare: Sonnet No. 116, The Seven Ages of Man • Michael Drayton: Since There's No Help Left • John Donne: Canonization	Complete Collection of Shakespeare's Sonnets by William Shakespeare John Donne's Poetry	Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings, Revision of full syllabus and clearing of doubts
7.04	DC I	4.	• William Blake: A Poison Tree, The Little Black Boy • William Wordsworth: The World is Too Much with Us • P.B. Shelley: Ode to the West Wind	Selected Poems of William Blake Wordsworth's Poetry and Prose: A Norton Critical Edition Selected Poems and Prose by Percy Bysshe Shelley	Detailed class room discussion and reading of texts in class, Question and Answers Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings

8		**Course Evaluation**
8.0	**CA: 20%**	
8.1	**Attendance**	5%

8.2	**Homework**	
8.3	**Presentation**	10%
8.4	**Quizzes**	
8.5	**Projects**	
8.6	**Any Other**	5%
8.7	**MTE(IA)**	
8.8	**End Term Examination**	60%
	References and Video References	
9	**References**	1. *English Literature by William J. Long* 2. *A Glossary of Literary Terms by MH Abrams* 3. *Kumar and P. Sreehari : Communicative English Orient Blackswan*
9.0	**Video Reference**	https://youtu.be/ufKN43yIR98 https://youtu.be/TCgVaB3dG5g https://youtu.be/BfE6Id5WeZw https://youtu.be/2YSPUbCBNvA https://youtu.be/1A6W_9Yr430

Question Bank

Unit 1

1. Write the different forms of poetry?
2. Elaborate epic poetry with some examples.
3. Explain elegy and where is it mostly used?
4. Who is the father of the sonnet?
5. Describe the characteristics of a sonnet.
6. Exemplify the most common topic of sonnets.
7. What makes a poem a sonnet?
8. Who is the father of the elegy?
9. Write the main idea of elegy.
10. Exemplify the three types of elegy.
11. Who wrote the first elegy?
12. What is the most famous elegy?
13. Where is the origin of elegy?
14. Who is known as elegiac poet?
15. Explain the characteristics of an elegy.
16. What is the structure of an elegy?
17. Explain the purpose of epic poems.
18. Classify the epic poems.
19. What is the element of epic poetry?
20. Elaborate the themes of epic poetry.
21. Explain the main purpose of a ballad poem.
22. How do you identify a ballad in a poem?
23. Elaborate the main defining feature of a ballad.
24. Classify the ballad in poetry.
25. Exemplify lyric.
26. Elaborate the themes of lyric.
27. Structure an ode.
28. What is the basic ode format?
29. Exemplify ode.
30. Who is the father of ode poetry?

31. Explain the form of the Keats odes.

Unit 2

1. Explain Heroic couplet with some examples.
2. Compare Spenserian stanza and Terza rhyme.
3. Explain blank verse with examples.
4. What is the form of a heroic couplet?
5. Who is the father of the heroic couplet?
6. Elaborate the elements of heroic couplet.
7. Who is the father of blank verse?
8. Describe Blank Verse with some examples.
9. What is the form of a Spenserian stanza.
10. What is a nine stanza poem called?
11. Explain the features of Spenserian poetry?
12. Describe Terza Rhyme with some examples.

Unit 3

1. Write a critical analysis of the poem '*The Seven Ages of Man'*.
2. What is the central theme of "*The Seven Ages of Man*"? How does Shakespeare use this theme to explore the concept of the human life cycle?
3. Analyze the structure and form of "*The Seven Ages of Man*." How does Shakespeare's use of the monologue format enhance the delivery of his ideas about the stages of life?
4. Discuss the imagery used to depict each of the seven stages of man. How do the descriptions of these stages contribute to the overall meaning of the speech?
5. How the poet Michael Drayton reflected his life though his poetry '*Since There's no Help Left'*.
6. What is the central theme of Since There's No Help? How does Michael Drayton explore themes of love, resignation, and finality in the poem?
7. Analyze the use of imagery in Since There's No Help. How do the visual and sensory images contribute to the poem's emotional impact and thematic depth?
8. Discuss the tone of the poem. How does Drayton's tone reflect the speaker's feelings of resignation and acceptance regarding the end of a relationship?
9. How does Drayton use metaphor and simile in Since There's No Help? What do these literary devices reveal about the nature of the speaker's emotional state?
10. Describe poet John Donne as a Metaphysical Poet.
11. What does *let me not to the marriage of true minds* mean in Sonnet 116?
12. How does Shakespeare immortalize in *Let me not to the marriage of true minds*?
13. Explain the sonnet no 116 of Shakespeare *Let me not to the marriage of true minds.*
14. Explain the main idea of the poem "*The Seven Ages of Man*".
15. Summarize "*The Seven Ages of Man*".
16. Explain idea of the poem "*Since there's no help*"?
17. Explain the central idea of *Canonization* by John Donne?
18. Is *Canonization* a metaphysical poem?
19. What is the paradox in Donne's *Canonization*?
20. What are the central themes of Canonization? How does John Donne explore the themes of love, sanctity, and martyrdom in the poem?
21. Analyze the use of metaphor in Canonization. How does Donne use religious and secular imagery to depict the nature of love and its transformative power?

22. Discuss the tone of the poem. How does Donne's tone reflect his views on the relationship between love and sanctity?
23. How does Donne use the conceit of canonization in the poem? What does this religious metaphor reveal about the speaker's perception of love and its significance?
24. Examine the structure and form of Canonization. How does the poem's structure contribute to its overall argument and emotional effect?

Unit 4

1. Write the subjective interpretation of '*The Little Black Boy'* by William Blake.
2. What are the central themes in The Little Black Boy? How does William Blake use these themes to address issues of race, innocence, and spirituality?
3. Analyze the portrayal of race and identity in The Little Black Boy. How does Blake depict the experiences of the young black boy in relation to societal norms and expectations?
4. Discuss the use of imagery in The Little Black Boy. How do visual and sensory images contribute to the poem's exploration of themes such as suffering and redemption?
5. What is the central theme of "The World is Too Much with Us"? How does Wordsworth use this theme to critique contemporary society's values?
6. Analyze the use of imagery in "The World is Too Much with Us". How do Wordsworth's descriptions of nature and human activity contribute to the poem's message?
7. Discuss the tone of the poem. How does Wordsworth's tone reflect his feelings about the materialism and disconnection from nature he describes?
8. Critical analyze the poem "*Ode to the West Wind*".
9. What are the central themes of Ode to the West Wind? How does Shelley explore themes such as nature, transformation, and the power of the poet?
10. Analyze the symbolism of the West Wind in the poem. How does Shelley use this symbol to represent various abstract concepts such as change and inspiration?
11. Discuss the structure and form of Ode to the West Wind. How does the use of the terza rima rhyme scheme contribute to the poem's overall effect and themes?
12. What does the little black boy symbolize?
13. Explain the central idea of the poem *The little black boy?*
14. What literary devices are used in *The little black boy*?
15. Why did the foe want the fruit?
16. How did the speaker feed the tree?
17. What does the poison tree symbolize?
18. What does the apple symbolize in *A Poison Tree*?
19. What is Wordsworth's message in *The World Is Too Much with Us*?
20. Why does the poet in *The World Is Too Much with Us* want to be a Pagan?
21. Explain the central theme of the poem *The World Is Too Much with Us*.
22. What does the narrator prefer to do in the poem "*The World is Too Much with Us*"?
23. What is the objective of *Ode to the West Wind*?
24. What is the message of *Ode to the West Wind*?
25. What does the wind symbolize in *Ode to the West Wind*?
26. Explain the purpose of mentioning Maenad in *Ode to the West Wind*.
27. What are the central themes of A Poison Tree? How does Blake explore themes such as anger, deceit, and the consequences of unspoken emotions?
28. Analyze the use of metaphor in A Poison Tree. How does Blake use the metaphor of a poison tree to represent the nature and effects of suppressed anger?

Introduction to Sociology: Lesson Plan

SOC 101

Unit I: Sociology: Discipline and Perspective

Lecture 1-2: Introduction to Sociology

- **Objective:** Define Sociology, its nature, and scope.
- **Content:** Overview of Sociology as a discipline, its origins, and scope.
- **Activities:** Lecture, class discussion on the importance of Sociology in understanding society.

Lecture 3-4: Sociology as a Science

- **Objective:** Explore the scientific nature of Sociology.
- **Content:** Scientific methods used in Sociology, comparison with natural sciences.
- **Activities:** Case study analysis, discussion on how Sociology adheres to scientific principles.

Lecture 5-6: Sociology and Common Sense

- **Objective:** Differentiate between sociological and common sense understanding.
- **Content:** How common sense differs from sociological analysis.
- **Activities:** Discussion on examples of common sense versus sociological insights, role-playing exercises.

Lecture 7-8: Nature and Scope of Sociology

- **Objective:** Delve deeper into the nature and scope of Sociology.
- **Content:** Detailed exploration of key concepts and sub-disciplines within Sociology.
- **Activities:** Lecture, group discussions, and Q&A sessions.

Unit II: Sociology and Other Social Sciences

Lecture 9-10: Sociology and Social Anthropology

- **Objective:** Understand the relationship between Sociology and Social Anthropology.
- **Content:** Similarities and differences between the two disciplines.
- **Activities:** Comparative analysis of case studies from Sociology and Social Anthropology.

Lecture 11-12: Sociology and Psychology

- **Objective:** Explore how Sociology and Psychology intersect.
- **Content:** Key concepts and theories shared between Sociology and Psychology.
- **Activities:** Lecture, discussion on joint case studies, and comparative analysis.

Lecture 13-14: Sociology and History

- **Objective:** Examine the connections between Sociology and History.
- **Content:** How Sociology and History complement each other in understanding social phenomena.
- **Activities:** Discussion on historical context and sociological research, case studies.

Unit III: Basic Concepts

Lecture 15-16: Individual and Group

- **Objective:** Define and differentiate between individual and group dynamics in Sociology.
- **Content:** Concepts of individual behavior and group interactions.
- **Activities:** Group activities and case studies on group behavior.

Lecture 17-18: Associations and Institutions

- **Objective:** Understand the roles of associations and institutions in society.
- **Content:** Definitions, functions, and examples of various associations and institutions.
- **Activities:** Case studies and group presentations on social institutions.

Lecture 19-20: Culture and Society

- **Objective:** Explore the relationship between culture and society.
- **Content:** Definitions of culture and society, cultural practices, and their societal impacts.
- **Activities:** Discussions on cultural norms, case studies on cultural diversity.

Lecture 21-22: Social Change

- **Objective:** Study the concept and theories of social change.
- **Content:** Theories of social change, factors influencing social change, historical examples.
- **Activities:** Case study analysis of social change, group discussions on contemporary changes.

Lecture 23-24: Review of Basic Concepts

- **Objective:** Review and consolidate understanding of basic sociological concepts.
- **Content:** Summary of key concepts covered.
- **Activities:** Review sessions, group discussions, and Q&A.

Unit IV: Advanced Topics and Applications

Lecture 25-26: Sociological Theories Overview

- **Objective:** Introduce major sociological theories.
- **Content:** Overview of Functionalism, Conflict Theory, Symbolic Interactionism.
- **Activities:** Lecture and discussions on the application of these theories.

Lecture 27-28: Research Methods in Sociology

- **Objective:** Understand different research methods used in Sociology.
- **Content:** Qualitative and quantitative research methods, data collection techniques.
- **Activities:** Workshops on research methods, group projects.

Lecture 29-30: Applying Sociological Theories to Current Issues

- **Objective:** Apply sociological theories to contemporary social issues.
- **Content:** Case studies on current issues using various sociological theories.
- **Activities:** Group presentations and discussions on applied theories.

Lecture 31-32: Sociology in Everyday Life

- **Objective:** Connect sociological concepts to everyday experiences.
- **Content:** How sociological perspectives can be applied to daily life and personal experiences.
- **Activities:** Class discussions, personal reflection exercises.

Lecture 33-34: Global Perspectives in Sociology

- **Objective:** Explore global sociological perspectives and issues.
- **Content:** Comparative analysis of different societies and global issues.
- **Activities:** Case studies on global social issues, discussions on cultural differences.

Lecture 35-36: Sociology of Family and Relationships

- **Objective:** Examine the sociological aspects of family and relationships.
- **Content:** Family structures, relationships, and their societal impacts.
- **Activities:** Discussions, case studies, and group activities on family dynamics.

Lecture 37-38: Sociology of Education

- **Objective:** Understand the role of education in society.
- **Content:** Education systems, socialization, and educational inequality.
- **Activities:** Case studies on educational systems, group discussions on educational issues.

Lecture 39-40: Sociology of Work and Economy

- **Objective:** Explore the sociological aspects of work and economic systems.
- **Content:** Work, labor markets, economic systems, and their social implications.
- **Activities:** Case studies, discussions on economic issues, and their impact on society.

Lecture 41-42: Sociology of Religion

- **Objective:** Examine the role of religion in society.
- **Content:** Religion, beliefs, practices, and their social functions.
- **Activities:** Case studies, group discussions on the impact of religion on society.

Lecture 43-44: Sociology of Deviance and Crime

- **Objective:** Study the sociological perspectives on deviance and crime.
- **Content:** Theories of deviance, crime, and social control.
- **Activities:** Case studies, discussions on criminal justice, and deviance.

Lecture 45-46: Urban and Rural Sociology

- **Objective:** Compare urban and rural sociological perspectives.
- **Content:** Differences between urban and rural societies, issues, and challenges.
- **Activities:** Case studies, group discussions on urban and rural life.

Lecture 47-48: Health and Illness in Sociological Perspective

- **Objective:** Understand the sociological aspects of health and illness.
- **Content:** Health systems, illness, and healthcare disparities.
- **Activities:** Case studies on health issues, discussions on healthcare systems.

Lecture 49-50: Sociology of Gender and Sexuality

- **Objective:** Explore gender and sexuality from a sociological perspective.
- **Content:** Gender roles, sexual orientation, and their social implications.
- **Activities:** Discussions, case studies on gender and sexuality issues.

Lecture 51-52: Environmental Sociology

- **Objective:** Study the relationship between society and the environment.
- **Content:** Environmental issues, sustainability, and societal impacts.
- **Activities:** Case studies on environmental challenges, group discussions.

Lecture 53-54: Sociological Perspectives on Globalization

- **Objective:** Understand the sociological impacts of globalization.
- **Content:** Globalization, its effects on societies, and social changes.
- **Activities:** Case studies, discussions on global trends.

Lecture 55-56: Social Policy and Sociology

- **Objective:** Explore the relationship between social policy and Sociology.
- **Content:** Social policies, their development, and sociological impacts.
- **Activities:** Discussions on current social policies, case studies.

Lecture 57-58: Future Directions in Sociology

- **Objective:** Discuss emerging trends and future directions in Sociology.
- **Content:** New theories, methodologies, and areas of research in Sociology.
- **Activities:** Group discussions, presentations on future trends.

Lecture 59-60: Course Review and Final Examination

- **Objective:** Review course content and prepare for the final examination.
- **Content:** Comprehensive review of all topics covered.
- **Activities:** Review sessions, Q&A, and final examination.

Additional Notes:

- **Readings:** Provide students with a list of recommended textbooks, articles, and case studies for each lecture.
- **Assignments:** Include essays, group projects, presentations, and quizzes to assess student comprehension.
- **Interactive Activities:** Incorporate discussions, case studies, and practical exercises to enhance engagement and understanding.

Readings-

- A. Beteille : Sociology—Essays on Approach and Method (OUP)
- Alex Inkeles: What Is Sociology?
- Alex Thio: Sociology
- Andre, Beteille, 2009, *Sociology: Essays in Approach and Method*, Delhi: OxfordUniversity Press, Chapter 1, 'Sociology and Common Sense', Pp. 13- 27
- Anthony Giddens : Sociology
- G. Rocher: A General Introduction to Sociology
- George Ritzer : Encyclopaedia of sociology
- Gilles Ferreol& Jean-Pierre Noreck: An Introduction to Sociology(PHI Learning)
- Gordon Marshal : Dictionary of Sociology (OUP)
- Harry M. Johnson : Sociology
- Henry Tischler: Introduction to Sociology

- J Ross Eshleman& B.G. Cashion: Sociology an Introduction
- M. Haralambas&R. M. Heald: Sociology Themes and Perspectives.
- P. Worsely: New Introducing Sociology
- T. Bottomore : Sociology—A Guide to Problems and Literature

Principles of Public Administration and Government PS 201

Lesson Plan

Unit I: Foundation of Public Administration

Lecture 1-2: Meaning, Nature, Scope, and Significance of Public Administration

- **Objective:** Define Public Administration and understand its scope and significance.
- **Content:** Overview of Public Administration, its role in governance, and its importance in society.
- **Activities:** Lecture, class discussion on the significance of Public Administration.
- **Assessment:** Quiz on the definitions and scope of Public Administration.

Lecture 3-4: Evolution of the Discipline and Its Present Status

- **Objective:** Explore the historical development and current state of Public Administration.
- **Content:** Historical evolution, key milestones, and contemporary trends.
- **Activities:** Lecture, timeline activity on the evolution of Public Administration.
- **Assessment:** Short essay on the evolution of Public Administration.

Lecture 5-6: Difference Between Public and Private Administration

- **Objective:** Distinguish between Public and Private Administration.
- **Content:** Key differences, similarities, and unique characteristics.
- **Activities:** Comparative analysis, group discussions.
- **Assessment:** Comparative essay on Public vs. Private Administration.

Lecture 7-8: New Public Administration and Its Characteristics

- **Objective:** Understand the New Public Administration and its characteristics.
- **Content:** Key features, principles, and criticisms.
- **Activities:** Lecture, case studies on New Public Administration practices.
- **Assessment:** Presentation on the characteristics of New Public Administration.

Lecture 9-10: New Public Management and Its Characteristics

- **Objective:** Explore New Public Management and its features.
- **Content:** Principles, goals, and applications of New Public Management.
- **Activities:** Lecture, group discussions on the impact of New Public Management.
- **Assessment:** Short essay on the characteristics and impact of New Public Management.

Lecture 11-12: New Public Services and Good Governance

- **Objective:** Examine New Public Services and concepts of Good Governance.
- **Content:** Principles of New Public Services, elements of Good Governance.
- **Activities:** Case studies, discussions on the implementation of Good Governance.
- **Assessment:** Case study analysis on Good Governance practices.

Lecture 13-14: Relationship of Public Administration with Political Science, Law, Economics, Sociology, and Psychology

- **Objective:** Understand how Public Administration intersects with other social sciences.
- **Content:** Interdisciplinary relationships and their impact on Public Administration.
- **Activities:** Lecture, discussion on the integration of Public Administration with other disciplines.
- **Assessment:** Group project on the interdisciplinary nature of Public Administration.

Unit II: Organization of Public Administration and Administrative Behaviour

Lecture 15-16: Principles of Hierarchy, Unity of Command, Span of Control

- **Objective:** Explore fundamental organizational principles in Public Administration.
- **Content:** Definitions and applications of hierarchy, unity of command, and span of control.
- **Activities:** Lecture, organizational chart exercises.
- **Assessment:** Quiz on organizational principles.

Lecture 17-18: Division of Labor and Centralization vs. Decentralization

- **Objective:** Understand the concepts of division of labor and centralization/decentralization.
- **Content:** Definitions, advantages, and disadvantages.
- **Activities:** Case studies, group discussions on organizational structure.
- **Assessment:** Comparative essay on centralization vs. decentralization.

Lecture 19-20: Line, Staff, and Auxiliary Agencies: Definitions and Distinctions

- **Objective:** Define and differentiate between line, staff, and auxiliary agencies.
- **Content:** Roles, functions, and distinctions.
- **Activities:** Lecture, case studies on different types of agencies.
- **Assessment:** Quiz on line, staff, and auxiliary agencies.

Lecture 21-22: Decision Making: Meaning, Process, Types, and Conditions

- **Objective:** Explore decision-making in Public Administration.
- **Content:** Decision-making process, types, and influencing factors.
- **Activities:** Lecture, role-playing decision-making scenarios.
- **Assessment:** Case study analysis on decision-making processes.

Lecture 23-24: Communication: Meaning, Process, Channels, and Barriers

- **Objective:** Understand communication in an organizational context.
- **Content:** Communication processes, channels, and common barriers.
- **Activities:** Lecture, communication exercises, and role-plays.
- **Assessment:** Group presentation on effective communication strategies.

Unit III: The Concept of Government

Lecture 25-26: Government: Definition and Characteristics

- **Objective:** Define government and explore its characteristics.
- **Content:** Types of governments, key characteristics.
- **Activities:** Lecture, discussion on different forms of government.
- **Assessment:** Short essay on the characteristics of various forms of government.

Lecture 27-28: Legislature: Meaning and Types

- **Objective:** Understand the role and types of legislatures.
- **Content:** Definitions, functions, and types of legislative bodies.
- **Activities:** Lecture, case studies on legislative systems.
- **Assessment:** Quiz on legislative bodies and their functions.

Lecture 29-30: Executive: Meaning and Functions

- **Objective:** Explore the executive branch of government.
- **Content:** Definition, roles, and functions of the executive.
- **Activities:** Lecture, case studies on executive functions.
- **Assessment:** Comparative essay on executive functions in different governments.

Lecture 31-32: Judiciary: Importance and Functions

- **Objective:** Examine the role and functions of the judiciary.
- **Content:** Importance of the judiciary, its functions, and impact on governance.
- **Activities:** Lecture, discussion on judicial systems.
- **Assessment:** Case study analysis on judicial functions and impact.

Unit IV: Theories of Organization (Classical or Neo-Classical)

Lecture 33-34: Scientific Management Theory of F.W. Taylor

- **Objective:** Understand Taylor's Scientific Management Theory.
- **Content:** Principles and applications of Scientific Management.
- **Activities:** Lecture, case studies on Taylor's principles.
- **Assessment:** Short essay on the impact of Scientific Management Theory.

Lecture 35-36: Bureaucratic Theory of Max Weber

- **Objective:** Explore Weber's Bureaucratic Theory.
- **Content:** Key principles and characteristics of bureaucratic management.
- **Activities:** Lecture, discussion on Weber's theory.
- **Assessment:** Comparative analysis of Bureaucratic Theory with other organizational theories.

Lecture 37-38: Administrative Theory or Classical Theory

- **Objective:** Examine Classical Administrative Theory.
- **Content:** Key principles and theorists (e.g., Henri Fayol).
- **Activities:** Lecture, case studies on administrative principles.
- **Assessment:** Quiz on Classical Administrative Theory.

Lecture 39-40: Herbert Simon's Decision Making Theory

- **Objective:** Understand Simon's Decision Making Theory.
- **Content:** Principles of decision-making as proposed by Herbert Simon.
- **Activities:** Lecture, case studies on decision-making theory.
- **Assessment:** Group presentation on Simon's theory and its applications.

Unit V: Governance: Concept and Development

Lecture 41-42: Role of State in the Era of Globalization

- **Objective:** Explore the role of the state in a globalized world.
- **Content:** Impact of globalization on state functions and governance.

- **Activities:** Lecture, discussions on globalization effects.
- **Assessment:** Essay on the role of the state in globalization.

Lecture 43-44: State, Market, and Civil Society

- **Objective:** Understand the interactions between state, market, and civil society.
- **Content:** Roles and relationships of state, market, and civil society.
- **Activities:** Lecture, case studies on state-market-civil society interactions.
- **Assessment:** Group project on the balance between state, market, and civil society.

Lecture 45-46: Changing Dimensions of Development

- **Objective:** Examine new dimensions in development.
- **Content:** Modern approaches to development, including sustainable development.
- **Activities:** Lecture, discussions on changing development paradigms.
- **Assessment:** Short essay on new dimensions of development.

Lecture 47-48: Strengthening Democracy through Good Governance

- **Objective:** Explore how good governance strengthens democracy.
- **Content:** Principles of good governance and their impact on democratic processes.
- **Activities:** Case studies on good governance practices.
- **Assessment:** Group presentation on strengthening democracy through good governance.

Lecture 49-50: Democratic Decentralization

- **Objective:** Understand the concept and practice of democratic decentralization.
- **Content:** Principles, benefits, and challenges of decentralization.
- **Activities:** Lecture, discussions on decentralization in practice.
- **Assessment:** Comparative analysis of centralized vs. decentralized governance.

Lecture 51-52: People's Participation in Governance

- **Objective:** Examine the role of people's participation in governance.
- **Content:** Importance and methods of involving citizens in governance.
- **Activities:** Lecture, case studies on citizen participation.
- **Assessment:** Group project on strategies for increasing public participation in governance.

Lecture 53-54: Case Studies in Public Administration

- **Objective:** Apply theoretical concepts to real-world case studies.
- **Content:** In-depth analysis of various public administration case studies.
- **Activities:** Group analysis and presentations on case studies.
- **Assessment:** Case study analysis and presentation.

Lecture 55-56: Emerging Trends in Public Administration

- **Objective:** Explore recent developments and trends in Public Administration.
- **Content:** New trends, technologies, and practices in public administration.
- **Activities:** Lecture, discussions on emerging trends.
- **Assessment:** Short essay on emerging trends in Public Administration.

Lecture 57-58: Review and Integration of Key Concepts

- **Objective:** Review and integrate key concepts from the course.

- **Content:** Comprehensive review of all topics covered.
- **Activities:** Review sessions, Q&A, and group discussions.
- **Assessment:** Comprehensive quiz or mid-term review.

Lecture 59-60: Final Examination and Course Wrap-up

- **Objective:** Assess overall understanding and conclude the course.
- **Content:** Final examination covering all course topics.
- **Activities:** Final examination, course feedback session.
- **Assessment:** Final exam and course evaluation.

RAFFLES UNIVERSITY

TEACHING PLAN: Introduction to British Drama

SCHOOL: SOHSS		**ACADEMIC SESSION 2023-24**		**STUDENTS' BATCH:** B.A. II Semester	
1	**Course code**				**ENG- 201**
2	**Course Title**				**Introduction to British Drama**
3	**Credits**				**4**
4	**Course Objective**	The subject of British Drama is basically designed for students of Humanities having English Literature as a subject to equip them with British. The more specific objectives are as follows: • To acquaint students with Dramas. • To understand and analyze key play texts. • To understand different forms and elements of Drama. • To do the analysis of realistic dramas.			
5	**Course learning Outcomes**	After completing the course, the student shill be able to: • Students would have widened their idea about plays. • Students would have grasped the major theme of dramas.			
6					**Outline syllabus:**
6.00	**Paper Code**	**Unit**	**Introduction**	**Reference number**	**Teaching methods**
6.01	**Paper Code. ENG-201**	I	**Introduction to British Drama** **Forms of Drama-** • Tragedy • Comedy • Farce • Melodrama	*English Literature* by William J. Long; *A Glossary of Literary Terms* by M. H. Abrams	Lecture and discussion
6.02	**Paper Code. ENG-201**	II	**William Shakespeare:** • Hamlet	Text	Lecture and discussion
6.03	**Paper Code. ENG-201**	III	**Christopher Marlowe:** • Doctor. Faustus	Text	Lecture and discussion

6.04	**Paper Code. ENG-201**	IV	**GB Shaw:** • Arms and The Man	Text	Lecture and discussion

7		**Course Evaluation**
7.10		**CA: 20%**
7.1	**Attendance**	5%
7.12	**Homework**	-
7.13	**Quizzes**	4 Quizzes, 5%
7.14	**Projects**	1 Project, 5%
7.15	**Presentation**	1 Presentation, 5%
7.16	**Any other**	--
7.2	**MTE(IA)**	20%
7.3		**End-term examination: 60%**
8		**Recommended Reading and Online Sources**
8.1	**Recommended Reading**	Kumar and P. Sreehari: *Communicative English*, Orient Blackswan. *English Literature* by William J. Long *A Glossary of Literary Terms* by M. H. Abrams K Elango: *Insights A Course in English Literature and Language* Orient Blackswan, 2009. E. Suresh. *Mastering English: A Course for Beginners*, Orient Blackswan. *Using English: A Course for Undergraduate Learners: Board of Editors*. Orient Blackswan.
8.2	**Online Sources**	https://www.poetryfoundation.org/poems/47395 PDF Drive – search and download PDF files for free SparkNotes: Today's Most Popular Study Guides Share and discover knowledge on slideshare English Literature by (prezi.com)
8.3	**Video References**	https://www.youtube.com/watch?v=Gg7Uim8JCmQ https://www.youtube.com/watch?v=M3NXV5NojH0 https://www.youtube.com/watch?v=mCZYw5LU720

QUESTION BANK

UNIT I

1) Differentiate between Tragedy and Comedy.
2) How will you define a Drama? Explain its types in detail.
3) What is a Melodrama? Explain in detail.
4) What is Farce? Explain.

UNIT II

1) How does Shakespeare demonstrate Hamlet's confusion when he first sees the ghost?
2) What poetic devices does Hamlet employ in scene two?
3) How does Shakespeare use a variety of techniques (eg. antithesis, imagery etc) to communicate Hamlet's melancholy to the audience?
4) How does the character of Gertrude change throughout the scene four?

5) What is Claudius' and Laertes' plan for Hamlet?

6) What is Claudius' and Laertes' plan for Hamlet?

7) Why do you think Shakespeare has chosen to include the scene with the gravediggers (ie. the clown) at this stage of the play? How does it affect the tone of the play?

8) What does the arrival of young Fontinbras signal at the end of the play?

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9) Does Hamlet need to apologise to Laertes? How might this demonstrate a change in his character?

10) Summarize "Hamlet" by Shakespeare.

UNIT III

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1) Explain in detail the plot development of "Doctor Faustus" by Marlowe.
2) Discuss Doctor Faustus as a tragedy.
3) What is the function of the Good Angel and the Evil Angel in the drama?

UNIT IV

1) What are the two main themes of Shaw's Arms and the Man?
2) Why is Arms and the Man called anti romantic comedy?

PROJECTS (To be given to group of students)

1. Enact and play the roles of Hamlet by Shakespeare.

RAFFLES UNIVERSITY

TEACHING PLAN: Macroeconomics

SCHOOL: LAW		**ACADEMIC SESSION 23-24**	**FOR STUDENTS' BATCH:** B.A.II SEM 2023-24
1	**Course code**	**ECO 201**	
2	**Course Title**	**Macroeconomics**	
3	**Credits**	**6**	
4	**Course Objective**	The course aims to: • Make students understand about the basic concepts of Macroeconomics • Understand the concepts of estimating national income • Understand the impact of government policies on economy • Make the students understand the concept of money and functioning of different financial institutions in India	
5	**Course Outcomes**	After completion of the course, the students will be able to: • Understand the calculation of national income and its aggregates • Understand the forms and functions of RBI and commercial banking • Learn about the macroeconomic policies and their impact on the economy • Able to understand the impacts of changes in money supply	

6					Outline syllabus:
6.00	**Paper Code**	**Unit**	**Introduction**	**Reference number**	**Teaching methods**
6.01	**Paper Code. ECO201**	I	**INTRODUCTION** • Introduction, nature and scope, Difference between Micro and Macro Economics • Various macroeconomics Concepts: Stock, Flow, Endogenous and Exogenous variables.	H.L. Ahuja Macroeconomics Theory and Policy	Lecture and Discussion
6.02	**Paper Code. ECO201**	II	**Aggregates of National Income** • Circular Flow of Income, • Concepts of GDP and National Income; measurement of national income and related aggregates;	H.L. Ahuja Macroeconomics Theory and Policy	Lecture and Discussion

			nominal and real income;		
6.03	**Paper Code. ECO201**	III	**Output, Employment and Money** • Aggregate Demand, Aggregate Supply • Classical Theory of Income, Output and Employment • Consumption Function- APC, MPC; • Investment Analysis- Meaning, Types, Factors Determining Investment, Factors Affecting MPC. • Keynesian Theory of Income and Employment, • Concept of Multiplies and Accelerator.	H.L Ahuja Macroeconomics theory and policy	Lecture and Discussion
7					**Course Evaluation**
7.10					**CA: 20%**
7.1	**Attendance**				5%
7.12	**Homework**				-
7.13	**Quizzes**				4 Quizzes, 5%
7.14	**Projects**				1 Project, 5%
7.15	**Presentation**				1 Presentation, 5%
7.16	**Any other**				--
7.2	**MTE(IA)**				20%
7.3					**End-term examination: 60%**
8					**Text Books & References**
8.1	**Text books**		1. Shapiro.E. 2005. Macro-economic Analysis (5th Edition). Galgotia Publications. New Delhi. 2. H.L Ahuja, Macroeconomics, Theory and Policy. S.Chand & Co. ltd. New Delhi.		
8.2	**References**		1. Mankiw, N. (2016). Macroeconomics, 9th ed. Worth Publishers. 2. Dornbusch, R., Fischer, S., Startz, R. (2018). Macroeconomics, 12th ed. McGraw-Hill.		
8.3	**Video**		https://www.youtube.com/watch?v=d8uTB5XorBw		

	References	https://www.youtube.com/watch?v=OPV1BOs1ISI&list=PLWeicFreBUYDlaLppnRTZpwgBASflf4lU https://www.youtube.com/watch?v=nCPi_17EXcY

QUESTION BANK

UNIT I

1) What is macroeconomics. Describe its nature and scope.
2) Differentiate between stock and flow concept.
3) Explain endogenous and exogenous variables.
4) Differentiate between microeconomics and macroeconomics.

UNIT II

5) Explain Circular flow of income? What are leakages and injections in circular flow of income.
6) What are the different aggregates of national income?
7) What is GDP at market price. How factor cost can be converted in market price?
8) Suppose the GDP at market price of a country in a particular year was Rs 1,100 crores. Net Factor Income from Abroad was Rs 100 crores. The value of Indirect taxes – Subsidies was Rs 150 crores and National Income was Rs 850 crores. Calculate the aggregate value of depreciation.
9) Explain the three methods of measuring national income.
10) Differentiate between nominal and real income

UNIT III

1) Explain classical Theory of Income, Output and Employment.
2) Explain the Keynesian short run consumption function?
3) Explain Average propensity to consume and Marginal propensity to consume?
4) What is Investment? Explain autonomous and induced investment.

Introductory Sociology: Lesson Plan

SOC 201

Unit I: Understanding Sociology

Lecture 1-2: Introduction to Sociology

- **Objective:** Introduce the field of sociology, its importance, and basic concepts.
- **Content:** Definition, scope, and significance of sociology; Sociological imagination.
- **Activities:** Lecture, class discussion on the role of sociology in understanding society.
- **Assessment:** Quiz on basic concepts and importance of sociology.

Lecture 3-4: The Sociological Perspective

- **Objective:** Understand different sociological perspectives and approaches.
- **Content:** Overview of major sociological perspectives (Functionalism, Conflict Theory, Symbolic Interactionism).
- **Activities:** Lecture, comparative analysis of perspectives.
- **Assessment:** Short essay on the application of sociological perspectives.

Lecture 5-6: Sociology and Other Social Sciences

- **Objective:** Explore the relationship between sociology and other disciplines.
- **Content:** Sociology vs. Psychology, Economics, Political Science, and History.
- **Activities:** Lecture, discussion on interdisciplinary connections.
- **Assessment:** Comparative essay on sociology and other social sciences.

Unit II: Sociological Research Methods

Lecture 7-8: Introduction to Sociological Research

- **Objective:** Understand the basics of sociological research methods.
- **Content:** Quantitative vs. Qualitative research, research methods, and ethical considerations.
- **Activities:** Lecture, case studies on research methods.
- **Assessment:** Quiz on research methods and ethics.

Lecture 9-10: Data Collection and Analysis

- **Objective:** Learn about data collection techniques and analysis in sociology.
- **Content:** Surveys, interviews, observations, and content analysis.
- **Activities:** Lecture, practical exercises in data collection.
- **Assessment:** Group project on designing a research study.

Lecture 11-12: Research Design and Ethics

- **Objective:** Explore the design of sociological research and ethical issues.
- **Content:** Research design, sampling methods, ethical considerations in research.

- **Activities:** Lecture, case studies on research ethics.
- **Assessment:** Research proposal incorporating ethical considerations.

Unit III: Social Structure and Socialization

Lecture 13-14: Social Structure and Institutions

- **Objective:** Understand the concept of social structure and its institutions.
- **Content:** Definition of social structure, roles, statuses, and institutions (family, education, religion).
- **Activities:** Lecture, discussion on the impact of social institutions.
- **Assessment:** Short essay on the role of social institutions in society.

Lecture 15-16: Socialization and Identity

- **Objective:** Examine the process of socialization and its impact on identity.
- **Content:** Agents of socialization, theories of socialization, and identity formation.
- **Activities:** Lecture, case studies on socialization processes.
- **Assessment:** Analysis of socialization experiences through personal narratives.

Lecture 17-18: Social Roles and Socialization

- **Objective:** Explore social roles and their impact on behavior and identity.
- **Content:** Role theory, role conflict, and role strain.
- **Activities:** Lecture, role-playing exercises.
- **Assessment:** Essay on the impact of social roles on personal identity.

Unit IV: Social Change and Social Issues

Lecture 19-20: Theories of Social Change

- **Objective:** Understand various theories of social change.
- **Content:** Evolutionary theory, cyclical theory, conflict theory of social change.
- **Activities:** Lecture, discussion on historical examples of social change.
- **Assessment:** Comparative essay on theories of social change.

Lecture 21-22: Social Movements and Reform

- **Objective:** Explore the role of social movements in social change.
- **Content:** Types of social movements, their causes, and impacts.
- **Activities:** Lecture, case studies on significant social movements.
- **Assessment:** Group project on analyzing a historical or contemporary social movement.

Lecture 23-24: Contemporary Social Issues

- **Objective:** Examine current social issues and their sociological implications.
- **Content:** Topics such as inequality, racism, gender issues, and globalization.
- **Activities:** Lecture, discussions on contemporary social issues.
- **Assessment:** Research paper on a contemporary social issue.

Unit V: Sociological Perspectives and Theories

Lecture 25-26: Functionalism

- **Objective:** Explore the Functionalist perspective and its key theories.
- **Content:** Key concepts, contributions of Parsons and Merton.
- **Activities:** Lecture, discussion on Functionalism in practice.
- **Assessment:** Quiz on Functionalist theory and its applications.

Lecture 27-28: Conflict Theory

- **Objective:** Understand Conflict Theory and its contributions.
- **Content:** Theories of Marx, Dahrendorf, and Coser.
- **Activities:** Lecture, case studies on Conflict Theory.
- **Assessment:** Essay on the contributions of Conflict theorists.

Lecture 29-30: Symbolic Interactionism

- **Objective:** Learn about Symbolic Interactionism and its key concepts.
- **Content:** Contributions of Mead, Blumer, and Goffman.
- **Activities:** Lecture, discussions on Symbolic Interactionism.
- **Assessment:** Short essay on Symbolic Interactionism and its relevance.

Lecture 31-32: Postmodernism

- **Objective:** Examine Postmodern perspectives in sociology.
- **Content:** Key ideas, contributions of Foucault and Lyotard.
- **Activities:** Lecture, discussion on Postmodernism.
- **Assessment:** Quiz on Postmodern theories and their implications.

Unit VI: Applied Sociology and Review

Lecture 33-34: Applied Sociology

- **Objective:** Understand the application of sociological theories in real-world scenarios.
- **Content:** Application of theories to issues in health, education, and criminal justice.
- **Activities:** Lecture, case studies on applied sociology.
- **Assessment:** Group project on applying sociological theories to a social issue.

Lecture 35-36: Review of Key Concepts

- **Objective:** Review and integrate key concepts from the course.
- **Content:** Comprehensive review of all major topics and theories.
- **Activities:** Review sessions, Q&A, and group discussions.
- **Assessment:** Comprehensive review quiz.

Lecture 37-38: Final Examination Preparation

- **Objective:** Prepare for the final examination.
- **Content:** Review of major theories, concepts, and research methods.
- **Activities:** Practice exams, review sessions.
- **Assessment:** Final examination.

Lecture 39-40: Final Exam and Course Wrap-Up

- **Objective:** Assess overall understanding and conclude the course.

- **Content:** Final examination covering all course topics.
- **Activities:** Final exam, course feedback session.
- **Assessment:** Final exam and course evaluation.

Readings:

8. Anthony Elliot and Charles Lemert, 2014. Introduction to Contemporary Social theory, Routledge.
9. Bert N. Adams and R.A. Sydie. 2002. Sociological Theory. Sage, Vistara
10. Baert, Patrick. 1998. Social Theory in the Twentieth Century. New York. NYU Press.
11. Bottomore, T. B. 1971. *Sociology: A Guide to Problems and Literature*, London:Allen and Unwin, Chapter 2, Pp. 29-47
12. Bottomore, Tom and Nisbet, Robert. 2004. A History of Sociological Analysis. Jaipur: Rawat
13. Bottomore, Tom. 2002. The Frankfurt School. London: Routledge
14. Collins, Randall. 1994. Four Sociological Traditions. New York. OUP

5) What is multiplier and accelerator?

UNIT IV

11) Explain the functions of commercial bank.

12) What is Money? Explain its functions.

13) What are quantitative and qualitative measures to control creation by RBI?

14) What are the various objectives of monetary policy? Explain.

15) Describe the function of RBI.

PROJECTS (To be given to group of students)

1) What is the process of credit creation by Commercial Bank.

2) How money supply is determined in India

International Relations: Lesson Plan

PS 301

Unit I: Introduction to International Relations

Lecture 1-2: Meaning, Nature, and Scope of International Relations

- **Objective:** Understand the basic concepts, meaning, and scope of International Relations (IR).
- **Content:** Definition, scope, and importance of IR; Distinction between IR and other social sciences.
- **Activities:** Lecture, class discussion on the relevance of IR in today's world.
- **Assessment:** Quiz on key concepts in International Relations.

Lecture 3-4: History and Emergence of the International State System

- **Objective:** Trace the historical development of the international state system.
- **Content:** Pre-Westphalia, Westphalia, and Post-Westphalia international order.
- **Activities:** Lecture, timeline creation of key historical events leading to the modern state system.
- **Assessment:** Short essay on the impact of the Westphalian system on modern IR.

Lecture 5-6: The Westphalian System

- **Objective:** Examine the significance of the Westphalian Peace and its influence on state sovereignty.
- **Content:** Overview of the Treaty of Westphalia, its principles, and implications for state sovereignty.
- **Activities:** Lecture, discussion on state sovereignty in the Westphalian context.
- **Assessment:** Comparative analysis of pre- and post-Westphalian state systems.

Lecture 7-8: Post-Westphalian International System

- **Objective:** Explore the evolution of the international system after the Westphalian era.
- **Content:** Changes in the international system post-Westphalia, with a focus on global governance.
- **Activities:** Lecture, case study on the impact of global organizations on state sovereignty.
- **Assessment:** Group project on the role of international organizations in the post-Westphalian era.

Unit II: Theories of International Relations

Lecture 9-10: Introduction to IR Theories

- **Objective:** Introduce major theories in International Relations.
- **Content:** Overview of Classical Realism, Neo-Realism, Liberalism, and Neo-liberalism.
- **Activities:** Lecture, discussion on how different theories explain international events.
- **Assessment:** Quiz on key IR theories.

Lecture 11-12: Classical Realism and Neo-Realism

- **Objective:** Understand the principles of Classical Realism and Neo-Realism.
- **Content:** Key thinkers (e.g., Thucydides, Morgenthau, Waltz), assumptions, and critiques.
- **Activities:** Lecture, comparative analysis of Realism and Neo-Realism.
- **Assessment:** Essay on the relevance of Realism in contemporary IR.

Lecture 13-14: Liberalism and Neo-Liberalism

- **Objective:** Explore Liberalism and Neo-Liberalism in IR.
- **Content:** Key thinkers (e.g., Kant, Wilson, Keohane), principles, and contemporary relevance.
- **Activities:** Lecture, debate on the effectiveness of Liberalism in global governance.
- **Assessment:** Comparative essay on the strengths and weaknesses of Liberalism vs. Neo-Liberalism.

Lecture 15-16: Marxism and Dependency Theory

- **Objective:** Analyze Marxist approaches to IR, including Dependency Theory.
- **Content:** Overview of Marxist thought in IR, key concepts, and critiques.
- **Activities:** Lecture, discussion on the application of Dependency Theory to global inequality.
- **Assessment:** Research paper on the impact of Marxism on developing countries' foreign policies.

Lecture 17-18: Feminist Perspectives in IR

- **Objective:** Understand Feminist approaches to IR and their critiques of traditional theories.
- **Content:** Key concepts in Feminist IR, analysis of gendered power structures.
- **Activities:** Lecture, case studies on the role of women in international diplomacy.
- **Assessment:** Essay on the contribution of Feminist perspectives to IR theory.

Lecture 19-20: Eurocentrism and Perspectives from the Global South

- **Objective:** Critically examine Eurocentrism in IR and explore alternative perspectives from the Global South.

- **Content:** Overview of Eurocentric biases in IR theory, contributions from Global South scholars.
- **Activities:** Lecture, discussion on the challenges of decolonizing IR.
- **Assessment:** Group presentation on the Global South's contribution to IR theory.

Unit III: History in the Modern Era of IR

Lecture 21-22: World War I: Causes and Consequences

- **Objective:** Explore the causes and global impact of World War I.
- **Content:** Origins of WWI, major battles, and the Treaty of Versailles.
- **Activities:** Lecture, map analysis of WWI's global impact.
- **Assessment:** Essay on the long-term consequences of WWI on global politics.

Lecture 23-24: World War II: Causes and Consequences

- **Objective:** Examine the factors leading to WWII and its aftermath.
- **Content:** The rise of totalitarian regimes, major events of WWII, and the formation of the United Nations.
- **Activities:** Lecture, documentary viewing and discussion on WWII.
- **Assessment:** Comparative analysis of the outcomes of WWI and WWII.

Lecture 25-26: The Bolshevik Revolution and the Rise of Fascism/Nazism

- **Objective:** Understand the significance of the Bolshevik Revolution and the rise of Fascism/Nazism.
- **Content:** Overview of the Russian Revolution, the rise of totalitarian regimes in Germany and Italy.
- **Activities:** Lecture, primary source analysis of revolutionary documents.
- **Assessment:** Research paper on the global influence of the Bolshevik Revolution.

Lecture 27-28: The Cold War: Different Phases

- **Objective:** Trace the evolution of the Cold War through its different phases.
- **Content:** Origins of the Cold War, key conflicts (Korean War, Vietnam War), and the arms race.
- **Activities:** Lecture, timeline creation of key Cold War events.
- **Assessment:** Essay on the impact of the Cold War on global politics.

Lecture 29-30: Collapse of the USSR and the End of the Cold War

- **Objective:** Analyze the factors leading to the collapse of the USSR and the end of the Cold War.
- **Content:** Economic and political factors, Gorbachev’s policies, and the fall of the Berlin Wall.
- **Activities:** Lecture, discussion on the global impact of the USSR's collapse.
- **Assessment:** Comparative essay on the Cold War's impact on Eastern Europe vs. the Global South.

Lecture 31-32: Emergence of the Third World: Uni-Polar, Multi-Polar, or Bi-Polar?

- **Objective:** Explore the emergence of the Third World and the global power structure post-Cold War.
- **Content:** Definitions of Uni-Polar, Multi-Polar, and Bi-Polar systems, and the role of Non-Aligned Movement.
- **Activities:** Lecture, group discussion on the current global power structure.
- **Assessment:** Group project on the role of Third World countries in the current international system.

Unit IV: Foreign Politics in International Relations

Lecture 33-34: Power Management: Diplomacy

- **Objective:** Understand the role of diplomacy in managing international power relations.
- **Content:** Definition, types of diplomacy, and case studies of successful diplomacy.
- **Activities:** Lecture, role-play exercises in diplomatic negotiations.
- **Assessment:** Essay on the importance of diplomacy in conflict resolution.

Lecture 35-36: Balance of Power and Collective Security

- **Objective:** Explore the concepts of Balance of Power and Collective Security.
- **Content:** Historical examples, the role of international organizations like the UN.
- **Activities:** Lecture, debate on the effectiveness of collective security mechanisms.
- **Assessment:** Essay on the success and failures of Balance of Power and Collective Security in the 20th century.

Lecture 37-38: Foreign Policy: Meaning, Kinds & Methods

- **Objective:** Understand the fundamentals of foreign policy and its execution.
- **Content:** Definition, types of foreign policy, decision-making processes.
- **Activities:** Lecture, case studies on different countries' foreign policies.
- **Assessment:** Research paper on a comparative analysis of foreign policies of two nations.

Lecture 39-40: National Power: Meaning, Nature, and Determinants

- **Objective:** Examine the concept of national power and its determinants.
- **Content:** Economic, military, political, and soft power as elements of national power.
- **Activities:** Lecture, discussion on the measurement of national power.
- **Assessment:** Essay on the role of national power in shaping global politics.

Unit V: Review and Final Assessment

Lecture 41-42: Review of Key Concepts and Theories

- **Objective:** Review major theories and concepts discussed throughout the course.
- **Content:** Recap of IR theories, historical events, and foreign policy concepts.
- **Activities:** Review sessions, Q&A, group discussions.
- **Assessment:** Quiz on key concepts from all units.

Lecture 43-44: Application of Theories to Contemporary Issues

- **Objective:** Apply IR theories to analyze current global issues.
- **Content:** Case studies on contemporary international conflicts, diplomacy, and global governance.
- **Activities:** Group analysis and presentation on applying IR theories to current events.
- **Assessment:** Group project presentation.

Lecture 45-46: Preparation for Final Examination

- **Objective:** Prepare for the final examination with a comprehensive review.
- **Content:** Practice exams, review of major themes and theories.
- **Activities:** Review sessions, mock exams.
- **Assessment:** Practice exam.

Lecture 47-48: Final Examination

TEACHING PLAN: British Prose and Novel

RAFFLES UNIVERSITY

SCHOOL: humanities & Social Sciences		**ACADEMIC SESSION 2023**		**FOR STUDENTS' BATCH:** 2022-2025	
1	**Course code**	**ENG 301**			
2	**Course Title**	**British Prose and Novel**			
3	**Credits**	**4**			
4	**Course Objective**	The subject of British Prose and Novel is basically designed for students of Humanities having English Literature as a subject to equip them with British Prose and Novel from 19th to 20th Century with reference to some seminal texts. The more specific objectives are as follows: • To acquaint students with 19th and 20th Century British Prose and Novel. • To understand and analyze key prose texts of 19th and 20th century. • To understand different forms and elements of novels of Romantic and Victorian Age. • To do the analysis of romantic and realistic novels.			
5	**Course learning Outcomes**	After completing the course, the student shill be able to: • Students would have widened their idea about prose and novels of 19th an 20th century. • Students would have grasped the major theme of prose and novels that belong to 19th and 20th century. • Students would have understood the socio-political context of the period from 19th-20th century with particular reference to prose and novel.			
6	**Outline syllabus:**				
6.00	**Paper Code**	**Unit**	**Introduction**	**Reference**	**Teaching methods**
6.01	**Paper Code. DC III**	I	**Personal Essay, modern essay, types of novel, short story**	*English Literature* by William J. Long; *A Glossary of Literary Terms* by M. H. Abrams	Detailed class room discussion and reading of texts in class, Question and Answers Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings, and clearing of students' doubts in class
6.02	**Paper Code. DC III**	II	**a) Charles Lamb:** New Year's Eve **b) William Hazlitt:** On the Pleasure of Hating **c) G. K. Chesterton:** A Piece of Chalk	Text, https://www.slideshare.net/slideshow/new-years-eve-25780485/25780485 https://www.slideshare.net/slideshow/a-piece-of-chalk-by-gk-chesterton/41872408	Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings, Revision of full syllabus and clearing of doubts
6.03	**Paper Code. DC III**	III	**Jane Austen:** Pride and Prejudice	Text, https://ebooks.inflibnet.ac.in/engp03/chapter/jane-austen-pride-and-prejudice/	Detailed class room discussion and reading of texts in class, Question and Answers Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings, and clearing of students' doubts in class
6.04	**Paper Code. DC III**	IV	**Charlotte Perkins Gilman:** The Yellow Wallpaper	Text, http://acl.digimat.in/nptel/courses/video/109106147/lec18.pdf	Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings, Revision of full

					syllabus and clearing of doubts

7	**Course Evaluation**	
7.10	**CA: 20%**	
7.1	**Attendance**	5%
7.12	**Homework**	-
7.13	**Quizzes**	4 Quizzes, 5%
7.14	**Projects**	1 Project, 5%
7.15	**Presentation**	1 Presentation, 5%
7.16	**Any other**	--
7.2	**MTE(IA)**	20%
7.3	**End-term examination: 60%**	
8	**Text and Reference:** 1. Virginia Woolf, A Room of One's Own (New Year: Harcourt, 1957) Chaps. 1 and 6. 1. Lamb, "New Year's Eve," The London Magazine 3 (January 1821): 5-8. 2. Chesterton, G. K.. "A piece of chalk." 1909. Quotidiana. Ed. Patrick Madden. 3. Austen, Jane. 2003. Pride and Prejudice. Edited by Vivien Jones. Penguin Classics. London, England: Penguin Classics. 4. Gilman, Charlotte Perkins, 1860-1935. The Yellow Wall-Paper, and Other Stories. Oxford ; New York :Oxford University Press, 1995.	
8.1	**Recommended Reading**	1. Kumar and P. Sreehari: *Communicative English*, Orient Blackswan. 2. *English Literature* by William J. Long 3. *A Glossary of Literary Terms* by M. H. Abrams 4. K Elango: *Insights A Course in English Literature and Language* Orient Blackswan, 2009. E. Suresh. 5. *Mastering English: A Course for Beginners*, Orient Blackswan. 6. *Using English: A Course for Undergraduate Learners: Board of Editors*. Orient Blackswan. 2. Raymond William, 'Introduction', in The English Novel from Dickens to Lawrence (London: Hongarth Press, 1984) pp. 9-27
8.2	**Online Sources**	http://essays.quotidiana.org/hazlitt/pleasure_of_hating/ https://www.sparknotes.com/lit/yellowwallpaper/ https://www.slideshare.net/slideshow/5-charles-lamb/81514846 https://www.studocu.com/in/document/st-aloysius-college-autonomous/masters-in-english-literature/charles-lamb-auto-recovered/92695128
8.3	**Video References**	https://onlinecourses.nptel.ac.in/noc22_hs06/preview https://archive.nptel.ac.in/courses/109/106/109106124/ https://archive.nptel.ac.in/courses/109/106/109106145/

QUESTION BANK

UNIT I

1) Differentiate between personal essay and Modern essay.
2) How will you define a novel? Explain its types in detail.
3) What is a short story? Explain in detail.
4) What are the central themes of the personal essay? How does the author use their personal experiences to explore broader concepts or universal truths?
5) Analyze the narrative voice in the personal essay. How does the author's voice contribute to the intimacy and authenticity of the narrative?
6) Discuss the use of descriptive language and imagery in the personal essay. How does the author use these elements to create a vivid and engaging narrative?

7) Examine the structure of the personal essay. How does the organization of the essay enhance the reader's understanding of the author's experiences and insights?
8) How does the author balance personal anecdotes with reflections and analysis in the essay? What impact does this balance have on the overall effectiveness of the essay?
9) What are the central themes of the modern essay? How does the author address contemporary issues or ideas in the essay?
10) Analyze the author's approach to argumentation and persuasion in the modern essay. What techniques does the author use to convince the reader of their viewpoint?
11) What are the different types of novels?

UNIT II

1. Summarize "New Year's Eve" by Charles Lamb.
2. What are the central themes of Charles Lamb's essay "New Year's Eve"? How does Lamb explore themes such as time, reflection, and mortality?
3. Analyze the tone and mood of the essay. How does Lamb's use of language convey his emotional state and perspectives on the passage of time?
4. Discuss Lamb's reflections on the past year in "New Year's Eve". How does he balance nostalgia with a sense of melancholy?
5. Examine the role of personal anecdotes in the essay. How does Lamb use his own experiences to illustrate broader themes and engage the reader?
6. Summarize "On the Pleasures of Hating" by William Hazlitt.
7. What are the central themes of William Hazlitt's essay "On the Pleasures of Hating"? How does Hazlitt explore the darker aspects of human nature, such as hatred and animosity?
8. Analyze the tone of Hazlitt's essay. How does his use of language and rhetorical devices convey his attitudes towards the subject of hatred?
9. Discuss Hazlitt's perspective on the inevitability of hatred. How does he argue that hatred is an intrinsic part of human nature?
10. Examine the examples Hazlitt uses to illustrate his points about hatred. How do these examples from literature, politics, and personal experience enhance his argument?
11. How does Hazlitt contrast the pleasures of hating with other human emotions, such as love and admiration? What conclusions does he draw from these comparisons?

UNIT III

1. Describe the art of characterization of *Pride and Prejudice* by Jane Austen.
2. Explain in detail the plot development of Pride and Prejudice by Jane Austen.
3. Comment on the thematic richness of Pride and Prejudice by Jane Austen.
4. What are the central themes of *Pride and Prejudice*? How does Jane Austen explore themes such as love, marriage, social class, and reputation?
5. Analyze the character development of Elizabeth Bennet. How does she evolve throughout the novel, and what key events contribute to her growth?
6. Discuss the role of social class and hierarchy in *Pride and Prejudice*. How do these elements influence the characters' relationships and decisions?
7. Examine the dynamics of the Bennet family. How do the individual personalities and actions of the Bennet family members impact the overall narrative?
8. How does Austen use irony and satire in *Pride and Prejudice*? Provide examples of how these literary devices are employed to critique societal norms and behaviors.

UNIT IV

1. Describe the art of characterization of *The Yellow Wallpaper* by Charlotte Perkins Gilman.
2. Explain in detail the plot development of *The Yellow Wallpaper* by Charlotte Perkins Gilman.
3. Comment on the thematic richness of *The Yellow Wallpaper* by Charlotte Perkins Gilman.

4. What are the central themes of "*The Yellow Wallpaper*"? How does Charlotte Perkins Gilman explore themes such as mental illness, gender roles, and societal expectations?
5. Analyze the narrative structure of "*The Yellow Wallpaper*". How does the first-person point of view impact the reader's understanding of the protagonist's mental state?
6. Discuss the significance of the yellow wallpaper itself. How does the wallpaper symbolize the protagonist's mental condition and societal oppression?
7. Examine the character of the narrator. How does her descent into madness reflect the effects of the "rest cure" and the broader implications of 19th-century medical practices on women?
8. How does Gilman use setting and environment to enhance the themes of the story? What role does the isolated mansion play in the protagonist's psychological decline?
9. Discuss the role of John, the narrator's husband, in the story. How does his behavior and attitude towards his wife contribute to her mental deterioration?

PROJECTS (To be given to group of students)

Enact and play the roles of Pride and Prejudice by Jane Austen.

RAFFLES UNIVERSITY

Teaching Plan: Sociology of India-I SOC 301

SCHOOL: (SOHSS) SCHOOL OF HUMANITIES AND SOCIAL SCIENCES		**Academic Session: 2023 – 2024**		**For Students' Batch: 2022-2025**	
1	**Course No.**			**SOC 301**	
2	**Course Title**			**Sociology of India- I**	
3	**Credits**			**4**	
4	**Learning Hours**		**Contact Hours**	60	
			Assessment	1	
			Guided Study	10	
			Total hours	80	
5	**Course Objective**	1. To make students aware with the micro and macro world of Indian Society 2. To recognize functional similarities and differences in the institutions of Indian Society **3.** To understand the processes of social change and development in Indian Society			
6	**Course Outcomes**	1. Students will be able to identify the Indological Approach. 2. Students will comprehend basic institutions of village society 3. Students will understand the importance of caste system			
7					**Outline syllabus:**
7.01	**Paper Code**	**Unit**	**Introduction**	**Page Numbers[1]**	**Lectures**

7.02		Unit I	**EMERGENCE OF SOCIOLOGY IN INDIA** 1. Orientalist Approach 2. Indological Approach: G. S Ghurye and Louis Dumont	2-7 8-20	2 4
		Unit II	**SOCIAL INSTITUTIONS AND PRACTICES –** 1. Caste 2. Tribe 3. Class 4. Village 5. Family and Kinship	21-28 29-47 48-53 54-65 66-68	3 3 3 3 5
		Unit III	**CASTE SYSTEM IN INDIA** 1. Caste System: Meaning, definition and Features 2. Changing trends in the Caste System 1. Caste system in Contemporary India 2. Caste and Social Mobility 3. Aspects of Mobility in Caste-Sanskritization, Westernization and Modernization	80-85 90-97 101-103 105-110 110-128	3 3 3 4 4

RAFFLES UNIVERSITY

TEACHING PLAN: WESTERN POLITICAL THOUGHT

SCHOOL: HUMANITIES AND SOCIAL SCIENCE		**ACADEMIC SESSION 2023-24**		**FOR STUDENTS' BATCH:** B.A. 2021-24
Teacher		**Dr. Sonika Sharma**		
1	**Course code**	**PS-501**		
2	**Course Title**	**WESTERN POLITICAL THOUGHT**		
3	**Credits**	**4**		
4	**Learning Hours**	**Contact Hours**	**45**	
		Project, Tutorial and Assessment	**15**	
		Total hours	**60**	
5	**Course Objective**	The objective of the course is designed to understand political philosophical traditions as they evolved in Europe from ancient to the beginning of modern era. It examines the contributions of the Greeks, Medieval Philosophers and the breaking of the Christian Tradition with Machiavelli and Social Contractualists.		

6	**Course Outcomes**	1. To understand the salient features of Greek and Medieval Political thought. 2. Identify and explain major political philosophers, their contributions, and the historical context in which their ideas emerged. 3. Critically analyze and evaluate primary texts and secondary literature in Western political thought. 4. Analyze how ideas from Western political thought have influenced other disciplines and vice versa. 5. Conduct independent research on specific topics or thinkers within Western political thought, utilizing appropriate scholarly sources and methodologies.
7		**Outline syllabus:**

7.00	**Paper Code**	**Unit**	**Introduction**	**Reference number**	**Teaching methods**
7.01	**Paper Code. PS 501**	I	**Natural-Rational Tradition of the Greeks** • **Salient Features of Greek Political Thought** • **Plato's Ideal State: Justice, Philosopher King, Education and Communism** • **Aristotle's Policy: Classification of Governments, Revolution, The Best Practicable State.**	*A History of Political Thought*- Mukharjee	Lecture and Presentation
7.02	**Paper Code. PS 501**	II	**Medieval-Christian Tradition** • **Salient features of Medieval Political Thought** • **St. Thomas Aquinas: Theory of Law, Relationship between Church and the State** • **Machiavelli: Separation of Ethics and Politics, Theory of State-Craft**	*A History of Political Thought*- Mukharjee	Lecture and Presentation
7.03	**Paper Code. PS 501**	III	**Social Contractualists** • **Thomas Hobbes: State of Nature, Social Contract, Sovereignty** • **John Locke: State of Nature, Social Contract, Natural Rights, Limited Government** • **Rousseau: State of Nature, Social Contract, General Will**	*A History of Political Thought*- Mukharjee	Lecture and Presentation

7.04	**Paper Code. PS 501**	IV	**Utilitarianism and Marxism** • Jeremy Bentham: Utilitarianism, Political and Legal Reforms • J.S. Mill: Utilitarianism, Liberty, Representative Government • T.H. Green: Theory of State, Rights and Political Obligation • Immanuel Kant: Theory of Moral Freedom, the Civil State • George Wilhelm Fredrick Hegel: Dialectical Method, Theory of State • Karl Marx: Dialectical Materialism, Historical Materialism, Theory of Class Struggle	*A History of Political Thought*- Mukharjee	Lecture and Presentation
8					**Course Evaluation**
8.10					**CA: 20%**
8.11 (a)	**Attendance**				10%
8.12 (b)	**Assignment**				60%
8.13 (c)	**Presentation**				1 Presentation, 30%
8.14	**Any other**				--
8.15	**MTE(IA)**				20%
8.16					**End-term examination: 60%**
9					**References and Video References**
9.1	**References**	1. *A History of Political Theory* – J.P. Sudha. 2. *A History of Political Thought* – S. Mukherjee, PHI. 3. *Western Political Thought*- O.P. Gauba, (Macmillan 2011). 4. *A History of political Theory*- George H. Sabine. 5. *Western Political Thought*- Shefali Jha (Pearson, 2010). 6. *Political Thinkers*- David Boucher and Paul Kelly(editors), Oxford . 7. *Political Thought*- C.L. Wayper. 8. *Political Philosophy*- Maxie. 9. *Great Political Thinkers*- William Ebenstein. 10. *Western Political Thought*- B.R. Nelson (Pearson).		
9.2	**Video References**	1. https://www.youtube.com/watch?v=ZDyB8sAf4Ks 2. https://www.youtube.com/watch?v=C0kJSBq1QNI 3. https://www.youtube.com/watch?v=3sURlwJ9rrE 4. https://www.youtube.com/watch?v=xgLfQN1cLgs 5. https://www.youtube.com/watch?v=fWb-xxxio6w 6. https://www.youtube.com/watch?v=YWZX9xacqCI&t=4s 7. https://www.youtube.com/watch?v=nS5OFdnN5k0 8. https://www.youtube.com/watch?v=QAr-UmXAzbs		

Mapping of Outcomes iv. Topics

Outcome no. → Syllabus topic↓	1	2	3	4	
Paper Code.Unit I.1	√				
Paper Code. Unit I .2	√				
Paper Code. Unit I.3	√				
Paper Code.Unit I.4					√
Paper Code. Unit I.5	√				
Paper Code. Unit II.1		√			
Paper Code.Unit III .2		√			
Paper Code. Unit II.3		√			
Paper Code. Unit II.4		√			
Paper Code.Unit III.1			√		
Paper Code. Unit III.2					√
Paper Code. Unit III.3			√		
Paper Code. Unit IV.1				√	
Paper Code. Unit IV.2				√	
Paper Code. Unit IV.3					√
Paper Code. Unit IV.4				√	

QUESTION BANK

UNIT I

1. What do you know about Plato's idea of philosopher King?
2. Describe Plato's idea of Justice.
3. What do you Plato's idea on education?
4. Write a short essay on Aristotle.
5. What do you know about Aristotle's best possible state?
6. Explain Aristotle's idea of slavery?
7. Elaborate Aristotle's idea of family.
8. Explain idea of Golden mean.

UNIT II

1. What are the salient features of Medieval Political Thought?
2. Write short essay on Thomas Aquinas.
3. Explain Thomas Aquinas's idea on the relationship between Church and State.
4. What do you know about Machiavelli's idea on Theory of State-Craft?

UNIT III

1. Explain the idea of Thomas Hobbes on State of Nature.
2. Explain the idea of Thomas Hobbes on Social Contract.
3. Write a short note on Thomas Hobbes idea on Sovereignty.
4. What do you know about John Locke's State of Nature?
5. Write short note on John Locke's idea on Social Contract.
6. Write short note on John Locke's idea on Natural Rights.
7. Write short note on John Locke's idea on Limited Government.
8. Write an essay on Rousseau's idea on State of Nature.
9. What do you know Rousseau's idea of Social Contract and General will?

UNIT IV

1. Write short note on Jeremy Bentham's Utilitarianism,
2. What do you know about Political and Legal Reforms of Jeremy Bentham?
3. Explain Utilitarianism.
4. Explain Mill's Idea on Representative Government and Liberty.
5. Write an essay on T.H. Green.

6. What do you know about Kant’s Theory of Moral Freedom?
7. What do you know about Hegel’s idea of Dialectical Method?
8. Write short note on Hegel’s Theory of State.

9. Write an essay on Marxism.
10. What do you know about Dialectical Materialism?
11. What do you know about Marxist Theory of Class Struggle?

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			4. Caste and Class Nexus	130-137	3
		Unit IV	**SOCIAL MOVEMENTS IN INDIA** • Social Movements: Definition, Characteristics and Types • Religious Movements • Caste Movements • Tribal Movements • Agrarian Movements	182-184 185-189 190-195 195-201 201-204	4 4 4 4 4

8		**Course Evaluation**
8.1		**CA: 10%**
8.1.1	**Attendance**	25 %
8.1.2	**Homework**	2 Assignments, 50%
8.1.3	**Quizzes**	2 Quizzes, 25%
8.1.4	**Projects**	1
8.1.5	**Presentation**	Group presentation-1 Individual presentation-1
8.2	**MTE**	10%
8.3		**End-term examination: 50%**
9		**Text Books & References**
9.1	**Text book**	1. Bhushan, Vidaya and Sachdeva, D. R. (2006) An Introduction to Sociology. Kitab Mahal
9.2	**References**	1. Ahuja, Ram (1999). Society in India: Concepts, Theories and Recent Rrends. New Delhi: Rawat Publication. **2.** Kuppuswamy, B (1992). Social Change in India. Konark Publishers Ltd.
9.3	**Video References**	**G.S. Ghurye - Indological & Textual Perspective** https://youtu.be/HQIY5L-gWoo **M N Srinivas : Caste system, Sanskritization & Westernization** https://youtu.be/fXMno8xSCoE

Question Bank:

Short Answer Questions:

1. What is the Orientalist approach to the emergence of sociology in India?

2. Who were the key figures associated with the Indological approach, specifically G. S Ghurye and Louis Dumont?

3. Name five social institutions and practices covered in the syllabus.

4. Define the caste system and list its key features.

5. Explain the concept of Sanskritization in the context of caste mobility.

6. Identify three types of social movements discussed in the syllabus.

7. What are the characteristics of religious movements in the context of social movements in India?

8. Briefly describe the changing trends in the caste system.

9. How does the caste system relate to social mobility in contemporary India?

10. What is the caste and class nexus, and why is it significant in sociological studies?

Long Answer Questions:

1. Discuss the Orientalist approach and its impact on the emergence of sociology in India, highlighting key scholars and their contributions.

2. Analyze the key features of the caste system in India, its historical context, and its role in shaping social structures.

3. Compare and contrast the Indological approaches of G. S Ghurye and Louis Dumont in understanding Indian society and culture.

4. Explore the social institutions of village, family, and kinship, emphasizing their role in shaping community life in India.

5. Evaluate the changing trends in the caste system, considering historical, social, and economic factors that have influenced its dynamics.

6. Examine the concepts of Sanskritization, Westernization, and Modernization as aspects of mobility in the caste system, illustrating their impact on social structures.

7. Define social movements and discuss their characteristics, with a focus on types such as religious, caste, tribal, and agrarian movements.

8. Investigate the relationship between caste and social mobility in contemporary India, highlighting challenges and opportunities for individuals within the caste system.

9. Analyze the role of caste movements in challenging or reinforcing existing social structures, and their impact on Indian society.

10. Explore the significance of the caste and class nexus in understanding social stratification and inequality in India, providing examples to illustrate its manifestations.

RAFFLES UNIVERSITY

TEACHING PLAN: INDIAN ENGLISH LITERATURE

SCHOOL: Humanities and Social Science		**ACADEMIC SESSION 2023**	**FOR STUDENTS' BATCH:** 2021-24
1	**Course code**	**ENG 501**	
2	**Course Title**	**Indian English Literature**	
3	**Credits**	**4**	
4	**Course Objective**	The subject of Indian English Literature is basically designed for students of Humanities having English Literature as a subject to equip them with Indian English Literature with reference to some seminal texts. The more specific objectives are as follows: • To acquaint them with Indian English Literature. • To understand and analyze different genres like poetry, drama, fiction, short story, novella, etc., of Indian English Literature. • To introduce students to major movements and figures of Indian Literature in English through the study of selected literary texts. • To create literary sensibility and emotional response to the literary texts an implant sense of appreciation of literary text. • To expose the students to the artistic and innovative use of language	

		employed by the writers. • To instil values and develop human concern in students through exposure to literary texts.
5	**Course Outcomes**	After completing the course, the student shall be able to: • Students would have widened their idea about different genres of Indian English Literature. • Students would have grasped the major theme of poetry, novel, short story and novellas that belong to Indian Writings in English. • Analyze how the sociological, historical, cultural and political context impacted the texts selected for study. • Evaluate critically the contributions of major Indian English poets, dramatists, and novelists.

6 Outline syllabus:

6.00	Paper Code	Unit	Introduction	References	Teaching methods
6.01	**Paper Code. ENG 501**	I	**a) Nissim Ezekiel:** Background Casually **b) Kamala Das:** My Grandmother's House **c) Jayanta Mahapatra:** Dhauli **d) Tabish Khair:** Amma	**Text, The Penguin Book of Indian Poets edited by Jeet Thayil** https://archive.nptel.ac.in/courses/109/106/109106135/	Detailed class room discussion and reading of texts in class, Question and Answers Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings, and clearing of students' doubts in class
6.02	**Paper Code. ENG 501**	II	**Discursive Prose/Short Stories** a) **Gandhi:** As A School Master **b) Ruskin Bond:** The Blue Umbrella	Text, http://acl.digimat.in/nptel/courses/video/109106135/L40.html	Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings, Revision of full syllabus and clearing of doubts
6.03	**Paper Code. ENG 501**	III	**Mulk Raj Anand:** Untouchable	Text, https://www.youtube.com/watch?v=jL2RpfnErVk	Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings, Revision of full syllabus and clearing of doubts
6.04	**Paper Code. ENG 501**	IV	**Raja Rao:** Kanthapura	Text, http://www.digimat.in/nptel/courses/video/109104116/L11.html	Detailed class room discussion and reading of texts in class, Question and Answers Discussion, Presentations, Assignments, Research Orientation, and Parallel Readings, and clearing of students' doubts in class

7	**Course Evaluation**

7.10	**CA: 20%**	
7.1	**Attendance**	5%
7.12	**Homework**	-
7.13	**Quizzes**	4 Quizzes, 5%
7.14	**Projects**	1 Project, 5%
7.15	**Presentation**	1 Presentation, 5%
7.16	**Any other**	--
7.2	**MTE(IA)**	20%
7.3	**End-term examination: 60%**	
8	**Text Books & References:** 1. Anand, M. R. (1940). Untouchable: a novel / by Mulk Raj Anand ; with a pref. by E. M. Forster. Harmondsworth, Penguin Books. 2. Bond, Ruskin. The Blue Umbrella. Rupa Publications India Pvt. Ltd, 1992 3. M.K. Gandhi, An Autobiography or The Story of My Experiments with Truth 4. Mahapatra Jayanta, Dhauli 5. Bijay Kumar Das, The Poetry of Jayanta Mahapatra: 3rd revised and enlarged edition; New Delhi: Atlantic, ISBN 81-7156-968-4	
8.1	**Recommended Reading**	1. Heyman, Michael. The Life and Works of Ruskin Bond. Children's Literature Association Quarterly, vol. 28, 2009, pp. 253-254. 2. Sumathy, U. Eco criticism in Practice. Sarup Book Publishers, New Delhi. 2009. 3. *English Literature* by William J Long. 4. *A Glossary of Literary Terms* by M. H. Abrams. 5. K Elango: *Insights A Course in English Literature and Language*. Orient Blackswan, 2009, E. Suresh. 6. *Mastering English: A Course for Beginners*. Orient Blackswan 7. *Using English: A Course for Undergraduate Learners*, Board of Editors. Orient Blackswan.
8.2	**Online Sources**	https://www.slideshare.net/AditiVala1/nissim-ezekiel-a-poet-of-india http://www.digimat.in/nptel/courses/video/109104116/L11.html

QUESTION BANK

UNIT I

1. What are the central themes of "Background, Casually"? How does Nissim Ezekiel explore themes of identity, alienation, and cultural conflict in the poem?
2. Analyze the use of imagery in Background, Casually. How do the visual and sensory details contribute to the poem's exploration of the speaker's sense of self and place?
3. Discuss the tone of the poem. How does Ezekiel's tone reflect the speaker's attitude towards his own background and the cultural context in which he finds himself?
4. How does the poem address the concept of identity? What does the speaker's reflection on his background reveal about the complexities of self-perception and cultural belonging?
5. Examine the poem's structure and form. How does Ezekiel's choice of structure influence the delivery of the poem's themes and the portrayal of the speaker's experiences?
6. Discuss the role of irony in "Background, Casually". How does Ezekiel use irony to critique or reflect upon issues of cultural identity and societal expectations?
7. How does Ezekiel use contrast in the poem to highlight the differences between the speaker's past and present? What do these contrasts reveal about the speaker's internal and external conflicts?

8. Analyze the use of colloquial language and tone in the poem. How does this choice of language affect the reader's understanding of the speaker's personal and cultural struggles?
9. What is the significance of the poem's title, "Background, Casually"? How does the title frame the poem's content and themes?
10. Discuss the depiction of cultural and social tensions in the poem. How does Ezekiel portray the challenges faced by individuals navigating multiple cultural identities?
11. Examine the poem's portrayal of the speaker's relationship with his own cultural heritage. How does this relationship impact his sense of identity and place in society?
12. How does Ezekiel's background and historical context influence the themes and perspectives presented in the poem? What insights does the poem offer about the socio-cultural landscape of its time?
13. Discuss the poem's exploration of personal and collective memory. How does the speaker's recollection of his background shape his current identity and worldview?
14. Analyze the poem's use of metaphor and symbolism. How do these literary devices enhance the poem's exploration of cultural and personal identity?
15. How does Background, Casually compare to other works by Nissim Ezekiel in terms of themes and style? What common elements or distinctive features can be identified in his poetry?
16. What are the central themes in My Grandmother's House? How does Kamala Das explore themes of nostalgia, memory, and loss in the poem?
17. Analyze the use of imagery in My Grandmother's House. How does Das use visual and sensory images to evoke the emotional atmosphere of the grandmother's house?
18. Discuss the tone of the poem. How does the tone reflect the speaker's feelings about her grandmother's house and the memories associated with it?
19. How does Kamala Das use the concept of the grandmother's house as a symbol in the poem? What does it represent in terms of personal history and emotional significance?
20. Examine the poem's structure and form. How does the organization of the poem contribute to its themes and the portrayal of the speaker's memories?
21. Discuss the role of personal memory in My Grandmother's House. How does Das use memory to create a sense of longing and attachment to the past?
22. How does the poem address the idea of home and belonging? What does the grandmother's house symbolize about the speaker's sense of identity and connection to her past?
23. Analyze the use of metaphor and simile in the poem. How do these literary devices enhance the depiction of the grandmother's house and the speaker's feelings?
24. What is the significance of the poem's imagery of decay and deterioration? How does this imagery contribute to the themes of loss and change in the poem?
25. Discuss the emotional impact of the poem. How does Kamala Das's depiction of the grandmother's house evoke feelings of nostalgia, sadness, or comfort?
26. Examine the poem's reflection on the passage of time. How does Das address the effects of time on personal relationships and physical spaces?
27. How does My Grandmother's House fit within the broader context of Kamala Das's work? What common themes or stylistic elements are present in her poetry?
28. Discuss the use of first-person narrative in the poem. How does the speaker's personal perspective shape the reader's understanding of the grandmother's house and its significance?
29. Analyze the poem's portrayal of family and relationships. How does Das depict the relationship between the speaker and her grandmother, and what does this relationship reveal about the speaker's past?
30. What role does the physical description of the grandmother's house play in the poem? How does Das use physical details to evoke emotional responses and connect with the speaker's memories?
31. What are the central themes of Dhauli? How does Jayanta Mahapatra explore themes such as history, violence, and memory in the poem?

32. Analyze the use of imagery in Dhauli. How does Mahapatra use visual and sensory images to evoke the historical and emotional significance of the Dhauli region?
33. Discuss the tone of the poem. How does Mahapatra's tone reflect the speaker's feelings about the historical events and the landscape described in the poem?
34. How does the poem address the concept of history and its impact on the present? What does the depiction of Dhauli reveal about the relationship between past events and contemporary experiences?
35. Examine the poem's structure and form. How does Mahapatra's choice of structure contribute to the portrayal of the poem's themes and the depiction of Dhauli?
36. Discuss the role of historical context in Dhauli. How does Mahapatra incorporate historical references to enhance the poem's exploration of memory and violence?
37. How does Mahapatra use symbolism in Dhauli? What do the symbols in the poem represent, and how do they contribute to the overall meaning of the work?
38. Analyze the use of language and diction in the poem. How does Mahapatra's choice of words and stylistic elements enhance the thematic depth and emotional resonance of the poem?
39. What is the significance of the poem's imagery related to war and conflict? How does this imagery contribute to the poem's exploration of violence and its aftermath?
40. Discuss the emotional impact of Dhauli. How does Mahapatra's depiction of historical and personal trauma evoke feelings of reflection, sorrow, or contemplation?
41. Examine the role of the natural landscape in the poem. How does the depiction of the Dhauli region contribute to the poem's themes of history and memory?
42. How does Dhauli reflect broader cultural and historical concerns? What insights does the poem offer about the historical events of Dhauli and their significance in contemporary India?
43. Discuss the relationship between the individual and history as portrayed in the poem. How does Mahapatra explore the impact of historical events on personal identity and experience?
44. Analyze the poem's use of metaphor and allegory. How do these literary devices help to convey the themes of violence and historical memory?
45. How does Dhauli fit within the broader context of Jayanta Mahapatra's body of work? What common themes or stylistic elements are present in his poetry, and how does this poem contribute to his overall literary themes?
46. What are the central themes of Amma? How does Tabish Khair explore themes such as maternal influence, identity, and cultural expectations in the poem?
47. Analyze the use of imagery in Amma. How does Khair use visual and sensory details to evoke the presence and significance of the mother figure in the poem?
48. Discuss the tone of the poem. How does Khair's tone reflect the speaker's feelings about the mother figure and the impact of maternal relationships on personal identity?
49. How does Khair use symbolism in Amma? What does the mother figure symbolize in the context of the poem, and how does this symbolism contribute to the poem's themes?
50. Examine the poem's structure and form. How does Khair's choice of structure influence the delivery of the poem's themes and the portrayal of the mother figure?
51. Discuss the role of cultural and familial expectations in Amma. How does Khair address the influence of these expectations on the speaker's relationship with their mother and their own identity?
52. How does the poem address the concept of identity? What does the speaker's relationship with their mother reveal about their own sense of self and cultural belonging?
53. Analyze the use of language and diction in the poem. How does Khair's choice of words and stylistic elements enhance the thematic depth and emotional impact of the poem?
54. What is the significance of the poem's depiction of the mother figure's role in the family? How does Khair portray the complexities of maternal influence and its effects on family dynamics?
55. Discuss the emotional impact of Amma. How does Khair's portrayal of the mother figure evoke feelings of affection, conflict, or reflection?

56. Examine the poem's portrayal of generational differences. How does Khair address the tensions or connections between different generations within the family?
57. How does Amma reflect broader cultural and social issues? What insights does the poem offer about the role of women and mothers in contemporary society?
58. Discuss the use of metaphor in the poem. How do metaphors related to the mother figure enhance the poem's exploration of maternal influence and personal identity?
59. Analyze the poem's treatment of memory and nostalgia. How does Khair use these elements to convey the speaker's relationship with their mother and their past?
60. How does Amma fit within the broader context of Tabish Khair's work? What common themes or stylistic elements are present in his poetry, and how does this poem contribute to his overall literary concerns?

UNIT II

1. What are the central themes of ***As a School Master***? How does Mahatma Gandhi address themes such as education, moral development, and leadership in the essay?
2. Analyze Gandhi's perspective on the role of a school master in the essay. How does he define the responsibilities and qualities essential for effective teaching and leadership?
3. Discuss Gandhi's views on the relationship between education and character development. How does he argue that education should contribute to the moral and ethical growth of students?
4. How does Gandhi use examples or anecdotes in the essay to illustrate his points about the role of a school master? What impact do these examples have on the reader's understanding of his educational philosophy?
5. Examine the tone of the essay. How does Gandhi's tone reflect his views on education and the role of a school master?
6. What does Gandhi say about the importance of setting a personal example for students? How does he believe that a school master should model the values they wish to instill in their students?
7. Discuss Gandhi's ideas on the integration of practical life skills into the educational curriculum. How does he propose that education should be connected to real-life experiences and responsibilities?
8. Analyze Gandhi's views on discipline and authority in the context of education. How does he balance the need for discipline with the importance of nurturing and guiding students?
9. What are Gandhi's thoughts on the use of punishment in education? How does he suggest that discipline should be administered, and what are his reasons for this approach?
10. Discuss the role of cultural and moral values in Gandhi's vision of education. How does he believe that these values should be incorporated into the educational process?
11. Examine Gandhi's critique of contemporary educational practices of his time. What shortcomings does he identify, and how does he propose addressing them?
12. How does Gandhi's educational philosophy reflect his broader views on social and personal reform? What connections can be drawn between his ideas on education and his views on societal change?
13. Discuss the significance of the teacher-student relationship in Gandhi's framework. How does he envision the dynamics between a school master and their students?
14. Analyze Gandhi's approach to curriculum development. What emphasis does he place on different subjects, and how does he suggest they should be taught?
15. How does ***As a School Master*** fit within the broader context of Gandhi's writings and philosophy? What common themes or ideas can be identified in this essay compared to his other works?
16. What are the central themes of ***The Blue Umbrella***? How does Ruskin Bond explore themes such as kindness, greed, and community in the story?
17. Analyze the character of Binya in ***The Blue Umbrella***. How does her personality and actions drive the narrative, and what does she represent in the story?
18. Discuss the significance of the blue umbrella as a symbol in the story. How does it reflect the themes of the narrative and the characters' interactions?
19. How does Ruskin Bond use setting to enhance the story? What role does the natural and social environment play in shaping the events and themes of the narrative?
20. Examine the character of Ram Bharosa and his relationship with Binya. How does his character development contribute to the story's exploration of greed and redemption?

21. Discuss the role of the community in the story. How do the interactions between the characters and the village setting influence the unfolding of the plot and the development of themes?
22. Analyze the use of narrative perspective in ***The Blue Umbrella***. How does the point of view affect the reader's understanding of the characters and events?
23. What are the key conflicts in the story, and how are they resolved? How do these conflicts contribute to the overall message and themes of the narrative?
24. Discuss the role of empathy and generosity in ***The Blue Umbrella***. How do these values influence the characters' actions and the resolution of the story?
25. Examine the role of nature and the rural setting in the story. How does Bond use the natural environment to reflect the emotional states of the characters and the themes of the narrative?
26. How does Bond address the concept of materialism versus emotional value in ***The Blue Umbrella***? What message does the story convey about the true worth of objects and relationships?
27. Analyze the ending of the story. How does the resolution reflect the broader themes of forgiveness and transformation?
28. Discuss the development of Binya's character throughout the story. How do her experiences with the blue umbrella shape her personal growth and understanding of the world?
29. How does Bond use descriptive language and imagery to bring the story to life? What impact does his writing style have on the reader's engagement with the narrative?
30. How does ***The Blue Umbrella*** fit within the broader context of Ruskin Bond's work? What common themes or stylistic elements are present in this story compared to his other writings?

UNIT III

1. What are the central themes of ***Untouchable***? How does Mulk Raj Anand address issues of caste discrimination, social injustice, and human dignity in the novel?
2. Analyze the character of Bakha in ***Untouchable***. How does his experience as an untouchable shape his worldview and interactions with others in the story?
3. Discuss the significance of the social and cultural setting in ***Untouchable***. How does Anand use the historical and social context to highlight the plight of the untouchables?
4. How does Anand portray the impact of caste discrimination on Bakha's life and self-esteem? What does this portrayal reveal about the broader social structure of the time?
5. Examine the role of education and social reform in the novel. How do these elements contribute to Bakha's sense of hope and the potential for social change?
6. Discuss the use of symbolism in ***Untouchable***. How does Anand use symbols such as the latrine, the temple, and the sweepers to convey deeper meanings about caste and social hierarchy?
7. Analyze the interactions between Bakha and other characters in the novel. How do these interactions reflect the social divisions and prejudices of the time?
8. What role does religion play in the novel? How does Anand address the intersection of religion and caste, and what critiques does he offer about religious practices and beliefs?
9. How does Anand use narrative techniques to convey the emotional and social experiences of Bakha? What impact do these techniques have on the reader's understanding of the character and his struggles?
10. Discuss the role of family and community in ***Untouchable***. How does Bakha's relationship with his family and his position within the community influence his experiences and aspirations?
11. Examine the theme of aspiration and self-worth in the novel. How does Bakha's desire for a better life reflect broader themes of social mobility and personal dignity?
12. How does Anand's portrayal of British colonial rule influence the depiction of caste and social issues in the novel? What connections can be drawn between colonialism and the social conditions described?
13. Discuss the significance of the novel's ending. How does the conclusion reflect the themes of hope, disillusionment, and the possibility for change?
14. Analyze Anand's portrayal of gender roles within the context of caste discrimination. How does the novel address the experiences of women and their position within the social hierarchy?
15. How does ***Untouchable*** fit within the broader context of Mulk Raj Anand's body of work? What common themes or stylistic elements are present in this novel compared to his other writings?

UNIT IV

1. What are the central themes of ***Kanthapura***? How does Raja Rao explore themes of nationalism, rural life, and the impact of colonialism in the novel?
2. Analyze the narrative style of ***Kanthapura***. How does Raja Rao's use of a first-person, oral narrative shape the reader's understanding of the story and its characters?
3. Discuss the role of the village of Kanthapura in the novel. How does the setting contribute to the development of the plot and the exploration of social and political themes?
4. Examine the character of Moorthy in ***Kanthapura***. How does his role as a Gandhian leader influence the community and drive the novel's narrative?
5. How does Raja Rao depict the impact of Gandhian philosophy on the rural population of Kanthapura? What changes occur in the village as a result of Moorthy's leadership and Gandhian principles?
6. Discuss the significance of the various female characters in ***Kanthapura***. How do their experiences and roles contribute to the novel's themes of social change and gender dynamics?
7. Analyze the use of folklore and oral tradition in the novel. How does Raja Rao incorporate these elements to enhance the storytelling and reflect the cultural context of the village?
8. How does ***Kanthapura*** address the theme of resistance against colonial rule? What strategies and forms of resistance are depicted in the novel?
9. Examine the portrayal of caste and social hierarchy in ***Kanthapura***. How does the novel address the intersection of caste discrimination and the nationalist movement?
10. Discuss the impact of colonialism on the village of Kanthapura and its inhabitants. How does the presence of British rule shape the social and political landscape of the novel?
11. Analyze the role of religion and spirituality in the novel. How does Raja Rao use religious imagery and beliefs to underscore the themes of nationalism and social change?
12. What is the significance of the novel's structure, including the use of oral storytelling and mythic elements? How does this structure influence the reader's perception of the narrative?
13. Discuss the theme of community and solidarity in ***Kanthapura***. How do the characters come together to support the nationalist cause, and what does this reveal about the nature of communal resistance?
14. Examine the character development of the protagonist, Moorthy. How does his journey reflect the broader themes of sacrifice, leadership, and transformation in the context of the freedom movement?
15. How does ***Kanthapura*** fit within the broader context of Raja Rao's literary work? What themes or stylistic elements are common in this novel compared to his other writings?

PROJECTS (To be given to group of students)

1. Enact and play the roles of *Final Solutions* by Mahesh Dattani.

RAFFLES UNIVERSITY

TEACHING PLAN: Literary and Critical Movement, Critical Terms and Practical Criticism

SCHOOL: Humanities and Social Science		**ACADEMIC SESSION 2023-24**	**FOR STUDENTS' BATCH:** BA (2021-24)
1	**Course code**	**ENG 601**	
2	**Course Title**	**Literary and Critical Movement, Critical Terms and Practical Criticism**	
3	**Credits**	**4**	

4	**Course Objective**	The subject of Critical theory is basically designed for students of Humanities having English Literature as a subject to equip them with critical movements, terms and practical criticism with reference to some seminal texts. The more specific objectives are as follows: • To acquaint them with critical terms. • To understand and analyse literary texts. • To introduce students to major movements and criticism • To create literary sensibility and emotional response to the literary texts an implant sense of appreciation of literary text. • To expose the students to the artistic and innovative use of language employed by the writers. • To instil values and develop human concern in students through exposure to literary texts and terminology.
5	**Course Outcomes**	After completing the course, the student shall be able to: • Students would have widened their idea about different terms. • Students would know the nature and function of criticism. • Analyze how the sociological, historical, cultural and political context impacted the texts selected for study. • Evaluate critically and be familiar with the trending theories and tenets of practical criticism.

6 Outline syllabus:

6.00	**Paper Code**	**Unit**	**Introduction**	**References**	**Teaching methods**
6.01	**Paper Code. ENG 601**	**I**	**Literary Movements:** **Beat generation, Bloomsbury group, Modernism, Postmodernism, Romanticism, New criticism, Practical criticism, University wits, Aestheticism**	Abrams, M. H. A Glossary of Literary Terms. (8th Edition) New Delhi: Akash Press, 2007.	Lecture and discussion
6.02	**Paper Code. ENG 601**	**II**	**Critical Approaches:** **New Criticism** **Structuralism** **Psychoanalytic Criticism** **Disabled studies**	Abrams, M. H. The Mirror and the Lamp: Romantic Theory and Critical Tradition. Oxford: OUP, 1971	Lecture and discussion
6.03	**Paper Code. ENG 601**	**III**	**Critical Approaches** **Marxist Criticism, Karl Marx, Das Capital** **Feminist Criticism, Elaine Showalter, A Literature of their own** **Postcolonial Criticism, Gayatri Spivak: Can the Subaltern Speak?**	Ashcroft, Bill etal. (ed.) The Post-Colonial Studies Reader. London: Routledge,1995.	Lecture and discussion
6.04	**Paper Code. ENG 601**	**IV**	**Practical Criticism** **Critical Appreciation of an unseen poem: A short poem of about 20 lines will be set for appreciation. The title of the poem will be given. The unit will test the students 'responsiveness to the poem and their linguistic ability in analyzing the poem. Students are expected to mobilize the techniques of close reading and their understanding of literary devices like imagery, metaphor and other poetic**	Daiches, David. Critical Approaches to Literature. London: Longman, 1984.Drew, Elizabeth. Understanding Poetry. New York: Norton,	Lecture and discussion

			devices while learning this unit.	1959.	

7	**Course Evaluation**	
7.10	**CA: 20%**	
7.1	**Attendance**	5%
7.12	**Homework**	-
7.13	**Quizzes**	4 Quizzes, 5%
7.14	**Projects**	1 Project, 5%
7.15	**Presentation**	1 Presentation, 5%
7.16	**Any other**	--
7.2	**MTE(IA)**	20%
7.3	**End-term examination: 60%**	
8	**Text Books & References**	
8.1	**Recommended Reading**	
8.2	**Online Sources**	

QUESTION BANK

UNIT I

1. Define the following terms:
   Beat generation, Bloomsbury group, Modernism, Postmodernism, Romanticism, New criticism, Practical criticism, University wits, Aestheticism

UNIT II

1. Explain the ideas of Karl Marx briefly.
2. How is base and superstructure explained by Marx?
3. What are the basic principles of Marxism?
4. How is Russian Marxism different from Western Marxism?
5. Explain in detail the theory of alienation in Marxism.
6. Elucidate Terry Eagleton's concept of form and content.
7. What is feminism?
8. What is the main purpose of the feminist movement?
9. Write in detail the different phases of feminism explained by Elaine Showalter.
10. Elucidate the four waves of feminism.

UNIT III

8. What is the main purpose of the feminist movement?
9. Write in detail the different phases of feminism explained by Elaine Showalter.
10. Elucidate the four waves of feminism.
11. Comment on the feminist approach to literary criticism with examples.
12. What are the key concepts of feminist literary criticism?

UNIT IV

13. Describe the art of practical criticism.
14. Explain in detail the poem and write its interpretation.
15. Comment on the thematic richness of the given poem.

PROJECTS (To be given to group of students)

Analyse any text and write a research paper.

School of Law, Raffles University

Bachelor of Laws

B.A.LL.B/B.B.A.LL.B

PROGRAM OUTCOMES

1. **PO1. Legal Knowledge:** To acquire & apply legal knowledge to complex Socio-legal problems.
2. **PO2. Professional Practice:** to make students eligible to practice as legal practitioners in Courts, Industries, and Companies.
3. **PO3. Professional Skills:** To possess professional skills required for legal practice such as Argument, Pleading, drafting, conveyancing etc.
4. **PO4. Professional Ethics:** To understand and apply principles of professional ethics of the legal profession.
5. **PO5. Legal Research & Legal Reasoning:** to develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PO6. Leadership Skills:** To develop leadership qualities amongst students.

PROGRAM EDUCATIONAL OBJECTIVES

1. **PEO1**: To acquire & apply legal knowledge to multifaceted Socio-legal problems.
2. **PEO2:** To make students eligible to practice as legal experts in Courts, Industries, and Companies.
3. **PEO3**: To possess the expertise necessary for practicing law, such as argument, pleading, drafting, conveyancing, etc.
4. **PEO4**: Understanding and applying legal professional ethics in legal principles.
5. **PEO5**: To develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PEO6**: To create a foundation for independent employment by acquiring professional legal skills.
7. **PEO7**: To strengthen clinical skills and raise understanding of constitutional legislation and societal transformation.
8. **PEO8**: Each law graduate will acquire expertise in legal research, written and spoken communication, teamwork, advocacy, and problem-solving.

PROGRAM SPECIFIC OBJECTIVES

1. **PSO1**. Students should be able to demonstrate an understanding of substantive and procedural law sufficient to enter the legal profession and professions in which legal knowledge is an advantage.
2. **PSO2**. Should be able to associate the learning from the courses related to Law and Management.
3. **PSO3**. Should have the capability to understand the laws at national and global levels and to solve the client's problem.
4. **PSO4**. Should possess the skills to communicate in both oral and written forms and the ability to formulate legal problems and use appropriate concepts and methods to solve them.
5. **PSO5** should use skills in specific areas (e.g. Criminal, industrial-organizational, clinical, counselling, social, and community).
6. **PSO6** should be analyzing social problems and understanding social dynamics.

COURSE OUTCOMES (COs)

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER 1	
Legal Methods (BAL/BBL 101)	**CO1** Understand the foundations of law. **CO2** Analyze the application of the components of the Indian Legal System. **CO3** Write research reports, using proper research tools. **CO4** Draft plaints & written statements as a part of the clinical Legal Education.
Law of Torts, Consumer Protection and MV. Act (BAL/BBL 102)	**CO1** Identify the various conceptual aspects of the Law of Torts. **CO2** Apply various defences under tortuous liability and specific kinds of torts. **CO3** Enumerate the remedies available for specific torts. **CO4** Know the relation of torts with various other laws.
General English-I (BAL/BBL 103)	**CO1** Describe the importance of General English and Legal Language. **CO2** Identify the correct usage of grammar in legal drafting during the draft of any document.

	CO3 Draft documents for legal correspondence to use in the legal drafting. **CO4** Analyse characters of literary texts and apply skills of interpreting poetry.
Political Science-I (BAL 104)	**CO1** Enumerate the concepts associated with Political Theory in Political Science. **CO2** Correlate the knowledge of Political Science with Legal knowledge. **CO3** Conceptualize the associated concepts of Political Science **CO4** Know the relation of political science with law.
Sociology-I (BAL 105)	**CO1** Understand the basic and associated concepts of sociology in India. **CO2** Know the concept and essence of kingship in different societies under the current scenario. **CO3** Analyze the relevance of the sociological aspect with the present legal system. **CO4** Apply the knowledge of sociology with legal knowledge.
Principles of Management (BBL 104)	**CO1.** Understand the basic concept and fundamental principles of Management. **CO2**. Discuss the evolution of Management Thought **CO3**. Enumerate the functions of Management. **CO4** Appraise Management Practices in the specified domain.
Financial Accounting (BBL 105)	**CO1.** Develop an understanding of basic aspects of Financial Accounting **CO2**. Know all the components of the financial statement and how it relates to the law. **CO3**. Analyze and interpret Financial Statements and use them during legal proceedings. **CO4**. Understand the accounting process under financial accounting.
Economics-I (BAL/BBL 106)	**CO1** Conceptualize the various components of Micro and macroeconomics. **CO2** Enumerate functioning of markets. **CO3** Discuss the impact of a laissez-faire state in the Indian Economy. **CO4** Able to understand the business cycle and the concept of inflation.

Course	Course Outcomes: After Completion of these courses the students should be able to learn
SEMESTER II	
LEGAL & CONSTITUTIONAL HISTORY (BAL 201)	**CO1** Understand the basic concept of constitutional history. **CO2** Know the development of legal and constitutional history. **CO3** Apply the various provisions of GOI act with constitution. **CO4** Analyse the A Codification of Indian Laws and the Law Commissions Reports
LAW OF CONTRACT – I (BAL 202)	**CO1** Have an elementary understanding of the debates around the nature of law. **CO2** Distinguish between the major kinds of law, legal systems and institutions. **CO3** Knows the structure of the legal institutions and the hierarchy of courts in India. **CO4** Apply critically the various provisions of contract practically in the court of law .
GENERAL ENGLISH-II (BAL 203)	**CO1** Understand the general concept of legal language. **CO2** Summarize information and reconstruct arguments in a coherent presentation. **CO3** Produce organized and coherent communications and essays with clear paragraphs and appropriate methods for introducing and concluding. **CO4** Produce well-supported communications and essays using different patterns of development taking into consideration purpose and audience.
POLITICAL SCIENCE-II (BAL 204)	**CO1** Understand key field-specific theories and concepts, as well as their importance in the development of political science knowledge. **CO2** Summarise conceptual arguments or theoretical methods, apply them to field-relevant situations, and back up your claims with evidence.

	CO3 Compare and contrast the merits of various policies, theories, or concepts from various disciplinary perspectives. **CO4** Know the theories of Management and Administrative Reform.
SOCIOLOGY-II (BAL 205)	**CO1** Understand the functional similarities and differences in the institutions of Indian Society. **CO2** Make students aware of the micro and macro world of Indian Society **CO3** Know the various caste system in India. **CO4** Analyse how the sociological approach applies in society and is beneficial to them.
Business Environment (BBL 204)	**CO1.** Identify and evaluate social, cultural, legal and technical factors in the business environment. **CO2**. Describe the various economic systems and sectors. **CO3.** Discuss economic planning and policies of the Indian economy. **CO4.** Apply ethical values and social responsibilities in business.
Human Resource Management (BBL 205)	**CO1.** Understand the concept of the changing environment of HRM and the role of HR managers. **CO2.** Know the recruitment & selection process and application of Information Technology. **CO3.** Apply the critical knowledge for training and development during practical. **CO4.** Recognize the pay plans, performance appraisal and compensation and administer the wage and salary of employees and employee services.
ECONOMICS-II (BAL 206) (BAL/BBL 106)	**CO1** Identify and explain economic concepts and theories concerning economic agents' behaviour, markets, industry and corporate structures, legal institutions, social standards, and government policies. **CO2** Know the combine theoretical knowledge with quantitative and qualitative information to explain previous economic events and forecast future ones.

	CO3 Evaluate the consequences of economic activities and institutions for individual and social welfare. **CO4 U**nderstand about the basic concepts of Monetary Economics.
Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER III	
CONSTITUTIONAL LAW – I (BAL 301)	**CO1** Identify the various dimensions of the constitutional law. **CO2** Understand the process of Executive, legislative and judicial mechanisms under the constitution. **CO3** Enumerate the constitutional remedies available. **CO4** Apply the real spirit of distribution of power between centre and state government.
LAW OF CONTRACT – II (BAL 302)	**CO1** Understand the list and define the specific contracts. **CO2** Know the explanation of why specific contracts are important to our legal and economic system. **CO3** Analyse how sale transactions of moveable property take place. **CO4** They will find out how partnership firms are formed, and the duties and liabilities of the partners in a partnership firm.
LAW OF CRIMES-I (BAL 303)	**CO1** Understand the conceptual analysis of the law of crimes. **CO2** Analyse the spirit of legal provisions of crimes and apply it before the court of law. **CO3** Apply the practical aspects of the law of crime in the different types of courts in India. **CO4** Assess the real approach to the law of crime in the present context of Indian Society.
POLITICAL SCIENCE – III (BAL 304)	**CO1** Understand the basic and general concept of the political system in India. **CO2** Assess the relations of the Indian political system with the international political system. **CO3** Analyse the powers and limitations of the states in the context of international political scenarios. **CO4** Apply the Critical approach of the political system to the legal system in India

SOCIOLOGY-III (BAL 305)	**CO1** Understand the various theories of sociology and apply it into society. **CO2** Know and apply the social ideology of the various thinkers in the practical and real world. **CO3.** Analyse the role of media in the prevention of crime from the ground level in India. **CO4.** Express the views of various thinkers and sociologists in future for the betterment of society.
Organizational Behaviour (BBL 304)	**CO1.** Understand the conceptual framework of the discipline of Organizational Behaviour and its practical applications. **CO2.** Analyze the role of individuals, groups, and structures in achieving organizational goals effectively and efficiently. **CO3.** Critically evaluate the various theories and models of contribute to the overall understanding of the discipline. **CO4.** Develop innovative ideas that could positively shape the organizations from different cultural and diverse backgrounds in the workplace.
Business Strategy (BBL 305)	**CO1.** Study the concepts of strategic management and various business policies. **CO2.** Discuss the strategic operations governing business management. **CO3.** Implement the strategies suitable for various organizational structures. **CO4.** Understand the basic concept of business strategy.
ECONOMICS-III (BAL/BBL 306)	**CO1** Understand the fundamental principles of monetary economics and financial markets. **CO2** Analyse the financial system of markets and the tools of Monetary Policy used in the market system. **CO3** Know the banking and standards of banking, functions, quantitative & qualitative credit control methods, Limitations and role of RBI.

	CO4 Apply public finance in various sectors of economics and change the character of public finance through international financial instruments.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER IV	
CONSTITUTIONAL LAW - II (BAL 401)	**CO1** Understand the Concept of 'State' in reference to fundamental rights. **CO2** Fundamental rights and the method for ensuring conformity with fundamental rights, as well as Writ jurisdiction of the supreme court and high court under Articles 32 and 226. **CO3** The state's duty and relationship with the interdependence of fundamental rights and directive principles. **CO4** Know the provisions regarding fundamental rights under the national and international legal system.
LAW OF CRIMES-II (LCRL-II)	**CO1** Understand how society views crime against women, the human body and property. **CO2** Demonstrate a thorough understanding of aspects of criminal justice or law, as well as their relevance to larger social issues. **CO3** Identify and apply the principles of criminal law covered in the whole course. **CO4** Know the provisions of the various offences under criminal law and apply them in a court of law.
CODE CRIMINAL PROCEDURE (BAL 403)	**CO1** Understand the criminal procedure in India includes the following information: who prosecutes; process to compel production of things; right to a quick trial; and process to compel the appearance of persons. **CO2** Know the Criminal Procedure Act's legal guidelines for arrest and bail, the rights of those who have been detained, and how to apply these laws in a real-world situation.

	CO3 Describe the rules that govern the right to legal representation in criminal proceedings in India and demonstrate how to use them in a real-world situation. **CO4** Apply the various provisions of criminal procedure code in the different courts.
LAW OF EVIDENCE (BAL 404)	**CO1** Identify and enumerate the various categories of evidence, their general characteristics, and the relevant legal processes. **CO2** Examine the rule governing the admissibility of evidence in court and its importance. **CO3** Analyse the regulations governing dying declarations and their admissibility. **CO4** Understand the whole concept of the law of evidence and correlate it with other laws.
ADMINISTRATIVE LAW (BAL 405)	**CO1** State the need for the development of Administrative Law. **CO2** Express the concept of delegated legislation and its control mechanisms. **CO3** Demonstrate natural justice and its exceptions and examine the recent innovations in administrative Law. **CO4** Appraise the judicial control of administrative action.
ECONOMICS-IV (BAL 406)	**CO1** Understand the general concept of international economics. **CO2** Know the various theories of international trade and role of international trade in economic development. **CO3** States the importance of the terms of trade and commercial policy. **CO4** Analyse the international financial institutions and trade agreements and its functions.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER V	
FAMILY LAW – I (BAL 501)	**CO1** Understand the general concept and provisions of Hindu law. **CO2** Basic ideas including marriage, divorce, parental custody, domestic abuse, and children's rights are taught to students of family law.

	CO3 Family law investigates how historical and social settings have impacted how families are defined and governed in the present. **CO4** Students will learn to think critically, analyse information, and communicate ideas orally and in writing.
JURISPRUDENCE (BAL 502)	**CO1** Understand the basic principles of learning of law and sources of law. **CO2** Perform that you have a thorough understanding of the political, social, historical, philosophical, and economic framework of law. **CO3** Identify, articulate, and critically assess legal theory, as well as its consequences for policy. **CO4** Critically evaluate and explore intricate legal and theoretical issues and select the best course of action among available options.
CORPORATE LAW-I (BAL 503)	**CO1** Apply the practical aspect of company law in the global system of economics. **CO2** Understand multinational companies in the legal system. **CO3** Frame the legal requirement for registration for companies. **CO4** Contest the cases pertaining to corporate law.
INTELLECTUAL PROPERTY LAW (BAL 504)	**CO1** Understand the international origin of IPR. **CO2** Think over the Indian IPR law in relation to the International legal system. **CO3** Critically analyses the IPR law for protecting the intellectual property. **CO4** Apply critically the principles of IPR laws for the protection of creative activities.
PUBLIC INTERNATIONAL LAW (BAL 505)	**CO1** Understand the basic concept and sources of international law. **CO2** Demonstrate knowledge and understanding of the international rights framework, its origins and justifying theories **CO3** Establish the capacity to assess how specific human rights may be asserted, enforced or violated. **CO4** Critically evaluate the relationship between international and domestic law.
CIVIL PROCEDURE CODE-I (BAL 506)	**CO1** Know the detailed procedure for the redressal of civil rights.

	CO2 Where the suit is to be filed? The essential forms and procedures for the institution of the suit, the documents in support and against, evidence taking and trial, dimensions of an interim order, the peculiar nature of the suits, the complexities of executing a decree and provisions for appeal and revision are all matters which a lawyer for any side is to be familiar with. **CO3** Recognize and address issues that arise in Civil Procedure that implicate relevant ethical, moral, and religious principles. **CO4** Understand the basic concept of the civil procedure code.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER VI	
FAMILY LAW-II (BAL 601)	**CO1** Analyse Muslim law, its sources, Schools, the concept of marriage, and the various matrimonial remedies **CO2** Understand the legal or statutory provisions relating to maintenance, Dower Guardianship they will be able to solve disputes of property by reading the above course. **CO3** Know the legal solutions to some very sensitive disputes relating to Waqf, Will, Inheritance and Guardianship etc. **CO4** The Students recognize the recent development under Muslim Law through the judiciary.
TRANSFER OF PROPERTY (BAL 602)	**CO1** Understand and explain the basic principles of transfer of property with real-life examples. **CO2** Demonstrate the various kinds of transfer of properties with practical examples. **CO3** Know the draft of various deeds relating to the transfer of property. **CO4** Recognize the easementary rights in India.
COMPETITION LAW (BAL 603)	**CO1** Understand the basic principles of fair competition and constitutional perspectives. **CO2** Analyse the international perspectives of competition law.

	CO3 Recognise the role of the Competition Act, 2002 in regulating anti-competitive practices and promoting fair competition and enforcement procedures. **CO4** Identify and able to conduct research on emerging trends in competition law.
ARBITRATION & MEDIATION (BAL 604)	**CO1** Recognise the fundamentals and guiding principles of arbitration. **CO2** Interpreting and applying pertinent domestic and international arbitration and mediation laws and regulations. **CO3** Identify the advantages and limitations of arbitration and mediation. **CO4** Case analysis and legal research in arbitration and mediation.
PRIVATE INTERNATIONAL LAW (BAL 605)	**CO1** Analyse the fundamental principles of private international law and conduct legal research and assess legal data. **CO2** Apply private international law principles to difficult challenges and difficulties and assess how they work theoretically. **CO3** Examine the effects of private international law from a comparative and global viewpoint, taking social and cultural diversity into consideration. Build and maintain clear, convincing writing for a legal and professional audience.
CIVIL PROCEDURE CODE-I (BAL 606)	**CO1** Demonstrate the knowledge and understanding of substantive law, procedural law, and Constitutional Law. **CO2** Develop the ability to perform legal analysis and reasoning, legal research, problem-solving, and written and oral communication in the legal context and apply it in legal practice and real-life situations. **CO3** Demonstrate the professional skills of pleading, argument, drafting and conveyancing, collaboration, counselling, and negotiation required for legal practice. **CO4** Develop the ability to analyse the law in relation to contemporary developments at the national level.

Course	Course Outcomes: After Completion of these courses the students should be able to learn
SEMESTER VII	
INFORMATION TECHNOLOGY LAW (BAL 701)	**CO1** Clarify and apply the key legal principles of information technology law presented in the course. **CO2** Choose and use a variety of written and spoken communication techniques, as well as the critical thinking skills necessary to find answers to challenging legal issues in the field of information technology law. **CO3** Demonstrate knowledge of the various ways that the law can be affected by and changed by quickly developing technology in a way that can help clients with their planning or lawmakers with their recommendations. **CO4** Apply the provisions of law relating to Information Technology in the judicial proceedings.
PRINCIPLES OF TAXATION (BAL 702)	**CO1** Apply the principles of taxation laws to complex legal problems. **CO2** Understand the technical aspects of taxation laws. **CO3** To file and contest cases writ pertaining to taxation laws before the competent authorities. **CO4** Supervise and guide the persons whose matters are related to taxation laws.
HUMAN RIGHTS LAW & PRACTICE (BAL 703)	**CO1** Understand the meaning and historical development of human rights. **CO2** Classify relevant documents on human rights. **CO3** Interpret legal provisions on human rights under Indian laws. **CO4** Examine the effective implementation of human rights of vulnerable groups.
INTERPRETATION OF STATUTES (BAL 704)	**CO1** Understand the real thing of interpretation. **CO2** Apply the principles of interpretation in the courts. **CO3** Understanding the capacity of the students will increase for the real application of the law. **CO4** Practically understands the construction of various statutes.
INDIAN FEDERALISM (BALA 705)	**CO1** Understand the concept and definition of federalism. **CO2** Know the provisions regarding federalism in different countries.

	CO3 Analise the confederation and cooperative federalism. **CO4** Critically applies and compares the federal and unitary systems of government.
LOCAL SELF-GOVERNMENT (BALA 706)	**CO1** Understand the development of Local Self Government in India. **CO2** Critically analyse the working of self-governing institutions in India. **CO3** Explore the recent trends in Local Self Government in India. **CO4** Recognize the provisions under the constitution regarding local government.
CRIMINOLOGY PENOLOGY & VICTIMOLOGY (BALB 705)	**CO1** Understand the relationship between theories of punishment and historical context. **CO2** Analyze and evaluate the relevance of theories of punishment to current penal policy. **CO3** Become familiar with basic criminal laws and criminal justice processes in the country. **CO4** Evaluate the reasons behind the crime and the significance of Penology in the present society and theories of the punishments and its application in the criminal justice system.
CYBER CRIME SECURITY & SOVEREIGNTY (BALB 706)	**CO1** Defend and safeguard computer systems and networks from cybersecurity threats. **CO2** Analyse and investigate cybersecurity incidents or crimes involving digital evidence and computer systems. **CO3** Address information security issues through effective communication in a professional setting. **CO4** Identify present and potential assaults on a company's computer systems and networks, use critical thinking and problem-solving techniques.
CORPORATE GOVERNANCE (BALC 705)	**CO1** Understanding of Corporate Governance from a managerial as well as legal point of view. **CO2** Learn the importance of good governance which is an important tool to achieve shareholder democracy. **CO3** Enumerate the importance of the responsibilities of a corporation towards society.

	CO4 Critically applies the knowledge of corporate law in the court proceedings.
LAW OF CORPORATE FINANCE (BALC 706)	**CO1** Understand the basic concept and scope of corporate finance. **CO2** Know the provisions related to corporate finance under constitutional law. **CO3** Analyse the key concept of Share Capital and non-opting equity shares. **CO4** Apply critically the provision of company law and constitutional law in the proceedings before the court of law.
COPYRIGHTS AND TRADITIONAL CULTURAL EXPRESSION (BALD 705)	**CO1** Understand the concept of copyrights and folklore. **CO2** Analyse the authorship and ownership under copyrights. **CO3** Develops procedural knowledge to Legal System and solving the problem relating to copyrights. **CO4** Skill to understand the concept of Traditional Cultural Expressions (TCEs) or Expressions of Folklore.
LAW OF TRADEMARKS AND GEOGRAPHICAL INDICATIONS (BALD 706)	**CO1** Obtain a fair and sound knowledge of the ideas behind international and Indian trademark law. **CO2** Demonstrate a thorough understanding of trademark law in the applicant's chosen field of study or employment. **CO3** Employ fundamental research techniques, data analysis, and interpretation around trademark law. **CO4** Examine various approaches to problem-solving, build science-based solutions, and identify the main points of disagreement in both international and domestic trademark law.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER VIII	
Environmental Law (BAL 801)	**CO1**: Analyze a complex body of information in environmental law with an advanced and integrated understanding. **CO2**: Gain the ability to recognized new law and apply old law in the quickly changing environmental law landscape. **CO3**: Understanding of the specialized area of environmental law and related disciplinary topics.

	CO4: Know the different provisions related to Environmental Law in different legislations.
Banking Insurance and Negotiable Instrument (BAL 802)	**CO1**. Understand and gain practical knowledge of the insurance and banking industries. **CO2**. Professionals can find profitable employment in retail, investment, merchant, treasury, banking, and insurance. **CO3**. Students will have first-hand experience of the practice relevant to banking and insurance. **CO4**. The rapidly expanding industry of financial and investment services is also drawing numerous reputable firms and individual legal consultants.
Land & Agricultural Laws (BAL 803)	**CO1**. Identify and characterize the revenue board courts, as well as their role in appeal revision and review in case of any dispute. **CO2**. Demonstrate knowledge of the legal and regulatory framework for tribunals, as well as the regulatory requirements. **CO3**. Provide that you are aware of the professional abilities required by urbanization, particularly analytical abilities. **CO4**. Understand the basic concept of Land and Agricultural Laws.
Labour & Industrial Laws – I (BAL 804)	**CO1**. Know the development and the judicial setup of Labour Laws. **CO2**. Understand the 4 new codes of labour laws and knowledge of Labour Law in General HRD Practice. **CO3**. Learned about the rules governing labour relations and working conditions as well as the inquiry process and industrial discipline. **CO4**. Identify the new provisions and amendments under the labour laws.
Law Relating to Elections (BALA 805)	**CO1**. Understand and identify the basic concept and importance of election law in a democratic country. **CO2**. Analyze the lacuna of the law relating to elections and available remedies. **CO3**. Know the main reform in present election law and the procedure of elections. **CO4**. Identify the provisions of law relating to elections under the constitution of India.

Law Governing Service (BALA 806)	**CO1**. Understand the Basic concept of service laws in different countries. **CO2**. Know the legal provisions related to various service matters in different laws. **CO3**. Identify the procedure regarding service matters under public sectors. **CO4**. Critically apply the legal provisions relating to service matters during the proceedings.
Corporate & White-Collar Crimes (BALB 805)	**CO1**. Know that white-collar crime exists and is committed as a phenomenon in a globalized society. **CO2**. Develop a grasp of other principles that could be used to define white-collar crimes, such as organizational or corporate crimes, and acquire some knowledge of the many categories of white-collar crime. **CO3**. Explain the foundations or explanation for the committing of white-collar crimes in India. **CO4**. Through class discussions, students' writing and critical thinking abilities on the subject of white-collar crime will be improved.
Police Law & Administration (BALB 806)	**CO-1**-Knowledge of the Structure of the Police force under the India administrative system. **CO-2** Powers, functions, and Problems of the Police Force in all Forms under India's legal system. **CO-3** Understand different forums of Justice administration under the Indian legal system. **CO-4** Identify the nature and scope of police and administration under Indian legal.
Competition Law (BALC 805)	**CO1** Understand the Deep knowledge of fair competition and constitutional perspectives. **CO2** Analyse the national and international perspectives of competition law in different countries.

	CO3 Recognise the role of the Competition Act, 2002 in regulating anti-competitive practices and promoting fair competition and enforcement procedures. **CO4** Identify and able to conduct research on emerging and growing trends in competition law.
International Trade Law (BALC 806)	**CO1.** Understand the basic concept of trade law as various theories like free trade theory and the attacks that have been made on free trade theory. **CO2**. Identify the origin and development in the last century of international institutions governing trade. **CO3.** Knowing the laws and policies of the World Trade Organization. **CO4**. Critically analyse the relationship between trade, development, environment, and human rights.
Patent Drafting & Specification Writing (BALD 805)	**CO1.** Analyse the rights and responsibilities of the Patent holder, Copyright and Trademark Design etc. **CO2.** Identify the procedure to protect different forms of IPRs at the national and international levels. **CO3.** Develop key skills in making searches using modern tools and techniques in patent drafting. **CO4.** Understand the basics of IPR and patent drafting.
Law Relating to Design & Geographical Indication (BALD 806)	**CO1**. Develop a proper understanding of the basic concept of law relating to the design and layout of integrated circuits. **CO2**. Know the international and national treaties and laws dealing with law relating to design. **CO3**. Obtain a critical understanding of the subject matter regarding the design in different geographical areas. **CO4**. Identify the infringement that takes place in relation to the design and what are remedies available in case of infringement.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER IX	

Labour & Industrial Laws- II (BAL 901)	**CO1**. Understand the basic concept of the different Labour Codes. **CO2**. Resolve the Labour welfare problems and Students will learn the laws relating to Industrial Relations. **CO3**. Know the Social Security, private sector wages problems etc. **CO4**. Identify the working conditions and also learn the enquiry procedural and industrial discipline.
Insolvency and Bankruptcy Law (BAL 902)	**CO1**. Develop a conceptual understanding of the basic principles of Insolvency and Bankruptcy Laws in different Countries. **CO2**. Apply the different principles of insolvency and Bankruptcy to the real-life situations and relate theory with practical knowledge. **CO3**. Understand the concepts and apply them to a wide range of problems related to the Banking Sector. **CO4**. Know the linkages between insolvency, Banking and the Insurance sector and the related Law.
Clinical & Practical-I (Drafting, Pleading & Conveyance) (BAL 903)	**CO1.** Understand the basics of pleadings and conveyancing. **CO2.** Apply the practical law in drafting the various kinds of deeds. **CO3.** Know the law pertaining to the rules of pleading. **CO4.** Analyse affirmative actions in practice.
Clinical & Practical-II (Alternative Dispute Resolution) (BAL 904)	**CO1.** Understand the fundamental principles of equity, justice, and good conscience. **CO2.** Know the real spirit of the equity which was prevailing in Great Britain. The application of these principles will analyse for providing real justice in India. **CO3.** Apply the provisions of equity with reference to constitutional law in India. **CO4.** Analyse the principles and maxims of equity for the application of the spirit of justice.
Affirmative Action & Discriminative Justice (BALA 905)	**CO1.** Understand the applications of real justice in the development of society. **CO2.** Know the principles of protective discrimination for the upliftment of the privileged class. **CO3.** Apply the principles of affirmative action and principles of equity.

	CO4. Examine the reservation policy as existing in the global legal framework.
Gender Justice & Feminist Jurisprudence (BALA 906)	**CO1.** Understand the basic concept and law related to the gender justice system. **CO2.** Know the controversial issues, theories and texts with a critical lens and an open mind. **CO3.** Develop the ability to research and write substantive analytical research papers. **CO4.** Apply the professional activities in the national and international law in the Indian legal system.
International Criminal Law (BALB 905)	**CO1.** Understand the principles of International Criminal law for its application. **CO2.** Know the legal provisions of the International Criminal courts. **CO3.** Examine the procedure and practice of remedial forums related to International Criminal law. **CO4.** Analyse the contemporary issues on the International Criminal law regime.
Comparative Criminal Law (BALB 906)	**CO1.** Understand the comparative legal provisions of crime. **CO2.** Know about the trial procedure under the legal regime of various criminal systems. **CO3.** Analyse and assess the legal mechanism related to the remedy available under the comparative criminal system. **CO4.** Examine the reformative legal techniques under criminal law.
Laws of Mergers & Acquisitions (BALC 905)	**CO1.** Understand legal obligations in terms of mergers and acquisitions. **CO2.** Know the Corporate Restructuring and implication for society and economy. **CO3.** Appreciate the importance of mergers and acquisitions (M&A) in the present corporate world. **CO4.** Analyse the process of M&A, essentialities of valuation and various methods thereof in case of Mergers and Acquisitions.
Corporate & White-Collar Crimes (BALC 906)	**CO1**. Know that white-collar crime exists and is committed as a phenomenon in a globalized society.

	CO2. Develop a grasp of other principles that could be used to define white-collar crimes, such as organizational or corporate crimes, and acquire some knowledge of the many categories of white-collar crime. **CO3**. Explain the foundations or explanation for the committing of white-collar crimes in India. **CO4**. Through class discussions, students' writing, and critical thinking abilities about white-collar crime will be improved.
Patent and Patentability of Biotechnological Invention (BALD 905)	**CO1.** Understand the basics of intellectual property law. **CO2.** Analyse the Legal System and solve the problem relating to intellectual property rights. **CO3.** Know the registration process of patents, copyright trademarks etc. **CO4.** Context the cases relating to the IPR before the appropriate forum.
Intellectual Property Rights & Pharma Industry (BALD 906)	**CO1.** Understand the basic concept of the pharmaceutical industry in India. **CO2.** Know the domestic and International legal regime in relation to IPR. **CO3.** Critically analyse the role of IPR law in pharmaceutical development in India. **CO4.** Analyse the role of IPR and the right to health in particular access.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER X	
Clinical & practical-III (Professional Ethics) (BAL 1002)	**CO1**. Develop critical thinking skills to evaluate and analyze ethical issues from multiple perspectives and recognize the complexities involved in ethical decision-making. **CO2**. Learn the process of ethical decision-making, which includes identifying ethical issues, considering alternatives, and making well-reasoned ethical choices.

	CO3. Understanding of various ethical theories, such as deontology, utilitarianism, virtue ethics, and consequentialism, and be able to apply these theories to ethical dilemmas. **CO4**. Recognize personal and professional ethical responsibilities and obligations, including duties to clients, colleagues, employers, and society as a whole.
Clinical & Practical-IV (Moot Court & Art of Persuading Judges) (BAL 1003)	**CO1**. Develop proficiency in legal research techniques, including using databases, libraries, and online resources to find relevant case law, statutes, regulations, and legal precedents. **CO2**. Enhance the ability to analyze legal cases, statutes, and regulations in depth, focusing on relevant legal issues and precedents. **CO3**. Improve oral advocacy skills by participating in mock appellate court arguments, including developing persuasive arguments. **CO4**. Understand the procedural rules and protocols specific to appellate courts, including the rules for filing briefs, presenting oral arguments, and interacting with judges.
Seminar Paper (BAL 1004)	**CO1**. Learn how to choose a relevant and well-defined research topic or question that aligns with the course's objectives or the student's academic interests. **CO2**. Conduct a comprehensive literature review to identify existing research on the chosen topic, summarize key findings, and identify gaps in the literature. **CO3**. Improve academic writing skills, including clarity, conciseness, and precision in writing, as well as proper grammar and style. **CO4**. Practice critical analysis of research findings and their implications, drawing conclusions based on evidence and analysis.
Media and the Law (BALA 1005)	1. **CO1.** Identify the various media laws and legislation, and media trials in accordance with the Constitution under different countries. 2. **CO2.** Understand the legal remedies provided by different courts. 3. **CO3.** Enumerate the convergence and media in accordance with the broadcasting sector.

	4. **CO4.** Apply the real spirit of social media to become a strong democratic country.
Comparative Constitutional Law (BALA 1006)	1. **CO1.** Understand the similarities and differences between leading legal traditions in key areas. 2. **CO2.** Know the comparative study on Judicial systems and judicial review. 3. **CO3.** Apply the comparative methodology of principles of Natural Justice as well as law relating to trade commerce and intercourse. 4. **CO4.** Examine the comparative legal provisions of developed countries with the provisions of the Indian Constitution.
Organized Crimes and Law (BALA 1005)	**CO1.** Understand the different tactics to defining the organized crime in India. **CO2.** Know the basic concept of organized criminal groups under the Organized Crime in different Legislation and Convention. **CO3.** Apply a types of organized crime activity to specific organized crimes in India. **CO4.** Distinguish the different ways organized criminal groups can be assessed.
Forensic Science (BALB 1006)	**CO1**. Describe the fundamental principles of forensic sciences and functions and their significance to human society. **CO 2**. Illustrate the divisions in a forensic science laboratory which is useful for the investigation of any cases. **CO 3**. Understand the workings of forensic establishments in India and internationally. **CO4**. Know the basics of the forensic sciences and the law.
International Commercial Arbitration (BALC 1005)	**CO1.** Understanding the Arbitration Process including its principles, procedures, and rules such as those established by institutions like the International Chamber of Commerce (ICC) or the International Centre for Dispute Resolution (ICDR) **CO2.** Familiarize oneself with the relevant international and national laws governing international commercial arbitration. **CO3.** Develop skills in negotiation, mediation, and conflict resolution, as these are often integral to the arbitration process. **CO4.** Explore the unique challenges and considerations associated with cross-border disputes.
Laws of Infrastructure Development (BALC 1006)	**CO1**. Understand the various stages of an infrastructure project's lifecycle, from planning and feasibility studies to financing, construction, operation, and maintenance.

	CO2. Develop skills in identifying and assessing legal and financial risks associated with infrastructure projects, including political, regulatory, and financial risks. **CO3**. Explore contract law principles as they relate to infrastructure development, including contract drafting, negotiation, and dispute resolution. **CO4**. Learn about the legal framework for public procurement in infrastructure projects, including competitive bidding processes, contract award, and procurement regulations.
Protection of Plant Varieties & Traditional Knowledge (BALD 1005)	**CO1**. Gain a comprehensive understanding of plant varieties, genetic resources, and traditional knowledge associated with plants. **CO2**. Learn about the concept of plant breeders' rights, including the criteria for granting rights, duration, and the rights and obligations of breeders. **CO3**. Explore strategies for the management, conservation, and sustainable use of plant genetic resources, including gene banks and ex-situ conservation. **CO4**. Examine the ethical and cultural dimensions of traditional knowledge and plant genetic resources, including the rights and interests of indigenous and local communities.
IPR Management & Litigation (BALD 1006)	**CO1**. Develop a solid understanding of the key intellectual property laws, including patents, trademarks, copyrights, and trade secrets. **CO2**. Gain knowledge of patent law, including the requirements for patentability, patent prosecution, and the legal protection of inventions. **CO3**. Understand trademark law, including the registration process, trademark enforcement, and the protection of brand identities. **CO4**. Analyze real-world IP litigation cases to gain practical insights into the strategies and tactics employed by parties involved in disputes.

School of Law, Raffles University

Bachelor of Laws (LL.B)

PROGRAM OUTCOMES

1. **PO1. Legal Knowledge:** To acquire & apply legal knowledge to complex Socio-legal problems.
2. **PO2. Professional Practice:** to make students eligible to practice as legal practitioners in Courts, Industries, and Companies.
3. **PO3. Professional Skills:** To possess professional skills required for legal practice such as Argument, Pleading, drafting, conveyancing etc.
4. **PO4. Professional Ethics:** To understand and apply principles of professional ethics of the legal profession.
5. **PO5. Legal Research & Legal Reasoning:** to develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PO6. Leadership Skills:** To develop leadership qualities amongst students.

PROGRAM EDUCATIONAL OBJECTIVES

1. **PEO1**: To acquire & apply legal knowledge to multifaceted Socio-legal problems.
2. **PEO2:** To make students eligible to practice as legal experts in Courts, Industries, and Companies.
3. **PEO3**: To possess the expertise necessary for practising law, such as argument, pleading, drafting, conveyancing, etc.
4. **PEO4**: Understanding and applying legal professional ethics in legal principles.
5. **PEO5**: To develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PEO6**: To create a foundation for independent employment by acquiring professional legal skills.
7. **PEO7**: To strengthen clinical skills and raise understanding of constitutional legislation and societal transformation.
8. **PEO8**: Each law graduate will acquire expertise in legal research, written and spoken communication, teamwork, advocacy, and problem-solving.

PROGRAM SPECIFIC OBJECTIVES

1. **PSO1**. Students should be able to demonstrate an understanding of substantive and procedural law sufficient to enter the legal profession and professions in which legal knowledge is an advantage.
2. **PSO2**. Should be able to associate the learning from the courses related to Law and Management.
3. **PSO3**. Should have the capability to understand the laws at national and global levels and to solve the client's problem.
4. **PSO4**. Should possess the skills to communicate in both oral and written forms and the ability to formulate legal problems and use appropriate concepts and methods to solve them.
5. **PSO5** should use skills in specific areas (e.g. Criminal, industrial-organizational, clinical, counselling, social, and community).
6. **PSO6** should be analyzing social problems and understanding social dynamics.

COURSE OUTCOMES (COs)

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER 1	
Constitutional Law-I (LLB 101)	**CO1** Identify the various dimensions of constitutional law. **CO2** Understand the process of Executive, legislative and judicial mechanisms under the constitution. **CO3** Enumerate the constitutional remedies available. **CO4** Apply the real spirit of distribution of power between centre and state government.
Law of Contract-I (LLB 102)	**CO1** Understand the list and define the specific contracts. **CO2** Know the explanation of why specific contracts are important to our legal and economic system. **CO3** Analyse how sale transactions of moveable property take place. **CO4** They will find out how partnership firms are formed, and the duties and liabilities of the partners in a partnership firm.
Family Law-I (LLB 103)	**CO1** Understand the general concept and provisions of Hindu law.

	CO2 Basic ideas including marriage, divorce, parental custody, domestic abuse, and children's rights are taught to students of family law. **CO3** Family law investigates how historical and social settings have impacted how families are defined and governed in the present. **CO4** Students will learn to think critically, analyse information, and communicate ideas orally and in writing.
Law of Torts, Consumer Protection and MV. Act (LLB 104)	**CO1** Identify the various conceptual aspects of the Law of Torts. **CO2** Apply various defences under tortuous liability and specific kinds of torts. **CO3** Enumerate the remedies available for specific torts. **CO4** Know the relation of torts with various other laws.
General English-I (LLB 105)	**CO1** Describe the importance of General English and Legal Language. **CO2** Identify the correct usage of grammar in legal drafting during the draft of any document. **CO3** Draft documents for legal correspondence to use in the legal drafting. **CO4** Analyse characters of literary texts and apply skills of interpreting poetry.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER II	
CONSTITUTIONAL LAW - II (LLB 201)	**CO1** Understand the Concept of 'State' in reference to fundamental rights. **CO2** Fundamental rights and the method for ensuring conformity with fundamental rights, as well as Writ jurisdiction of the supreme court and high court under Articles 32 and 226. **CO3** The state's duty and relationship with the interdependence of fundamental rights and directive principles. **CO4** Know the provisions regarding fundamental rights under the national and international legal system.
LAW OF CRIMES-II (LLB 202)	**CO1** Understand how society views crime against women, the human body and property.

	CO2 Demonstrate a thorough understanding of aspects of criminal justice or law, as well as their relevance to larger social issues. **CO3** Identify and apply the principles of criminal law covered in the whole course. **CO4** Know the provisions of the various offences under criminal law and apply them in a court of law.
FAMILY LAW-II (LLB 203)	**CO1** Analyse Muslim law, its sources, Schools, the concept of marriage, and the various matrimonial remedies **CO2** Understand the legal or statutory provisions relating to maintenance, Dower Guardianship they will be able to solve disputes of property by reading the above course. **CO3** Know the legal solutions to some very sensitive disputes relating to Waqf, Will, Inheritance and Guardianship etc. **CO4** The Students recognize the recent development under Muslim Law through the judiciary.
INDIAN PENAL CODE (LLB 204)	**CO1** Understand the conceptual analysis of the law of crimes. **CO2** Analyse the spirit of legal provisions of crimes and apply it before the court of law. **CO3** Apply the practical aspects of the law of crime in the different types of courts in India. **CO4** Assess the real approach to the law of crime in the present context of Indian Society.
ADMINISTRATIVE LAW (LLB 205)	**CO1** State the need for the development of Administrative Law. **CO2** Express the concept of delegated legislation and its control mechanisms. **CO3** Demonstrate natural justice and its exceptions and examine the recent innovations in administrative Law. **CO4** Appraise the judicial control of administrative action.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER III	
JURISPRUDENCE (LLB 301)	**CO1** Understand the basic principles of learning of law and sources of law.

	CO2 Perform that you have a thorough understanding of the political, social, historical, philosophical, and economic framework of law. **CO3** Identify, articulate, and critically assess legal theory, as well as its consequences for policy. **CO4** Critically evaluate and explore intricate legal and theoretical issues and select the best course of action among available options.
PUBLIC INTERNATIONAL LAW (LLB 302)	**CO1** Understand the basic concept and sources of international law. **CO2** Demonstrate knowledge and understanding of the international rights framework, its origins and justifying theories. **CO3** Establish the capacity to assess how specific human rights may be asserted, enforced or violated. **CO4** Critically evaluate the relationship between international and domestic law.
CORPORATE LAW (LLB 303)	**CO1** Apply the practical aspect of company law in the global system of economics. **CO2** Understand multinational companies in the legal system. **CO3** Frame the legal requirement for registration for companies. **CO4** Contest the cases pertaining to corporate law.
INTELLECTUAL PROPERTY LAW (LLB 304)	**CO1** Understand the international origin of IPR. **CO2** Think over the Indian IPR law in relation to the International legal system. **CO3** Critically analyses the IPR law for protecting the intellectual property. **CO4** Apply critically the principles of IPR laws for the protection of creative activities.
CODE CRIMINAL PROCEDURE (LLB 305)	**CO1** Understand the criminal procedure in India includes the following information: who prosecutes; process to compel production of things; right to a quick trial; and process to compel the appearance of persons. **CO2** Know the Criminal Procedure Act's legal guidelines for arrest and bail, the rights of those who have been detained, and how to apply these laws in a real-world situation.

	CO3 Describe the rules that govern the right to legal representation in criminal proceedings in India and demonstrate how to use them in a real-world situation. **CO4** Apply the various provisions of the criminal procedure code in the different courts.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER V	
CIVIL PROCEDURE CODE (LLB 401)	**CO1** Demonstrate the knowledge and understanding of substantive law, procedural law, and Constitutional Law. **CO2** Develop the ability to perform legal analysis and reasoning, legal research, problem-solving, and written and oral communication in the legal context and apply it in legal practice and real-life situations. **CO3** Demonstrate the professional skills of pleading, argument, drafting and conveyancing, collaboration, counselling, and negotiation required for legal practice. **CO4** Develop the ability to analyse the law in relation to contemporary developments at the national level.
PROPERTY LAW (LLB 402)	**CO1** Understand and explain the basic principles of transfer of property with real-life examples. **CO2** Demonstrate the various kinds of transfer of properties with practical examples. **CO3** Know the draft of various deeds relating to the transfer of property. **CO4** Recognize the elementary rights in India.
PRIVATE INTERNATIONAL LAW (LLB 403)	**CO1** Analyse the fundamental principles of private international law and conduct legal research and assess legal data. **CO2** Apply private international law principles to difficult challenges and difficulties and assess how they work theoretically. **CO3** Examine the effects of private international law from a comparative and global viewpoint, taking social and cultural diversity into consideration.

	Build and maintain clear, convincing writing for a legal and professional audience.
CYBER LAW (LLB 404)	**CO1** Clarify and apply the key legal principles of information technology law presented in the course. **CO2** Choose and use a variety of written and spoken communication techniques, as well as the critical thinking skills necessary to find answers to challenging legal issues in the field of information technology law. **CO3** Demonstrate knowledge of the various ways that the law can be affected by and changed by quickly developing technology in a way that can help clients with their planning or lawmakers with their recommendations. **CO4** Apply the provisions of law relating to Information Technology in the judicial proceedings.
ENVIRONMENTAL LAW (LLB 405)	**CO1**: Analyze a complex body of information in environmental law with an advanced and integrated understanding. **CO2**: Gain the ability to recognized new law and apply old law in the quickly changing environmental law landscape. **CO3**: Understanding of the specialized area of environmental law and related disciplinary topics. **CO4**: Know the different provisions related to Environmental Law in different legislations.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
	SEMESTER V
LAW OF EVIDENCE (LLB 501)	**CO1** Identify and enumerate the various categories of evidence, their general characteristics, and the relevant legal processes. **CO2** Examine the rule governing the admissibility of evidence in court and its importance. **CO3** Analyse the regulations governing dying declarations and their admissibility. **CO4** Understand the whole concept of the law of evidence and correlate it with other laws.

INTERPRETATION OF STATUTES (LLB 502)	**CO1** Understand the real thing of interpretation. **CO2** Apply the principles of interpretation in the courts. **CO3** Understanding the capacity of the students will increase for the real application of the law. **CO4** Practically understands the construction of various statutes.
LABOUR LAWS (LLB 503)	**CO1**. Know the development and the judicial setup of Labour Laws. **CO2**. Understand the 4 new codes of labour laws and knowledge of Labour Law in General HRD Practice. **CO3**. Learned about the rules governing labour relations and working conditions as well as the inquiry process and industrial discipline. **CO4**. Identify the new provisions and amendments under the labour laws.
PRINCIPLES OF TAXATION (LLB 504)	**CO1** Apply the principles of taxation laws to complex legal problems. **CO2** Understand the technical aspects of taxation laws. **CO3** To file and contest cases writ pertaining to taxation laws before the competent authorities. **CO4** Supervise and guide the persons whose matters are related to taxation laws.
Alternative Dispute Resolution (LLB 505)	**CO1.** Understand the fundamental principles of equity, justice, and good conscience. **CO2.** Know the real spirit of the equity which was prevailing in Great Britain. The application of these principles will analyse for providing real justice in India. **CO3.** Apply the provisions of equity with reference to constitutional law in India. **CO4.** Analyse the principles and maxims of equity for the application of the spirit of justice.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER VI	
HUMAN RIGHTS (LLB 601)	**CO1** Understand the meaning and historical development of human rights. **CO2** Classify relevant documents on human rights.

	CO3 Interpret legal provisions on human rights under Indian laws. **CO4** Examine the effective implementation of human rights of vulnerable groups.
Land Laws (LLB 602)	**CO1**. Identify and characterize the revenue board courts, as well as their role in appeal revision and review in case of any dispute. **CO2**. Demonstrate knowledge of the legal and regulatory framework for tribunals, as well as the regulatory requirements. **CO3**. Provide that you are aware of the professional abilities required by urbanization, particularly analytical abilities. **CO4**. Understand the basic concept of Land and Agricultural Laws.
PROFESSIONAL ETHICS (LLB 603)	**CO1**. Develop critical thinking skills to evaluate and analyze ethical issues from multiple perspectives and recognize the complexities involved in ethical decision-making. **CO2**. Learn the process of ethical decision-making, which includes identifying ethical issues, considering alternatives, and making well-reasoned ethical choices. **CO3**. Understanding of various ethical theories, such as deontology, utilitarianism, virtue ethics, and consequentialism, and be able to apply these theories to ethical dilemmas. **CO4**. Recognize personal and professional ethical responsibilities and obligations, including duties to clients, colleagues, employers, and society as a whole.
ALTERNATIVE DISPUTE RESOLUTION (LLB 604)	**CO1.** Understand the fundamental principles of equity, justice, and good conscience. **CO2.** Know the real spirit of the equity which was prevailing in Great Britain. The application of these principles will be analysed for providing real justice in India. **CO3.** Apply the provisions of equity with reference to constitutional law in India. **CO4.** Analyse the principles and maxims of equity for the application of the spirit of justice.

MOOT COURT & INTERNSHIP (LLB 605)	**CO1**. Develop proficiency in legal research techniques, including using databases, libraries, and online resources to find relevant case law, statutes, regulations, and legal precedents. **CO2**. Enhance the ability to analyze legal cases, statutes, and regulations in depth, focusing on relevant legal issues and precedents. **CO3**. Improve oral advocacy skills by participating in mock appellate court arguments, including developing persuasive arguments. **CO4**. Understand the procedural rules and protocols specific to appellate courts, including the rules for filing briefs, presenting oral arguments, and interacting with judges.

LL.M (One Year Programme)

Programme Educational Objectives, Programme Specific Outcomes,and Programme Outcomes

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

The School of law, Raffles University faculty members have formulated the **Programme Educational Objectives** (PEOs). The PEOs are **broad statements** that describe the career and professional accomplishments that the program is preparing its graduates to achieve in a few yearsafter receiving the degree. The PEOs of the Master of Laws (LL.M.) program are as follows:

- **PEO 1:** RU LL.M. post-graduates will be able to demonstrate critical thinking in their chosen area of specialization leading to a successful career.
- **PEO 2:** RU LL.M. postgraduates will be able to develop their research skills and progress towards pursuing Doctoral studies.
- **PEO 3:** RU LL.M. postgraduates will be active members ready to serve society through their teaching skills.
- **PEO 4:** RU LL.M. postgraduates will be equipped with enhanced legal insights that will lend them a cutting edge over ordinary law graduates in the judicial profession.
- **PEO 5:** RU LL.M. post-graduates will have leadership skills with a high level of integrity and have the ability to function professionally with ethical responsibility as an individual as well as in a multidisciplinary team with a positive attitude.

PROGRAM-SPECIFIC OUTCOMES (PSOS)

(CONSTITUTIONAL LAW GROUP)

- **PSOS 1:** LLM in Constitutional Law allows students to specialise in all laws related to the Constitution and the operation of the judicial system to protect people's rights.
- **PSOS 2:** An LLM in Constitutional Law enables students to concentrate on legal topics in-depth and better prepare them to handle disputes involving government agencies and regulatory bodies.
- **PSOS 3:** It aims to provide students with specialised knowledge about legislation as well as extensive exposure to the many branches of government, both locally and globally.

- **PSOS 4:** In addition to having access to extensive national and international databases, the students also gain experience with writing seminar papers, research, legal writing, and internships.
- **PSOS 5:** The program focuses on going over the law in great depth, assisting participants in developing into better legal professionals with a thorough understanding of the law.

(CORPORATE LAW GROUP)

- **PSOS 1:** LLM in Corporate Law offers students the chance to focus on all legislation pertaining to the corporate sector.
- **PSOS 2:** An LLM in corporate law enables students to concentrate on legal topics in detail, better preparing them for a career in the corporate sector.
- **PSOS 3:** The program aims to provide students with specialised knowledge of the laws governing corporate finance, securities law, banking, and insurance. Law, M&A, and other legal issues Laws relating to insolvency and international trade.
- **PSOS 4:** Students are also exposed to seminar paper writing, research, legal writing, and internship opportunities, as well as access to enormous databases, both national and worldwide.
- **PSOS 5:** The program focuses on covering the law in more depth, assisting them in becoming stronger legal professionals with a broad understanding of the law.

(CRIMINAL LAW GROUP)

- **PSOS 1:** Students will gain a comprehensive understanding of criminal law principles, theories, and doctrines. They will study the elements of different criminal offences, defences, and the principles of criminal liability.

- **PSOS 2:** The program aims to develop student's analytical and critical thinking abilities, allowing them to analyze complex criminal law issues and apply legal reasoning to arrive at sound conclusions.

- **PSOS 3:** Students will be familiarized with the criminal justice system, including the investigation, prosecution, and defence processes. They will learn about the roles of various stakeholders, such as judges, prosecutors, defence attorneys, and law enforcement agencies.

- **PSOS 4:** Students may explore criminal law from a comparative perspective, examining the similarities and differences between criminal justice systems in different countries and jurisdictions.

- **PSOS 5:** LL.M. candidates are often required to conduct in-depth legal research and produce scholarly papers or a thesis on criminal law topics, which improves their legal research and writing skills.

(MARITIME LAW GROUP)

- **PSOS 1:** Students will have a thorough understanding of the concepts, laws, and conventions that govern maritime law, including maritime law, international maritime law, and domestic maritime law.
- **PSOS 2:** A focus on admiralty and maritime litigation could be a part of the curriculum, educating students to manage legal disputes involving shipping, marine insurance, salvage, collisions, and other maritime disasters.
- **PSOS 3:** Students will study marine insurance contracts, policies, and the principles guiding marine risk management to safeguard shipowners, cargo owners, and other stakeholders' interests.
- **PSOS 4:** The programme may address legal aspects of seaborne cargo transportation, such as bills of lading, charter parties, and other contracts for cargo transportation.
- **PSOS 5:** Students will learn about admiralty jurisdiction, which refers to the court's authority to hear maritime matters, maritime liens, and maritime arrests.

PROGRAM OUTCOMES (POS)

Program Outcomes (POs) are **attributes of the graduates** of the program that are indicative of the graduate's ability and competence to work as a legal professional upon graduation. Program Outcomes are statements that describe what students are expected to know or be able to do by the time of graduation. They must relate to the knowledge and skills that the students acquire from the program. The achievement of all outcomes indicates that the student is well prepared to achieve the program's educational objectives down the road. The following 10 POs have been chosen by the School the Law of Raffles University. The curriculum of LL.M. at RU has been designed to fully meet all the 10 Programme Outcomes:

- **PO 1:** Conduct independent research on diverse legal topics and questions using knowledgeof primary as well as secondary data. (*Legal Knowledge*)
- **PO 2:** Develop and demonstrate analytical skills to interpret various judgments of domesticand international courts of law and different provisions of law and re-interpret the opinionsand submissions of learned jurists and academicians. (*Analytical Skills*)
- **PO 3:** Demonstrate an understanding of substantive and/or procedural aspects of their chosen area of specialization, and offer solutions based on such understanding. (*Problem Solving*)
- **PO 4:** Independently write research articles and undertake research studies on different topics.

(*Research Skills*)

- **PO 5:** Develop a sense of social responsibility and commitment, and work on various socio-legal issues. (*Social Responsibility*)
- **PO 6:** Establish as a competent professional in a highly competitive world with cutting-edge legal education tools. (*Competitive Skills*)
- **PO 7:** Apply diverse knowledge to prepare for a higher research degree with clarity of purpose (*Higher Education*).
- **PO 8:** Ability to translate ideas into words, and words into practical solutions, which is reflective of their critical thinking (*Critical Thinking*).
- **PO 9:** Apply ethical principles and commit to professional ethics and responsibilities and norms of legal practice (*Ethics*).
- **PO 10:** Communicate effectively on complex legal activities with the legal community andwith the society at large; thus, giving and imparting clear instructions (*Communication*).

COURSE OUTCOMES

1. RESEARCH METHODOLOGY AND LEGAL WRITING

1. **CO1**: Students will be able to learn various research methods in the legal discipline.
2. **CO2**: Students will be able to develop the craft of legal writing.
3. **CO3**: To enable students to use different data collection methods and sampling design techniques in their research.

2. COMPARATIVE PUBLIC LAW

1. **CO1**: Students will be able to understand the similarities and differences between leading legal traditions in key areas like separation of powers, protection of rights, and the role of the judiciary.
2. **CO2**: Students will be able to understand the methodology of comparative public law.
3. **CO3**: Students will be able to use comparative methodology in public law analysis.

3. LAW AND JUSTICE IN A GLOBALISING WORLD

1. **CO1**: Students will be able to understand the role of law and justice in a rapidly globalizing world.
2. **CO2**: Students will be able to appreciate and comprehend finer aspects related to the subject.
3. **CO3**: Students will be able to recognize the significance of law and justice vis-à-vis the concept of globalization.

4. COMPARATIVE ADMINISTRATIVE LAW

1. **CO1**: Students will be able to understand the concepts associated with the subject.
2. **CO2**: Students will be able to critically evaluate the role of different organizations and establishments involved in administrative law.

3. **CO3**: The students will be able to recognize the relationship between constitutional law and administrative law of other countries.

4. MEDIA & INFORMATION LAWS

1. **CO1**: The students will be sensitized towards various legislations related to the subject.
2. **CO2**: Students will be able to understand constitutional provisions governing mass media.
3. **CO3**: Students will recognize the significance of media and information in a global world.

5. FEDERALISM AND LOCAL SELF GOVERNANCE

1. **CO1**: Students will be able to develop research skills in exploring the advantages and disadvantages associated with local self-government.
2. **CO2**: Students will learn about the specific legislation related to the subject.
3. **CO3**: Students will be able to recognize the importance of local self-government and its role in national growth.

6. SERVICE LAW

1. **CO1**: Students will be acquainted with various kinds of rules applicable to government employees.
2. **CO2**: Students will be able to analyze the role played by the Constitution in the protection of public servants.
3. **CO3**: Students will be able to apply legal provisions for the protection of employees.

7. HEALTH LAW

1. **CO1**: Students will be able to acquire the basic knowledge of health laws in the contemporary world.
2. **CO2**: Students will be able to analyze the role played by the judiciary in enhancing the scope of the medical profession.
3. **CO3**: Students will be able to evaluate the working of various special enactments on health in India.

8. ELECTION LAWS

1. **CO1**: Students will be able to develop research skills in exploring the various election laws in India.
2. **CO2**: Students will learn about the specific legislation related to the subject.
3. **CO3**: The students will be able to understand the provisions of the Representation of the People Act, 1951 as applicable to the elections in India.

9. BANKING AND INSURANCE LAW

1. **CO1**: Students will be able to understand that the scope of the banking and insurance sector is getting wider than the conventional role.
2. **CO2**: Students will be well acquainted with the conceptual as well as practical aspects of Banking and Insurance Laws as per the changing scenario.

3. **CO3**: Students will evaluate the concepts of Banking and Insurance with ordinary and cardinal approaches and cover different types of insurance laws.

10. LAWS OF SECURITIES AND FINANCIAL MARKETS

1. **CO1**: Students will be able to learn the securities markets and understand the different laws and rules related to the securities market in India.
2. **CO2**: Students will be able to learn the significance of FDI in the corporate market.
3. **CO3**: The students will be able to recognize the difference between capital and venture capital.

11. INTERNATIONAL COMMERCIAL ARBITRATION

1. **CO1**: Students will be able to learn the basic rules that guide the arbitration process from start to finish.
2. **CO2**: Students will be able to learn about the growth of international arbitration law as well as critically evaluate its functioning in India and abroad.
3. **CO3**: To enable the students to recognize the difference between arbitration and other law.

12. COMPETITION LAW

1. **CO1**: Students will be able to demonstrate the knowledge of Competition law in the present commercially competitive world.
2. **CO2**: Students will be well acquainted with the different anti-competition practices and the measures to curb them.
3. **CO3**: Students will be able to evaluate the working of various competition authorities in India.

13. CORPORATE GOVERNANCE

1. **CO1**: Students will be imparted complete understanding and knowledge about the concept of corporate governance, its history, emergence, objectives, and principles of good governance.
2. **CO2**: Students will understand the nature, system, and compliance requirements of corporate governance.
3. **CO3**: Students will understand the insights into the workings of companies around the world.

14. INTERNATIONAL TRADE LAW

1. **CO1**: Students will be able to understand the international aspects of trade law.
2. **CO2**: Students will have a comparative comprehension of international legislation/conventions/treaties, etc. related to the subject.
3. **CO3**: Students will be able to understand the evolution, role, and working of international institutions working for international trade.

15. CRIMINAL AND SECURITY LAW

1. **CO1**: The students will be able to understand the concept and historical background of criminal

law and would be able to critically review the application of general principles of criminal law.

2. **CO2**: The students will be able to differentiate between kinds of criminal liability and will be able to recognize the inchoate crimes under the Indian penal code.
3. **CO3**: The students will be able to critically evaluate the defenses and classify the theories and types of Punishment under the Indian Criminal justice system.

16. CRIMINOLOGY, PENOLOGY & VICTIMOLOGY

1. **CO1**: The students are able to recognize the basic concepts of Criminology, Penology, and Victimology.
2. **CO2**: The students are able to understand the nature and ideological thinking of criminological studies.
3. **CO3**: The students are able to outline logical thinking about specific penological and other measures available for dealing with criminals and how far these measures are appropriate in protecting the rights of the victims.

17. COMPARATIVE CRIMINAL PROCEDURE LAW

1. **CO1**: Students will be imparted complete understanding and knowledge about the procedure for arrest, trial, and execution of sentences in criminal cases.
2. **CO2**: Students will be imparted knowledge about the concept of bailable, non-bailable, cognizable, and non-cognizable cases, inquiry, investigation, F.I.R.etc.
3. **CO3**: Students to be well acquainted with complete knowledge of Trial procedures and Fair trials in different countries.

18. CRIMINAL AND SECURITY LAW

1. **CO1**: Students will have in-depth knowledge of cybercrimes.
2. **CO2**: The students will be able to develop a critical approach toward the law related to cybercrimes.
3. **CO3**: The students will be able to understand cyber investigation procedures and evidence collection.

19. INTERNATIONAL CRIMINAL LAW

1. **CO1**: The students are able to recognize the evolutionary aspect of International criminal law.
2. **CO2**: The students are able to classify the national and international persecution of crimes.
3. **CO3**: The students are able to categorize and compare different kinds of crimes under International Criminal Law.

20. ORGANIZED CRIME & TERRORISM

1. **CO1**: Students will be able to understand the concept of organized crime.
2. **CO2**: Students will be able to understand the international perspective towards organized crimes.
3. **CO3**: Students will be able to analyze the legislative provisions of India towards organized crimes.

SCHOOL OF LAW

Program: LL.M.

Programme Educational Objective (PEO)
Programme Outcomes (POs)
Programme Specific Outcomes (PSOs)
Course Outcomes (COs)
2023-2024

RAFFLES
UNIVERSITY

Japanese Zone, National Highway 48 Neemrana, Rajasthan 301020 **www.rafflesuniversity.edu.in**

Programme Educational Objective (PEO)

The LL.M. program is designed to provide students with the key skills and competencies needed to show these learning outcomes in academia, professions, and the corporate sector. After completing his LL.M., every student should be able to complete the following requirements:

1) He must be able to recognise and comprehend the fundamental ideas of Indian substantive law.
2) He should be able to use the fundamental ideas of substantive law, as well as the abilities of legal analysis, reasoning, and problem-solving, to the facts that are presented.
3) He needs to show that he is familiar with the precedent and how to apply it to specific facts.
4) He should demonstrate sharp acumen in legal research.
5) He should be familiar with international law and conduct research abroad.
6) He must demonstrate excellent listening, critical reading, objectivity in legal drafting, and persuasive abilities, as well as the ability to interview and counsel clients.
7) He must act with professional ideals, standards, and discipline, demonstrating professional judgement, ethics, and professionalism.
8) In a range of legal contexts, he should be able to comprehend, work with, and interact with persons of varied backgrounds and experiences.
9) He needs to show that he is aware of the commitment to access to justice that his profession has made.
10) He needs to be familiar with and have had exposure to the many job opportunities and career paths open to legal professionals.

Programme Outcomes (POs)

On completion of this program, a student would have an in-depth understanding

1) Understand and identify the different laws with respect to their area of specialization.
2) Communicate well by using a persuasive style and display oral advocacy abilities in a clear and objective manner.
3) Successfully analyze a situation and collaborate effectively with others on a variety of legal issues.
4) Writing a research report that effectively communicates the results of legal research while taking the readers' backgrounds into consideration.
5) Make a legal analysis by reasoning and problem-solving skills to arrive at solutions to legal problems

Programme Specific Outcomes (PSOs) Constitutional Law

1) LLM in Constitutional Law allows students to specialize in all laws related to the Constitution and the operation of the judicial system to protect people's rights.
2) An LLM in Constitutional Law enables students to concentrate on legal topics in-depth and better prepared them to handle disputes involving government agencies and regulatory bodies.
3) It aims to provide students with specialized knowledge about legislation as well as extensive exposure to the many branches of government, both locally and globally.
4) In addition to having access to extensive national and international databases, the students also gain experience with writing seminar papers, research, legal writing, and internships.
5) The program focuses on going over the law in great depth, assisting participants in developing into better legal professionals with a thorough understanding of the law.

Corporate Law

1) LLM in Corporate Law offers students the chance to focus on all legislation pertaining to the corporate sector.
2) An LLM in corporate law enables students to concentrate on legal topics in detail, better preparing them for a career in the corporate sector.
3) The program aims to provide students with specialized knowledge of the laws governing corporate finance, securities law, banking, and insurance. Law, M&A, and other legal issues Laws relating to insolvency and international trade.
4) Students are also exposed to seminar paper writing, research, legal writing, and internship opportunities, as well as access to enormous databases, both national and worldwide.
5) The program focuses on covering the law in more depth, assisting them in becoming stronger legal professionals with a broad understanding of the law.

Criminal Law

1) Students will gain a comprehensive understanding of criminal law principles, theories, and doctrines. They will study the elements of different criminal offences, defences, and the principles of criminal liability.

2) The program aims to develop students' analytical and critical thinking abilities, allowing them to analyze complex criminal law issues and apply legal reasoning to arrive at sound conclusions.
3) Students will be familiarized with the criminal justice system, including the investigation, prosecution, and defense processes. They will learn about the roles of various stakeholders, such as judges, prosecutors, defense attorneys, and law enforcement agencies.
4) Students may explore criminal law from a comparative perspective, examining the similarities and differences between criminal justice systems in different countries and jurisdictions.
5) LL.M. candidates are often required to conduct in-depth legal research and produce scholarly papers or a thesis on criminal law topics, which improves their legal research and writing skills.

Maritime Law

1) Students will have a thorough understanding of the concepts, laws, and conventions that govern maritime law, including maritime law, international maritime law, and domestic maritime law.
2) A focus on admiralty and maritime litigation could be a part of the curriculum, educating students to manage legal disputes involving shipping, marine insurance, salvage, collisions, and other maritime disasters.
3) Students will study marine insurance contracts, policies, and the principles guiding marine risk management to safeguard shipowners, cargo owners, and other stakeholders' interests.
4) The programme may address legal aspects of seaborne cargo transportation, such as bills of lading, charter parties, and other contracts for cargo transportation.
5) Students will learn about admiralty jurisdiction, which refers to the court's authority to hear maritime matters, maritime liens, and maritime arrests

Course Outcomes (COs)
COMPULSORY PAPER

MLA901	1) Demonstrate a strong understanding of legal research methods. 2) Conduct thorough and effective legal research using primary and secondary sources. 3) Analyze legal issues and develop coherent legal arguments. 4) Draft various legal documents, including research papers, briefs, and memoranda. 5) Apply appropriate citation styles (e.g., Bluebook) in legal writing.
MLA902	1) Understand and Analyze Comparative Public Law Systems 2) Evaluate the Impact of Public Law on Governance 3) Apply Comparative Methodology 4) Critically Engage with Public Law Issues 5) Develop Comparative Legal Research Skills
MLA906	1) Understand the Complex Relationship Between Law and Globalization 2) Critically Assess Theories of Global Justice 3) Examine the Role of International Law and Organizations 4) Analyze Transnational Legal Issues 5) Evaluate the Impact of Globalization on Human Rights

(CONSTITUTIONAL & ADMINISTRATIVE LAW) Group – B

MLB 201	1) Demonstrate an understanding of the core concepts and principles of administrative law in different legal systems. 2) Analyze and compare administrative law practices across various jurisdictions, identifying similarities and differences. 3) Critically assess the role of administrative law in maintaining the balance between governmental power and individual rights. 4) Evaluate the effectiveness of judicial review mechanisms in different legal traditions. 5) Discuss the influence of international and supranational legal frameworks on domestic administrative law.
MLB 202	1) To understand the historical evolution and current landscape of media laws. 2) To analyze the legal and ethical issues related to media practices. 3) To study the role of media in a democratic society and the legal responsibilities of media professionals. 4) To explore the impact of technology on media and information laws. 5) To examine case laws and legal precedents shaping media regulations.
MLB 203	1) To understand the concept and evolution of federalism in India. 2) To analyze the constitutional provisions related to federalism and local self-governance. 3) To study the structure, powers, and functions of Panchayats and other local self-government institutions.

	4) To examine the role of local governance in promoting participatory democracy and sustainable development.
MLB 204	1) Understand the Constitutional and legal framework governing the services under the Union and the States. 2) Analyze the recruitment and service conditions of public servants, including their rights and responsibilities. 3) Interpret and apply the rules and regulations concerning disciplinary proceedings and their impact on public service. 4) Critically examine judicial pronouncements that have shaped Service Law in India. 5) Evaluate the role and functioning of Administrative Tribunals in resolving service-related disputes.
MLB 205	1) Understand the fundamental legal principles related to healthcare and public health. 2) Analyze the impact of legal and regulatory frameworks on healthcare delivery. 3) Identify and evaluate legal issues in healthcare practice and policy. 4) Apply legal reasoning to real-world health law cases and problems. 5) Examine the ethical implications of legal decisions in healthcare

MLB 206	1) To understand the principles and frameworks governing elections. 2) To analyze the role of various stakeholders in the electoral process. 3) To examine the legal issues surrounding electoral reforms and the judicial review of election laws. 4) To explore the impact of election laws on democracy and governance.

CORPORATE AND COMMERCIAL LAW Group – C

MLC301	1) To understand the legal framework of banking and insurance industries. 2) To analyze regulatory bodies' roles and their impact on financial institutions. 3) To explore the legal issues related to banking operations and insurance policies. 4) To apply legal principles to real-world scenarios in banking and insurance.
MLC302	1) To understand the legal framework governing securities and financial markets. 2) To analyze the role of regulatory bodies and their impact on market practices. 3) To examine key regulations and statutes related to securities, investments, and financial transactions. 4) To develop skills in identifying and addressing legal issues in financial markets.

MLC303	1) Explain the fundamental concepts and legal principles of international commercial arbitration. 2) Analyze arbitration agreements and determine their validity and enforceability. 3) Apply international arbitration rules and procedures to real-world disputes. 4) Evaluate the roles and functions of various arbitration institutions. 5) Draft and critique arbitration clauses and procedural documents.
MLC304	1) Understand the historical evolution and objectives of competition law. 2) Compare and contrast different competition law regimes. 3) Identify and analyze different types of anti-competitive agreements. 4) Evaluate the impact of cartels on markets and consumers.
	5) Analyze the implications of mergers on competition and market structure.
MLC305	1) Understand the fundamental concepts and frameworks of corporate governance. 2) Analyze the roles and responsibilities of different governance bodies within a corporation. 3) Evaluate the impact of governance structures on corporate performance and compliance. 4) Apply governance principles to real-world scenarios and case studies. 5) Critically assess corporate governance practices and propose improvements

MLC306	1) Identify and explain the main principles and agreements in international trade law, including the World Trade Organization (WTO) agreements. 2) Analyze the impact of trade policies and regulations on international business transactions. 3) Evaluate legal issues related to trade disputes and the resolution mechanisms available under international law. 4) Apply legal frameworks to real-world scenarios involving international trade. 5) Discuss the role of international organizations such as the WTO, International Monetary Fund (IMF), and World Bank in shaping trade policies.

CRIMINAL & SECURITY LAW Group – D

MLD401	1) To understand the fundamental principles of criminal law, including the nature of criminal acts and the requirements for criminal responsibility. 2) To analyze the elements of various crimes and the principles governing their categorization and prosecution. 3) To explore the range of defenses available in criminal law and understand their applicability in different scenarios. 4) To develop critical thinking skills related to the application and interpretation of criminal law principles

MLD402	1) Understand the fundamental theories and concepts in criminology. 2) Analyze different types of crime and their impact on society. 3) Apply criminological theories to real-world scenarios. 4) Conduct basic criminological research and interpret findings.
MLD403	1) Compare and contrast criminal procedural laws from multiple jurisdictions. 2) Analyze the effectiveness of various procedural approaches in ensuring justice and protecting rights. 3) Critically evaluate the impact of procedural differences on international criminal law and human rights. 4) Apply comparative insights to propose reforms or improvements in criminal procedures. 5) Communicate and debate complex procedural issues effectively in both written and oral forms.
MLD404	1) Understand the different types of cybercrimes and their implications. 2) Analyze the legal frameworks and policies related to cybercrime. 3) Explore case studies to understand real-world applications of cyber law. 4) Develop strategies for legal responses and prevention of cybercrimes. 5) Discuss the ethical and practical challenges in prosecuting cyber crimes

MLD405	1) Understand the foundational principles and sources of International Criminal Law. 2) Analyze the structure and function of key international criminal institutions and tribunals. 3) Evaluate the legal frameworks and case law related to international crimes. 4) Critically assess the challenges and debates surrounding international criminal justice. 5) Develop practical skills in legal research, writing, and argumentation within the context of ICL.
MLD406	1) To understand the definitions, typologies, and historical evolution of organized crime and terrorism. 2) To analyze the socio-political and economic factors contributing to organized crime and terrorism. 3) To examine legal and policy responses to organized crime and terrorism. 4) To evaluate case studies and real-world scenarios to develop practical insights and solutions.

MARITIME LAW

MTL101	1) Understand the Principles of Admiralty Law: Demonstrate a thorough understanding of the historical development, sources, and scope of admiralty law. 2) Apply Legal Frameworks: Analyze and apply national and international maritime laws, including treaties and conventions, to real-world scenarios. 3) Draft and Interpret Shipping Contracts: Effectively draft, interpret, and negotiate various shipping contracts, such as charterparties and bills of lading. 4) Handle Marine Insurance Issues: Evaluate marine insurance policies and resolve disputes related to marine insurance claims. 5) Navigate Maritime Regulations: Understand and apply regulations related to shipping, navigation, safety, and environmental protection.
MTL102	1) To understand the historical development and principles of the Law of the Sea. 2) To analyze the legal frameworks established by international treaties and conventions, particularly the United Nations Convention on the Law of the Sea (UNCLOS). 3) To evaluate the rights and responsibilities of coastal states, landlocked states, and international bodies. 4) To explore contemporary issues and disputes in maritime law, including environmental protection, piracy, and territorial disputes.

MTL103	1) To understand the foundational concepts and principles of international commercial arbitration. 2) To analyze the legal frameworks and institutions governing arbitration.
	3) To evaluate the procedural aspects of arbitration and the role of arbitrators. 4) To apply theoretical knowledge to practical scenarios in arbitration
MTL104	1) Understand and Explain Key Concepts: Grasp the fundamental principles and terms associated with the carriage of goods by sea, including the roles of various parties involved. 2) Interpret Legal Frameworks: Analyze and apply international conventions and national laws related to the carriage of goods by sea. 3) Evaluate Contractual Terms: Assess the implications of various types of contracts and bills of lading, and understand the rights and responsibilities of involved parties. 4) Manage Liabilities and Claims: Identify potential liabilities, handle claims for loss or damage, and understand the mechanisms for dispute resolution. 5) Apply Legal Knowledge Practically: Use case studies and practical scenarios to apply legal principles and solve problems related to maritime transport.

MTL105	1) To understand the principles and practices of maritime insurance. 2) To analyze various types of maritime insurance policies and their applications. 3) To explore legal and regulatory aspects related to maritime insurance. 4) To develop the ability to evaluate and manage insurance claims in maritime contexts.
MTL106	1) To understand the sources and types of maritime pollution.
	2) To analyze the international legal instruments and conventions related to maritime pollution. 3) To evaluate the effectiveness of national and international measures in controlling maritime pollution. 4) To explore case studies and practical applications of maritime environmental law.

PROGRAM NAME:

BACHELOR OF LAW

B.A.LL.B/B.B.A.LL.B (H)

(5 Years Integrated Course)
Programme Out Comes/ Programme Specific Out Come/Course Out Comes
(2023-2024)

PROGRAM OUTCOMES

1. **PO1. Legal Knowledge:** To acquire & apply legal knowledge to complex Socio-legal problems.
2. **PO2. Professional Practice:** to make students eligible to practice as legal practitioners in Courts, Industries, and Companies.
3. **PO3. Professional Skills:** To possess professional skills required for legal practice such as Argument, Pleading, drafting, conveyancing etc.
4. **PO4. Professional Ethics:** To understand and apply principles of professional ethics of the legal profession.
5. **PO5. Legal Research & Legal Reasoning:** to develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PO6. Leadership Skills:** To develop leadership qualities amongst students.

PROGRAM EDUCATIONAL OBJECTIVES

1. **PEO1**: To acquire & apply legal knowledge to multifaceted Socio-legal problems.
2. **PEO2:** To make students eligible to practice as legal experts in Courts, Industries, and Companies.
3. **PEO3**: To possess the expertise necessary for practicing law, such as argument, pleading, drafting, conveyancing, etc.
4. **PEO4**: Understanding and applying legal professional ethics in legal principles.
5. **PEO5**: To develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PEO6**: To create a foundation for independent employment by acquiring professional legal skills.
7. **PEO7**: To strengthen clinical skills and raise understanding of constitutional legislation and societal transformation

8. **PEO8**: Each law graduate will acquire expertise in legal research, written and spoken communication, teamwork, advocacy, and problem-solving.

PROGRAM SPECIFIC OBJECTIVES

1. **PSO1**. Students should be able to demonstrate an understanding of substantive and procedural law sufficient to enter the legal profession and professions in which legal knowledge is an advantage.
2. **PSO2**. Should be able to associate the learning from the courses related to Law and Management.
3. **PSO3**. Should have the capability to understand the laws at national and global levels and to solve the client's problem.
4. **PSO4**. Should possess the skills to communicate in both oral and written forms and the ability to formulate legal problems and use appropriate concepts and methods to solve them.
5. **PSO5** should use skills in specific areas (e.g. Criminal, industrial-organizational, clinical, counselling, social, and community).
6. **PSO6** should be analyzing social problems and understand social dynamics.

COURSE OUTCOMES

LEGAL METHODS (BAL 101)

1. **CO1** Understand the foundations of law.
2. **CO2** Analyze the application of the components of the Indian Legal System.
3. **CO3** Write research reports, using proper research tools.
4. **CO4** Draft plaints & written statements as a part of the clinical Legal Education.

LAW OF TORTS, CONSUMER PROTECTION AND MV. ACT (BAL 102)

1. **CO1** Identify the various conceptual aspects of the Law of Torts.
2. **CO2** Apply various defences under tortuous liability and specific kinds of torts.
3. **CO3** Enumerate the remedies available for specific torts.
4. **CO4** Know the relation of torts with various other laws.

GENERAL ENGLISH-I (BAL 103)

1. **CO1** Describe importance of Legal Language.
2. **CO2** Identify the correct usage of grammar in legal drafting.
3. **CO3** Draft documents for legal correspondence.
4. **CO4** Analyse characters of literary texts.
5. **CO5** Apply skills of interpreting poetry.

POLITICAL SCIENCE-I (BAL 104)

1. **CO1** Enumerate the concepts associated with Political Theory
2. **CO2** Correlate Political Science with Law
3. **CO3** Conceptualize the associated concepts of Political Science
4. **CO4** Know the relation of political science with law

SOCIOLOGY-I (BAL 105)

1. **CO1** Understand the associated concepts of sociology
2. **CO2** Know the essence of kingship in current scenario
3. **CO3** Analyse the relevance of social anthropology
4. **CO4** Apply the knowledge of sociology with law

ECONOMICS-I (BAL 105)

1. **CO1** Conceptualize the various components of Micro and Macro Economics
2. **CO2** Enumerate functioning of markets
3. **CO3** Discuss the impact of lassiez faire state in Indian Economy
4. **CO4** Able to understand the business cycle and the concept of inflation

LEGAL & CONSTITUTIONAL HISTORY (BAL 201)

1. **CO1** Understand the basic concept of constitutional history.
2. **CO2** Know the development of legal and constitutional history.
3. **CO3** Apply the various provisions of GOI act with constitution
4. **CO4** Analyse the A Codification of Indian Laws and the Law Commissions Reports

LAW OF CONTRACT – I (BAL 202)

1. **CO1** Have an elementary understanding of the debates around the nature of law.
2. **CO2** Distinguish between the major kinds of law, legal systems and institutions.
3. **CO3** Knows the structure of the legal institutions and the hierarchy of courts in India.
4. **CO4** Apply critically the various provisions of contract practically in the court of law

GENERAL ENGLISH-II (BAL 203)

1. **CO1** Understand the general concept of legal language
2. **CO2** Summarize information and reconstruct arguments in a coherent presentation.
3. **CO3** Produce organized and coherent communications and essays with clear paragraphs and appropriate methods for introducing and concluding.
4. **CO4** Produce well-supported communications and essays using different patterns of development taking into consideration purpose and audience.

POLITICAL SCIENCE-II (BAL 204)

1. **CO1** Understand key field-specific theories and concepts, as well as their importance in the development of political science knowledge.
2. **CO2** Summarise conceptual arguments or theoretical methods, apply them to field-relevant situations, and back up your claims with evidence.
3. **CO3** Compare and contrast the merits of various policies, theories, or concepts from various disciplinary perspective.
4. **CO4** Know the theories of Management and Administrative Reform.

SOCIOLOGY-II (BAL 205)

1. **CO1** Understand the functional similarities and differences in the institutions of Indian Society.
2. **CO2** Make students aware with the micro and macro world of Indian Society
3. **CO3** Know the various caste system in India
4. **CO4** Analyse the how the sociological approach applies in the society legally.

ECONOMICS-II (BAL 206)

1. **CO1** Identify and explain economic concepts and theories concerning economicagents' behaviour, markets, industry and corporate structures, legal institutions, social standards, and government policies.
2. **CO2** Know the combine theoretical knowledge with quantitative and qualitative information to explain previous economic events and forecast future ones.
3. **CO3** Evaluate the consequences of economic activities and institutions for individual and social welfare.
4. **CO4 U**nderstand about the basic concepts of Monetary Economics.

CONSTITUTIONAL LAW – I (BAL 301)

1. **CO1** Identify the various dimensions of the constitutional law.
2. **CO2** Understand the process of Executive, legislative and judicial mechanisms under the constitution.
3. **CO3** Enumerate the constitutional remedies available.
4. **CO4** Apply the real sprit of distribution of power between centre and state government.

LAW OF CONTRACT – II (BAL 302)

1. **CO1** Understand the list and define the specific contracts.

2. **CO2** Know the explanation of why specific contracts are important to our legal and economic system.
3. **CO3** Analyse how sale transactions of moveable property take place.
4. **CO4** They will find out how partnership firms are formed, the duties and liabilities of the partners in a partnership firm.

LAW OF CRIMES-I (BAL 303)

1. **CO1** Understand the conceptual analysis of the law of crimes
2. **CO2** Analyse the spirit of legal provisions of crimes and apply it before the court of law.
3. **CO3** Apply the practical aspects of law of crime in the different types of courts in India.
4. **CO4** Assess the real approach of the law of crime in the present context of Indian Society.

POLITICAL SCIENCE – III (BAL 304)

1. **CO1** Understand the basic and general concept of political system in India
2. **CO2** Assess the relations of Indian political system with international political system.
3. **CO3** Analyse the powers and limitation of the states in the context of international political scenario.
4. **CO4** Apply the Critical approach of the political system with the legal system in India.

SOCIOLOGY-III (BAL 305)

1. **CO1** Understand the various theories of sociology and apply it into the society.
2. **CO2** Know and apply the social ideology of the various thinkers in the practical and real world.
3. **CO3** Analyse the role of media into the prevention of crime from the ground level in India.
4. **CO4** Express the views of various thinkers and sociologist in future for the betterment of society.

ECONOMICS-III (BAL 306)

1. **CO1** Understand the fundamental principles of monetary economics and financial markets.
2. **CO2** Analyse the financial system of markets and the tools of Monetary Policy used in the market system.

3. **CO3** Know the banking and standards of banking, functions, quantitative & qualitative credit control methods, Limitations and role of RBI.
4. **CO4** Apply public finance in various sectors of economics and change the character of public finance through international financial instruments.

CONSTITUTIONAL LAW - II (BAL 401)

1. **CO1** Understand the Concept of 'State' in reference to fundamental rights.
2. **CO2** Fundamental rights and the method for ensuring conformity with fundamental rights, as well as Writ jurisdiction of the supreme court and high court under Articles 32 and 226.
3. **CO3** The state's duty and relationship with the interdependence of fundamental rights and directive principles.
4. **CO4** Know the provisions regarding fundamental rights under the national and international legal system.

LAW OF CRIMES-II (LCRL-II)

1. **CO1** Understand how society views crime against women, the human body and property.
2. **CO2** Demonstrate a thorough understanding of aspects of criminal justice or law, as well as their relevance to larger social issues.
3. **CO3** Identify and apply the principles of criminal law covered in the whole course.
4. **CO4** Know the provisions of the various offences under criminal law and apply them in a court of law.

CODE CRIMINAL PROCEDURE (BAL 403)

1. **CO1** Understand the criminal procedure in India includes the following information: who prosecutes; process to compel production of things; right to a quick trial; and process to compel the appearance of persons.
2. **CO2** Know the Criminal Procedure Act's legal guidelines for arrest and bail, the rights of those who have been detained, and how to apply these laws in a real-world situation.
3. **CO3** Describe the rules that govern the right to legal representation in criminal proceedings in India and demonstrate how to use them in a real-world situation.
4. **CO4** Apply the various provisions of criminal procedure code in the different courts.

LAW OF EVIDENCE (BAL 404)

1. **CO1** Identify and enumerate the various categories of evidence, their general characteristics, and the relevant legal processes.
2. **CO2** Examine the rule governing the admissibility of evidence in court and its importance.
3. **CO3** Analyse the regulations governing dying declarations and their admissibility.
4. **CO4** Understand the whole concept of the law of evidence and correlate it with other laws.

ADMINISTRATIVE LAW (BAL 405)

1. **CO1** State the need for the development of Administrative Law.
2. **CO2** Express the concept of delegated legislation and its control mechanisms.
3. **CO3** Demonstrate natural justice and its exceptions and examine the recent innovations in administrative Law.
4. **CO4** Appraise the judicial control of administrative action.

ECONOMICS-IV (BAL 406)

1. **CO1** Understand the general concept of international economics.
2. **CO2** Know the various theories of international trade and role of international trade in economic development.
3. **CO3** States the importance of the terms of trade and commercial policy.
4. **CO4** Analyse the international financial institutions and trade agreements and its functions.

FAMILY LAW – I (BAL 501)

1. **CO1** Understand the general concept and provisions of Hindu law.
2. **CO2** Basic ideas including marriage, divorce, parental custody, domestic abuse, and children's rights are taught to students of family law.
3. **CO3** Family law investigates how historical and social settings have impacted how families are defined and governed in the present.
4. **CO4** Students will learn to think critically, analyse information, and communicate ideas orally and in writing.

JURISPRUDENCE (BAL 502)

1. **CO1** Understand the basic principles of learning of law and sources of law.

2. **CO2** Perform that you have a thorough understanding of the political, social, historical, philosophical, and economic framework of law.
3. **CO3** Identify, articulate, and critically assess legal theory, as well as its consequences for policy.
4. **CO4** Critically evaluate and explore intricate legal and theoretical issues, and select the best course of action among available options.

CORPORATE LAW-I (BAL 503)

1. **CO1** Apply the practical aspect of company law in the global system of economics.
2. **CO2** Understand multinational companies in the legal system.
3. **CO3** Frame the legal requirement for registration for companies.
4. **CO4** Contest the cases pertaining to corporate law.

INTELLECTUAL PROPERTY LAW (BAL 504)

1. **CO1** Understand the international origin of IPR.
2. **CO2** Think over the Indian IPR law in relation to the International legal system.
3. **CO3** Critically analyses the IPR law for protecting the intellectual property
4. **CO4** Apply critically the principles of IPR laws for the protection of creative activities.

PUBLIC INTERNATIONAL LAW (BAL 505)

1. **CO1** Understand the basic concept and sources of international law
2. **CO2** Demonstrate knowledge and understanding of the international rights frame work, its origins and justifying theories
3. **CO3** Establish the capacity to assess how specific human rights may be asserted, enforced or violated.
4. **CO4** Critically evaluate the relationship between international and domestic law.

CIVIL PROCEDURE CODE-I (BAL 506)

1. **CO1** Know the detailed procedure for the redressal of civil rights.
2. **CO2** Where the suit is to be filed? The essential forms and procedures for the institution of the suit, the documents in support and against, evidence taking and trial, dimensions of an interim order, the peculiar nature of the suits, the complexities of executing a decree and provisions for appeal and revision are all matters which a lawyer for any side is to be familiar with.
3. **CO3** Recognize and address issues that arise in Civil Procedure that implicate relevant ethical, moral, and religious principles.

4. **CO4** Understand the basic concept of the civil procedure code.

FAMILY LAW-II (BAL 601)

1. **CO1** Analyse Muslim law, its sources, Schools, the concept of marriage, and the various matrimonial remedies
2. **CO2** Understand the legal or statutory provisions relating to maintenance, Dower Guardianship they will be able to solve disputes of property by reading the above course.
3. **CO3** Know the legal solutions to some very sensitive disputes relating to Waqf, Will, Inheritance and Guardianship etc.
4. **CO4** The Students recognize the recent development under Muslim Law through the judiciary.

TRANSFER OF PROPERTY (BAL 602)

1. **CO1** Understand and explain the basic principles of transfer of property with real-life examples.
2. **CO2** Demonstrate the various kinds of transfer of properties with practical examples.
3. **CO3** Know the draft of various deeds relating to the transfer of property.
4. **CO4** Recognize the easementary rights in India.

COMPETITION LAW (BAL 603)

1. **CO1** Understand the basic principles of fair competition and constitutional perspectives.
2. **CO2** Analyse the international perspectives of competition law.
3. **CO3** Recognise the role of the Competition Act, 2002 in regulating anti-competitive practices and promoting fair competition and enforcement procedures.
4. **CO4** Identify and able to conduct research on emerging trends in competition law.

ARBITRATION & MEDIATION (BAL 604)

1. **CO1** Recognise the fundamentals and guiding principles of arbitration.
2. **CO2** Interpreting and applying pertinent domestic and international arbitration and mediation laws and regulations.
3. **CO3** Identify the advantages and limitations of arbitration and mediation.
4. **CO4** Case analysis and legal research in arbitration and mediation

PRIVATE INTERNATIONAL LAW (BAL 605)

1. **CO1** Analyse the fundamental principles of private international law and conduct legal research and assess legal data.
2. **CO2** Apply private international law principles to difficult challenges and difficulties and assess how they work theoretically.
3. **CO3** Examine the effects of private international law from a comparative and global viewpoint, taking social and cultural diversity into consideration.
4. Build and maintain clear, convincing writing for a legal and professional audience.

CIVIL PROCEDURE CODE-I (BAL 606)

1. **CO1** Demonstrate the knowledge and understanding of substantive law, procedural law, and Constitutional Law.
2. **CO2** Develop the ability to perform legal analysis and reasoning, legal research, problem-solving, and written and oral communication in the legal context and apply it in legal practice and real-life situations.
3. **CO3** Demonstrate the professional skills of pleading, argument, drafting and conveyancing, collaboration, counselling, and negotiation required for legal practice.
4. **CO4** Develop the ability to analyse the law in relation to contemporary developments at the national level.

INFORMATION TECHNOLOGY LAW (BAL 701)

1. **CO1** Clarify and apply the key legal principles of information technology law presented in the course.
2. **CO2** Choose and use a variety of written and spoken communication techniques, as well as the critical thinking skills necessary to find answers to challenging legal issues in the field of information technology law.
3. **CO3** Demonstrate knowledge of the various ways that the law can be affected by and changed by quickly developing technology in a way that can help clients with their planning or lawmakers with their recommendations.
4. **CO4** Apply the provisions of law relating to Information Technology in the judicial proceedings.

PRINCIPLES OF TAXATION (BAL 702)

1. **CO1** Apply the principles of taxation laws to complex legal problems.
2. **CO2** Understand the technical aspects of taxation laws.

3. **CO3** To file and contest cases writ pertaining to taxation laws before the competent authorities.
4. **CO4** Supervise and guide the persons whose matters are related to taxation laws.

HUMAN RIGHTS LAW & PRACTICE (BAL 703)

1. **CO1** Understand the meaning and historical development of human rights.
2. **CO2** Classify relevant documents on human rights.
3. **CO3** Interpret legal provisions on human rights under Indian laws.
4. **CO4** Examine the effective implementation of human rights of vulnerable groups.

INTERPRETATION OF STATUTES (BAL 704)

1. **CO1** Understand the real thing of interpretation.
2. **CO2** Apply the principles of interpretation in the courts.
3. **CO3** Understanding the capacity of the students will increase for the real application of the law.
4. **CO4** Practically understands the construction of various statutes.

INDIAN FEDERALISM (BALA 705)

1. **CO1** Understand the concept and definition of federalism.
2. **CO2** Know the provisions regarding federalism in different countries.
3. **CO3** Analise the confederation and cooperative federalism.
4. **CO4** Critically applies and compares the federal and unitary systems of government.

LOCAL SELF-GOVERNMENT (BALA 706)

1. **CO1** Understand the development of Local Self Government in India.
2. **CO2** Critically analyse the working of self-governing institutions in India.
3. **CO3** Explore the recent trends in Local Self Government in India.
4. **CO4** Recognize the provisions under the constitution regarding local government.

CRIMINOLOGY PENOLOGY & VICTIMOLOGY (BALB 705)

1. **CO1** Understand the relationship between theories of punishment and historical context.
2. **CO2** Analyze and evaluate the relevance of theories of punishment to current penal policy.
3. **CO3** Become familiar with basic criminal laws and criminal justice processes in the country.

4. **CO4** Evaluate the reasons behind the crime and the significance of Penology in the present society and theories of the punishments and its application in the criminal justice system.

CYBER CRIME SECURITY & SOVEREIGNTY (BALB 706)

1. **CO1** Defend and safeguard computer systems and networks from cybersecurity threats.
2. **CO2** Analyse and investigate cybersecurity incidents or crimes involving digital evidence and computer systems.
3. **CO3** Address information security issues through effective communication in a professional setting.
4. **CO4** Identify present and potential assaults on a company's computer systems and networks, use critical thinking and problem-solving techniques.

CORPORATE GOVERNANCE (BALC 705)

1. **CO1** Understanding of Corporate Governance from a managerial as well as legal point of view.
2. **CO2** Learn the importance of good governance which is an important tool to achieve shareholder democracy.
3. **CO3** Enumerate the importance of the responsibilities of a corporation towards society.
4. **CO4** Critically applies the knowledge of corporate law in the court proceedings.

LAW OF CORPORATE FINANCE (BALC 706)

1. **CO1** Understand the basic concept and scope of corporate finance.
2. **CO2** Know the provisions related to corporate finance under constitutional law.
3. **CO3** Analyse the key concept of Share Capital and non-opting equity shares.
4. **CO4** Apply critically the provision of company law and constitutional law in the proceedings before the court of law.

COPYRIGHTS AND TRADITIONAL CULTURAL EXPRESSION (BALD 705)

1. **CO1** Understand the concept of copyrights and folklore.
2. **CO2** Analyse the authorship and ownership under copyrights.
3. **CO3** Develops procedural knowledge to Legal System and solving the problem relating to copyrights.
4. **CO4** Skill to understand the concept of Traditional Cultural Expressions (TCEs) or Expressions of Folklore.

LAW OF TRADEMARKS AND GEOGRAPHICAL INDICATIONS (BALD 706)

1. **CO1** Obtain a fair and sound knowledge of the ideas behind international and Indian trademark law.
2. **CO2** Demonstrate a thorough understanding of trademark law in the applicant's chosen field of study or employment.
3. **CO3** Employ fundamental research techniques, data analysis, and interpretation around trademark law.
4. **CO4** Examine various approaches to problem-solving, build science-based solutions, and identify the main points of disagreement in both international and domestic trademark law.

School of Law, Raffles University

Bachelor of Laws

B.A.LL.B/B.B.A.LL.B

PROGRAM OUTCOMES

1. **PO1. Legal Knowledge:** To acquire & apply legal knowledge to complex Socio-legal problems.
2. **PO2. Professional Practice:** to make students eligible to practice as legal practitioners in Courts, Industries, and Companies.
3. **PO3. Professional Skills:** To possess professional skills required for legal practice such as Argument, Pleading, drafting, conveyancing etc.
4. **PO4. Professional Ethics:** To understand and apply principles of professional ethics of the legal profession.
5. **PO5. Legal Research & Legal Reasoning:** to develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PO6. Leadership Skills:** To develop leadership qualities amongst students.

PROGRAM EDUCATIONAL OBJECTIVES

1. **PEO1**: To acquire & apply legal knowledge to multifaceted Socio-legal problems.
2. **PEO2:** To make students eligible to practice as legal experts in Courts, Industries, and Companies.
3. **PEO3**: To possess the expertise necessary for practicing law, such as argument, pleading, drafting, conveyancing, etc.
4. **PEO4**: Understanding and applying legal professional ethics in legal principles.
5. **PEO5**: To develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PEO6**: To create a foundation for independent employment by acquiring professional legal skills.
7. **PEO7**: To strengthen clinical skills and raise understanding of constitutional legislation and societal transformation.
8. **PEO8**: Each law graduate will acquire expertise in legal research, written and spoken communication, teamwork, advocacy, and problem-solving.

PROGRAM SPECIFIC OBJECTIVES

1. **PSO1**. Students should be able to demonstrate an understanding of substantive and procedural law sufficient to enter the legal profession and professions in which legal knowledge is an advantage.
2. **PSO2**. Should be able to associate the learning from the courses related to Law and Management.
3. **PSO3**. Should have the capability to understand the laws at national and global levels and to solve the client's problem.
4. **PSO4**. Should possess the skills to communicate in both oral and written forms and the ability to formulate legal problems and use appropriate concepts and methods to solve them.
5. **PSO5** should use skills in specific areas (e.g. Criminal, industrial-organizational, clinical, counselling, social, and community).
6. **PSO6** should be analyzing social problems and understanding social dynamics.

COURSE OUTCOMES (COs)

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER 1	
Legal Methods (BAL/BBL 101)	**CO1** Understand the foundations of law. **CO2** Analyze the application of the components of the Indian Legal System. **CO3** Write research reports, using proper research tools. **CO4** Draft plaints & written statements as a part of the clinical Legal Education.
Law of Torts, Consumer Protection and MV. Act (BAL/BBL 102)	**CO1** Identify the various conceptual aspects of the Law of Torts. **CO2** Apply various defences under tortuous liability and specific kinds of torts. **CO3** Enumerate the remedies available for specific torts. **CO4** Know the relation of torts with various other laws.
General English-I (BAL/BBL 103)	**CO1** Describe the importance of General English and Legal Language. **CO2** Identify the correct usage of grammar in legal drafting during the draft of any document.

	CO3 Draft documents for legal correspondence to use in the legal drafting. **CO4** Analyse characters of literary texts and apply skills of interpreting poetry.
Political Science-I (BAL 104)	**CO1** Enumerate the concepts associated with Political Theory in Political Science. **CO2** Correlate the knowledge of Political Science with Legal knowledge. **CO3** Conceptualize the associated concepts of Political Science **CO4** Know the relation of political science with law.
Sociology-I (BAL 105)	**CO1** Understand the basic and associated concepts of sociology in India. **CO2** Know the concept and essence of kingship in different societies under the current scenario. **CO3** Analyze the relevance of the sociological aspect with the present legal system. **CO4** Apply the knowledge of sociology with legal knowledge.
Principles of Management (BBL 104)	**CO1.** Understand the basic concept and fundamental principles of Management. **CO2**. Discuss the evolution of Management Thought **CO3**. Enumerate the functions of Management. **CO4** Appraise Management Practices in the specified domain.
Financial Accounting (BBL 105)	**CO1.** Develop an understanding of basic aspects of Financial Accounting **CO2**. Know all the components of the financial statement and how it relates to the law. **CO3**. Analyze and interpret Financial Statements and use them during legal proceedings. **CO4**. Understand the accounting process under financial accounting.
Economics-I (BAL/BBL 106)	**CO1** Conceptualize the various components of Micro and macroeconomics. **CO2** Enumerate functioning of markets. **CO3** Discuss the impact of a laissez-faire state in the Indian Economy. **CO4** Able to understand the business cycle and the concept of inflation.

Course	Course Outcomes: After Completion of these courses the students should be able to learn
SEMESTER II	
LEGAL & CONSTITUTIONAL HISTORY (BAL 201)	**CO1** Understand the basic concept of constitutional history. **CO2** Know the development of legal and constitutional history. **CO3** Apply the various provisions of GOI act with constitution. **CO4** Analyse the A Codification of Indian Laws and the Law Commissions Reports
LAW OF CONTRACT – I (BAL 202)	**CO1** Have an elementary understanding of the debates around the nature of law. **CO2** Distinguish between the major kinds of law, legal systems and institutions. **CO3** Knows the structure of the legal institutions and the hierarchy of courts in India. **CO4** Apply critically the various provisions of contract practically in the court of law .
GENERAL ENGLISH-II (BAL 203)	**CO1** Understand the general concept of legal language. **CO2** Summarize information and reconstruct arguments in a coherent presentation. **CO3** Produce organized and coherent communications and essays with clear paragraphs and appropriate methods for introducing and concluding. **CO4** Produce well-supported communications and essays using different patterns of development taking into consideration purpose and audience.
POLITICAL SCIENCE-II (BAL 204)	**CO1** Understand key field-specific theories and concepts, as well as their importance in the development of political science knowledge. **CO2** Summarise conceptual arguments or theoretical methods, apply them to field-relevant situations, and back up your claims with evidence.

	CO3 Compare and contrast the merits of various policies, theories, or concepts from various disciplinary perspectives. **CO4** Know the theories of Management and Administrative Reform.
SOCIOLOGY-II (BAL 205)	**CO1** Understand the functional similarities and differences in the institutions of Indian Society. **CO2** Make students aware of the micro and macro world of Indian Society **CO3** Know the various caste system in India. **CO4** Analyse how the sociological approach applies in society and is beneficial to them.
Business Environment (BBL 204)	**CO1.** Identify and evaluate social, cultural, legal and technical factors in the business environment. **CO2**. Describe the various economic systems and sectors. **CO3.** Discuss economic planning and policies of the Indian economy. **CO4.** Apply ethical values and social responsibilities in business.
Human Resource Management (BBL 205)	**CO1.** Understand the concept of the changing environment of HRM and the role of HR managers. **CO2.** Know the recruitment & selection process and application of Information Technology. **CO3.** Apply the critical knowledge for training and development during practical. **CO4.** Recognize the pay plans, performance appraisal and compensation and administer the wage and salary of employees and employee services.
ECONOMICS-II (BAL 206) (BAL/BBL 106)	**CO1** Identify and explain economic concepts and theories concerning economic agents' behaviour, markets, industry and corporate structures, legal institutions, social standards, and government policies. **CO2** Know the combine theoretical knowledge with quantitative and qualitative information to explain previous economic events and forecast future ones.

	CO3 Evaluate the consequences of economic activities and institutions for individual and social welfare. **CO4 U**nderstand about the basic concepts of Monetary Economics.
Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER III	
CONSTITUTIONAL LAW – I (BAL 301)	**CO1** Identify the various dimensions of the constitutional law. **CO2** Understand the process of Executive, legislative and judicial mechanisms under the constitution. **CO3** Enumerate the constitutional remedies available. **CO4** Apply the real spirit of distribution of power between centre and state government.
LAW OF CONTRACT – II (BAL 302)	**CO1** Understand the list and define the specific contracts. **CO2** Know the explanation of why specific contracts are important to our legal and economic system. **CO3** Analyse how sale transactions of moveable property take place. **CO4** They will find out how partnership firms are formed, and the duties and liabilities of the partners in a partnership firm.
LAW OF CRIMES-I (BAL 303)	**CO1** Understand the conceptual analysis of the law of crimes. **CO2** Analyse the spirit of legal provisions of crimes and apply it before the court of law. **CO3** Apply the practical aspects of the law of crime in the different types of courts in India. **CO4** Assess the real approach to the law of crime in the present context of Indian Society.
POLITICAL SCIENCE – III (BAL 304)	**CO1** Understand the basic and general concept of the political system in India. **CO2** Assess the relations of the Indian political system with the international political system. **CO3** Analyse the powers and limitations of the states in the context of international political scenarios. **CO4** Apply the Critical approach of the political system to the legal system in India

SOCIOLOGY-III (BAL 305)	**CO1** Understand the various theories of sociology and apply it into society. **CO2** Know and apply the social ideology of the various thinkers in the practical and real world. **CO3.** Analyse the role of media in the prevention of crime from the ground level in India. **CO4.** Express the views of various thinkers and sociologists in future for the betterment of society.
Organizational Behaviour (BBL 304)	**CO1.** Understand the conceptual framework of the discipline of Organizational Behaviour and its practical applications. **CO2.** Analyze the role of individuals, groups, and structures in achieving organizational goals effectively and efficiently. **CO3.** Critically evaluate the various theories and models of contribute to the overall understanding of the discipline. **CO4.** Develop innovative ideas that could positively shape the organizations from different cultural and diverse backgrounds in the workplace.
Business Strategy (BBL 305)	**CO1.** Study the concepts of strategic management and various business policies. **CO2.** Discuss the strategic operations governing business management. **CO3.** Implement the strategies suitable for various organizational structures. **CO4.** Understand the basic concept of business strategy.
ECONOMICS-III (BAL/BBL 306)	**CO1** Understand the fundamental principles of monetary economics and financial markets. **CO2** Analyse the financial system of markets and the tools of Monetary Policy used in the market system. **CO3** Know the banking and standards of banking, functions, quantitative & qualitative credit control methods, Limitations and role of RBI.

	CO4 Apply public finance in various sectors of economics and change the character of public finance through international financial instruments.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER IV	
CONSTITUTIONAL LAW - II (BAL 401)	**CO1** Understand the Concept of 'State' in reference to fundamental rights. **CO2** Fundamental rights and the method for ensuring conformity with fundamental rights, as well as Writ jurisdiction of the supreme court and high court under Articles 32 and 226. **CO3** The state's duty and relationship with the interdependence of fundamental rights and directive principles. **CO4** Know the provisions regarding fundamental rights under the national and international legal system.
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CODE CRIMINAL PROCEDURE (BAL 403)	**CO1** Understand the criminal procedure in India includes the following information: who prosecutes; process to compel production of things; right to a quick trial; and process to compel the appearance of persons. **CO2** Know the Criminal Procedure Act's legal guidelines for arrest and bail, the rights of those who have been detained, and how to apply these laws in a real-world situation.

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Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER V	
FAMILY LAW – I (BAL 501)	**CO1** Understand the general concept and provisions of Hindu law. **CO2** Basic ideas including marriage, divorce, parental custody, domestic abuse, and children's rights are taught to students of family law.

	CO3 Family law investigates how historical and social settings have impacted how families are defined and governed in the present. **CO4** Students will learn to think critically, analyse information, and communicate ideas orally and in writing.
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CIVIL PROCEDURE CODE-I (BAL 506)	**CO1** Know the detailed procedure for the redressal of civil rights.

	CO2 Where the suit is to be filed? The essential forms and procedures for the institution of the suit, the documents in support and against, evidence taking and trial, dimensions of an interim order, the peculiar nature of the suits, the complexities of executing a decree and provisions for appeal and revision are all matters which a lawyer for any side is to be familiar with. **CO3** Recognize and address issues that arise in Civil Procedure that implicate relevant ethical, moral, and religious principles. **CO4** Understand the basic concept of the civil procedure code.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER VI	
FAMILY LAW-II (BAL 601)	**CO1** Analyse Muslim law, its sources, Schools, the concept of marriage, and the various matrimonial remedies **CO2** Understand the legal or statutory provisions relating to maintenance, Dower Guardianship they will be able to solve disputes of property by reading the above course. **CO3** Know the legal solutions to some very sensitive disputes relating to Waqf, Will, Inheritance and Guardianship etc. **CO4** The Students recognize the recent development under Muslim Law through the judiciary.
TRANSFER OF PROPERTY (BAL 602)	**CO1** Understand and explain the basic principles of transfer of property with real-life examples. **CO2** Demonstrate the various kinds of transfer of properties with practical examples. **CO3** Know the draft of various deeds relating to the transfer of property. **CO4** Recognize the easementary rights in India.
COMPETITION LAW (BAL 603)	**CO1** Understand the basic principles of fair competition and constitutional perspectives. **CO2** Analyse the international perspectives of competition law.

	CO3 Recognise the role of the Competition Act, 2002 in regulating anti-competitive practices and promoting fair competition and enforcement procedures. **CO4** Identify and able to conduct research on emerging trends in competition law.
ARBITRATION & MEDIATION (BAL 604)	**CO1** Recognise the fundamentals and guiding principles of arbitration. **CO2** Interpreting and applying pertinent domestic and international arbitration and mediation laws and regulations. **CO3** Identify the advantages and limitations of arbitration and mediation. **CO4** Case analysis and legal research in arbitration and mediation.
PRIVATE INTERNATIONAL LAW (BAL 605)	**CO1** Analyse the fundamental principles of private international law and conduct legal research and assess legal data. **CO2** Apply private international law principles to difficult challenges and difficulties and assess how they work theoretically. **CO3** Examine the effects of private international law from a comparative and global viewpoint, taking social and cultural diversity into consideration. Build and maintain clear, convincing writing for a legal and professional audience.
CIVIL PROCEDURE CODE-I (BAL 606)	**CO1** Demonstrate the knowledge and understanding of substantive law, procedural law, and Constitutional Law. **CO2** Develop the ability to perform legal analysis and reasoning, legal research, problem-solving, and written and oral communication in the legal context and apply it in legal practice and real-life situations. **CO3** Demonstrate the professional skills of pleading, argument, drafting and conveyancing, collaboration, counselling, and negotiation required for legal practice. **CO4** Develop the ability to analyse the law in relation to contemporary developments at the national level.

Course	Course Outcomes: After Completion of these courses the students should be able to learn
SEMESTER VII	
INFORMATION TECHNOLOGY LAW (BAL 701)	**CO1** Clarify and apply the key legal principles of information technology law presented in the course. **CO2** Choose and use a variety of written and spoken communication techniques, as well as the critical thinking skills necessary to find answers to challenging legal issues in the field of information technology law. **CO3** Demonstrate knowledge of the various ways that the law can be affected by and changed by quickly developing technology in a way that can help clients with their planning or lawmakers with their recommendations. **CO4** Apply the provisions of law relating to Information Technology in the judicial proceedings.
PRINCIPLES OF TAXATION (BAL 702)	**CO1** Apply the principles of taxation laws to complex legal problems. **CO2** Understand the technical aspects of taxation laws. **CO3** To file and contest cases writ pertaining to taxation laws before the competent authorities. **CO4** Supervise and guide the persons whose matters are related to taxation laws.
HUMAN RIGHTS LAW & PRACTICE (BAL 703)	**CO1** Understand the meaning and historical development of human rights. **CO2** Classify relevant documents on human rights. **CO3** Interpret legal provisions on human rights under Indian laws. **CO4** Examine the effective implementation of human rights of vulnerable groups.
INTERPRETATION OF STATUTES (BAL 704)	**CO1** Understand the real thing of interpretation. **CO2** Apply the principles of interpretation in the courts. **CO3** Understanding the capacity of the students will increase for the real application of the law. **CO4** Practically understands the construction of various statutes.
INDIAN FEDERALISM (BALA 705)	**CO1** Understand the concept and definition of federalism. **CO2** Know the provisions regarding federalism in different countries.

	CO3 Analise the confederation and cooperative federalism. **CO4** Critically applies and compares the federal and unitary systems of government.
LOCAL SELF-GOVERNMENT (BALA 706)	**CO1** Understand the development of Local Self Government in India. **CO2** Critically analyse the working of self-governing institutions in India. **CO3** Explore the recent trends in Local Self Government in India. **CO4** Recognize the provisions under the constitution regarding local government.
CRIMINOLOGY PENOLOGY & VICTIMOLOGY (BALB 705)	**CO1** Understand the relationship between theories of punishment and historical context. **CO2** Analyze and evaluate the relevance of theories of punishment to current penal policy. **CO3** Become familiar with basic criminal laws and criminal justice processes in the country. **CO4** Evaluate the reasons behind the crime and the significance of Penology in the present society and theories of the punishments and its application in the criminal justice system.
CYBER CRIME SECURITY & SOVEREIGNTY (BALB 706)	**CO1** Defend and safeguard computer systems and networks from cybersecurity threats. **CO2** Analyse and investigate cybersecurity incidents or crimes involving digital evidence and computer systems. **CO3** Address information security issues through effective communication in a professional setting. **CO4** Identify present and potential assaults on a company's computer systems and networks, use critical thinking and problem-solving techniques.
CORPORATE GOVERNANCE (BALC 705)	**CO1** Understanding of Corporate Governance from a managerial as well as legal point of view. **CO2** Learn the importance of good governance which is an important tool to achieve shareholder democracy. **CO3** Enumerate the importance of the responsibilities of a corporation towards society.

	CO4 Critically applies the knowledge of corporate law in the court proceedings.
LAW OF CORPORATE FINANCE (BALC 706)	**CO1** Understand the basic concept and scope of corporate finance. **CO2** Know the provisions related to corporate finance under constitutional law. **CO3** Analyse the key concept of Share Capital and non-opting equity shares. **CO4** Apply critically the provision of company law and constitutional law in the proceedings before the court of law.
COPYRIGHTS AND TRADITIONAL CULTURAL EXPRESSION (BALD 705)	**CO1** Understand the concept of copyrights and folklore. **CO2** Analyse the authorship and ownership under copyrights. **CO3** Develops procedural knowledge to Legal System and solving the problem relating to copyrights. **CO4** Skill to understand the concept of Traditional Cultural Expressions (TCEs) or Expressions of Folklore.
LAW OF TRADEMARKS AND GEOGRAPHICAL INDICATIONS (BALD 706)	**CO1** Obtain a fair and sound knowledge of the ideas behind international and Indian trademark law. **CO2** Demonstrate a thorough understanding of trademark law in the applicant's chosen field of study or employment. **CO3** Employ fundamental research techniques, data analysis, and interpretation around trademark law. **CO4** Examine various approaches to problem-solving, build science-based solutions, and identify the main points of disagreement in both international and domestic trademark law.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER VIII	
Environmental Law (BAL 801)	**CO1**: Analyze a complex body of information in environmental law with an advanced and integrated understanding. **CO2**: Gain the ability to recognized new law and apply old law in the quickly changing environmental law landscape. **CO3**: Understanding of the specialized area of environmental law and related disciplinary topics.

	CO4: Know the different provisions related to Environmental Law in different legislations.
Banking Insurance and Negotiable Instrument (BAL 802)	**CO1**. Understand and gain practical knowledge of the insurance and banking industries. **CO2**. Professionals can find profitable employment in retail, investment, merchant, treasury, banking, and insurance. **CO3**. Students will have first-hand experience of the practice relevant to banking and insurance. **CO4**. The rapidly expanding industry of financial and investment services is also drawing numerous reputable firms and individual legal consultants.
Land & Agricultural Laws (BAL 803)	**CO1**. Identify and characterize the revenue board courts, as well as their role in appeal revision and review in case of any dispute. **CO2**. Demonstrate knowledge of the legal and regulatory framework for tribunals, as well as the regulatory requirements. **CO3**. Provide that you are aware of the professional abilities required by urbanization, particularly analytical abilities. **CO4**. Understand the basic concept of Land and Agricultural Laws.
Labour & Industrial Laws – I (BAL 804)	**CO1**. Know the development and the judicial setup of Labour Laws. **CO2**. Understand the 4 new codes of labour laws and knowledge of Labour Law in General HRD Practice. **CO3**. Learned about the rules governing labour relations and working conditions as well as the inquiry process and industrial discipline. **CO4**. Identify the new provisions and amendments under the labour laws.
Law Relating to Elections (BALA 805)	**CO1**. Understand and identify the basic concept and importance of election law in a democratic country. **CO2**. Analyze the lacuna of the law relating to elections and available remedies. **CO3**. Know the main reform in present election law and the procedure of elections. **CO4**. Identify the provisions of law relating to elections under the constitution of India.

Law Governing Service (BALA 806)	**CO1**. Understand the Basic concept of service laws in different countries. **CO2**. Know the legal provisions related to various service matters in different laws. **CO3**. Identify the procedure regarding service matters under public sectors. **CO4**. Critically apply the legal provisions relating to service matters during the proceedings.
Corporate & White-Collar Crimes (BALB 805)	**CO1**. Know that white-collar crime exists and is committed as a phenomenon in a globalized society. **CO2**. Develop a grasp of other principles that could be used to define white-collar crimes, such as organizational or corporate crimes, and acquire some knowledge of the many categories of white-collarcrime. **CO3**. Explain the foundations or explanation for the committing of white-collar crimes in India. **CO4**. Through class discussions, students' writing and critical thinking abilities on the subject of white-collar crime will be improved.
Police Law & Administration (BALB 806)	**CO-1**-Knowledge of the Structure of the Police force under the India administrative system. **CO-2** Powers, functions, and Problems of the Police Force in all Forms under India's legal system. **CO-3** Understand different forums of Justice administration under the Indian legal system. **CO-4** Identify the nature and scope of police and administration under Indian legal.
Competition Law (BALC 805)	**CO1** Understand the Deep knowledge of fair competition and constitutional perspectives. **CO2** Analyse the national and international perspectives of competition law in different countries.

	CO3 Recognise the role of the Competition Act, 2002 in regulating anti-competitive practices and promoting fair competition and enforcement procedures. **CO4** Identify and able to conduct research on emerging and growing trends in competition law.
International Trade Law (BALC 806)	**CO1.** Understand the basic concept of trade law as various theories like free trade theory and the attacks that have been made on free trade theory. **CO2**. Identify the origin and development in the last century of international institutions governing trade. **CO3.** Knowing the laws and policies of the World Trade Organization. **CO4**. Critically analyse the relationship between trade, development, environment, and human rights.
Patent Drafting & Specification Writing (BALD 805)	**CO1.** Analyse the rights and responsibilities of the Patent holder, Copyright and Trademark Design etc. **CO2.** Identify the procedure to protect different forms of IPRs at the national and international levels. **CO3.** Develop key skills in making searches using modern tools and techniques in patent drafting. **CO4.** Understand the basics of IPR and patent drafting.
Law Relating to Design & Geographical Indication (BALD 806)	**CO1**. Develop a proper understanding of the basic concept of law relating to the design and layout of integrated circuits. **CO2**. Know the international and national treaties and laws dealing with law relating to design. **CO3**. Obtain a critical understanding of the subject matter regarding the design in different geographical areas. **CO4**. Identify the infringement that takes place in relation to the design and what are remedies available in case of infringement.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER IX	

Labour & Industrial Laws- II (BAL 901)	**CO1**. Understand the basic concept of the different Labour Codes. **CO2**. Resolve the Labour welfare problems and Students will learn the laws relating to Industrial Relations. **CO3**. Know the Social Security, private sector wages problems etc. **CO4**. Identify the working conditions and also learn the enquiry procedural and industrial discipline.
Insolvency and Bankruptcy Law (BAL 902)	**CO1**. Develop a conceptual understanding of the basic principles of Insolvency and Bankruptcy Laws in different Countries. **CO2**. Apply the different principles of insolvency and Bankruptcy to the real-life situations and relate theory with practical knowledge. **CO3**. Understand the concepts and apply them to a wide range of problems related to the Banking Sector. **CO4**. Know the linkages between insolvency, Banking and the Insurance sector and the related Law.
Clinical & Practical-I (Drafting, Pleading & Conveyance) (BAL 903)	**CO1.** Understand the basics of pleadings and conveyancing. **CO2.** Apply the practical law in drafting the various kinds of deeds. **CO3.** Know the law pertaining to the rules of pleading. **CO4.** Analyse affirmative actions in practice.
Clinical & Practical-II (Alternative Dispute Resolution) (BAL 904)	**CO1.** Understand the fundamental principles of equity, justice, and good conscience. **CO2.** Know the real spirit of the equity which was prevailing in Great Britain. The application of these principles will analyse for providing real justice in India. **CO3.** Apply the provisions of equity with reference to constitutional law in India. **CO4.** Analyse the principles and maxims of equity for the application of the spirit of justice.
Affirmative Action & Discriminative Justice (BALA 905)	**CO1.** Understand the applications of real justice in the development of society. **CO2.** Know the principles of protective discrimination for the upliftment of the privileged class. **CO3.** Apply the principles of affirmative action and principles of equity.

	CO4. Examine the reservation policy as existing in the global legal framework.
Gender Justice & Feminist Jurisprudence (BALA 906)	**CO1.** Understand the basic concept and law related to the gender justice system. **CO2.** Know the controversial issues, theories and texts with a critical lens and an open mind. **CO3.** Develop the ability to research and write substantive analytical research papers. **CO4.** Apply the professional activities in the national and international law in the Indian legal system.
International Criminal Law (BALB 905)	**CO1.** Understand the principles of International Criminal law for its application. **CO2.** Know the legal provisions of the International Criminal courts. **CO3.** Examine the procedure and practice of remedial forums related to International Criminal law. **CO4.** Analyse the contemporary issues on the International Criminal law regime.
Comparative Criminal Law (BALB 906)	**CO1.** Understand the comparative legal provisions of crime. **CO2.** Know about the trial procedure under the legal regime of various criminal systems. **CO3.** Analyse and assess the legal mechanism related to the remedy available under the comparative criminal system. **CO4.** Examine the reformative legal techniques under criminal law.
Laws of Mergers & Acquisitions (BALC 905)	**CO1.** Understand legal obligations in terms of mergers and acquisitions. **CO2.** Know the Corporate Restructuring and implication for society and economy. **CO3.** Appreciate the importance of mergers and acquisitions (M&A) in the present corporate world. **CO4.** Analyse the process of M&A, essentialities of valuation and various methods thereof in case of Mergers and Acquisitions.
Corporate & White-Collar Crimes (BALC 906)	**CO1**. Know that white-collar crime exists and is committed as a phenomenon in a globalized society.

	CO2. Develop a grasp of other principles that could be used to define white-collar crimes, such as organizational or corporate crimes, and acquire some knowledge of the many categories of white-collarcrime. **CO3**. Explain the foundations or explanation for the committing of white-collar crimes in India. **CO4**. Through class discussions, students' writing, and critical thinking abilities about white-collar crime will be improved.
Patent and Patentability of Biotechnological Invention (BALD 905)	**CO1.** Understand the basics of intellectual property law. **CO2.** Analyse the Legal System and solve the problem relating to intellectual property rights. **CO3.** Know the registration process of patents, copyright trademarks etc. **CO4.** Context the cases relating to the IPR before the appropriate forum.
Intellectual Property Rights & Pharma Industry (BALD 906)	**CO1.** Understand the basic concept of the pharmaceutical industry in India. **CO2.** Know the domestic and International legal regime in relation to IPR. **CO3.** Critically analyse the role of IPR law in pharmaceutical development in India. **CO4.** Analyse the role of IPR and the right to health in particular access.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER X	
Clinical & practical-III (Professional Ethics) (BAL 1002)	**CO1**. Develop critical thinking skills to evaluate and analyze ethical issues from multiple perspectives and recognize the complexities involved in ethical decision-making. **CO2**. Learn the process of ethical decision-making, which includes identifying ethical issues, considering alternatives, and making well-reasoned ethical choices.

	CO3. Understanding of various ethical theories, such as deontology, utilitarianism, virtue ethics, and consequentialism, and be able to apply these theories to ethical dilemmas. **CO4**. Recognize personal and professional ethical responsibilities and obligations, including duties to clients, colleagues, employers, and society as a whole.
Clinical & Practical-IV (Moot Court & Art of Persuading Judges) (BAL 1003)	**CO1**. Develop proficiency in legal research techniques, including using databases, libraries, and online resources to find relevant case law, statutes, regulations, and legal precedents. **CO2**. Enhance the ability to analyze legal cases, statutes, and regulations in depth, focusing on relevant legal issues and precedents. **CO3**. Improve oral advocacy skills by participating in mock appellate court arguments, including developing persuasive arguments. **CO4**. Understand the procedural rules and protocols specific to appellate courts, including the rules for filing briefs, presenting oral arguments, and interacting with judges.
Seminar Paper (BAL 1004)	**CO1**. Learn how to choose a relevant and well-defined research topic or question that aligns with the course's objectives or the student's academic interests. **CO2**. Conduct a comprehensive literature review to identify existing research on the chosen topic, summarize key findings, and identify gaps in the literature. **CO3**. Improve academic writing skills, including clarity, conciseness, and precision in writing, as well as proper grammar and style. **CO4**. Practice critical analysis of research findings and their implications, drawing conclusions based on evidence and analysis.
Media and the Law (BALA 1005)	1. **CO1.** Identify the various media laws and legislation, and media trials in accordance with the Constitution under different countries. 2. **CO2.** Understand the legal remedies provided by different courts. 3. **CO3.** Enumerate the convergence and media in accordance with the broadcasting sector.

	4. **CO4.** Apply the real spirit of social media to become a strong democratic country.
Comparative Constitutional Law (BALA 1006)	1. **CO1.** Understand the similarities and differences between leading legal traditions in key areas. 2. **CO2.** Know the comparative study on Judicial systems and judicial review. 3. **CO3.** Apply the comparative methodology of principles of Natural Justice as well as law relating to trade commerce and intercourse. 4. **CO4.** Examine the comparative legal provisions of developed countries with the provisions of the Indian Constitution.
Organized Crimes and Law (BALA 1005)	**CO1.** Understand the different tactics to defining the organized crime in India. **CO2.** Know the basic concept of organized criminal groups under the Organized Crime in different Legislation and Convention. **CO3.** Apply a types of organized crime activity to specific organized crimes in India. **CO4.** Distinguish the different ways organized criminal groups can be assessed.
Forensic Science (BALB 1006)	**CO1**. Describe the fundamental principles of forensic sciences and functions and their significance to human society. **CO 2**. Illustrate the divisions in a forensic science laboratory which is useful for the investigation of any cases. **CO 3**. Understand the workings of forensic establishments in India and internationally. **CO4**. Know the basics of the forensic sciences and the law.
International Commercial Arbitration (BALC 1005)	**CO1.** Understanding the Arbitration Process including its principles, procedures, and rules such as those established by institutions like the International Chamber of Commerce (ICC) or the International Centre for Dispute Resolution (ICDR) **CO2.** Familiarize oneself with the relevant international and national laws governing international commercial arbitration. **CO3.** Develop skills in negotiation, mediation, and conflict resolution, as these are often integral to the arbitration process. **CO4.** Explore the unique challenges and considerations associated with cross-border disputes.
Laws of Infrastructure Development (BALC 1006)	**CO1**. Understand the various stages of an infrastructure project's lifecycle, from planning and feasibility studies to financing, construction, operation, and maintenance.

	CO2. Develop skills in identifying and assessing legal and financial risks associated with infrastructure projects, including political, regulatory, and financial risks. **CO3**. Explore contract law principles as they relate to infrastructure development, including contract drafting, negotiation, and dispute resolution. **CO4**. Learn about the legal framework for public procurement in infrastructure projects, including competitive bidding processes, contract award, and procurement regulations.
Protection of Plant Varieties & Traditional Knowledge (BALD 1005)	**CO1**. Gain a comprehensive understanding of plant varieties, genetic resources, and traditional knowledge associated with plants. **CO2**. Learn about the concept of plant breeders' rights, including the criteria for granting rights, duration, and the rights and obligations of breeders. **CO3**. Explore strategies for the management, conservation, and sustainable use of plant genetic resources, including gene banks and ex-situ conservation. **CO4**. Examine the ethical and cultural dimensions of traditional knowledge and plant genetic resources, including the rights and interests of indigenous and local communities.
IPR Management & Litigation (BALD 1006)	**CO1**. Develop a solid understanding of the key intellectual property laws, including patents, trademarks, copyrights, and trade secrets. **CO2**. Gain knowledge of patent law, including the requirements for patentability, patent prosecution, and the legal protection of inventions. **CO3**. Understand trademark law, including the registration process, trademark enforcement, and the protection of brand identities. **CO4**. Analyze real-world IP litigation cases to gain practical insights into the strategies and tactics employed by parties involved in disputes.

School of Law, Raffles University

Bachelor of Laws (LL.B)

PROGRAM OUTCOMES

1. **PO1. Legal Knowledge:** To acquire & apply legal knowledge to complex Socio-legal problems.
2. **PO2. Professional Practice:** to make students eligible to practice as legal practitioners in Courts, Industries, and Companies.
3. **PO3. Professional Skills:** To possess professional skills required for legal practice such as Argument, Pleading, drafting, conveyancing etc.
4. **PO4. Professional Ethics:** To understand and apply principles of professional ethics of the legal profession.
5. **PO5. Legal Research & Legal Reasoning:** to develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PO6. Leadership Skills:** To develop leadership qualities amongst students.

PROGRAM EDUCATIONAL OBJECTIVES

1. **PEO1**: To acquire & apply legal knowledge to multifaceted Socio-legal problems.
2. **PEO2:** To make students eligible to practice as legal experts in Courts, Industries, and Companies.
3. **PEO3**: To possess the expertise necessary for practising law, such as argument, pleading, drafting, conveyancing, etc.
4. **PEO4**: Understanding and applying legal professional ethics in legal principles.
5. **PEO5**: To develop legal research skills & legal reasoning and apply it during the program & in Legal practice.
6. **PEO6**: To create a foundation for independent employment by acquiring professional legal skills.
7. **PEO7**: To strengthen clinical skills and raise understanding of constitutional legislation and societal transformation.
8. **PEO8**: Each law graduate will acquire expertise in legal research, written and spoken communication, teamwork, advocacy, and problem-solving.

PROGRAM SPECIFIC OBJECTIVES

1. **PSO1**. Students should be able to demonstrate an understanding of substantive and procedural law sufficient to enter the legal profession and professions in which legal knowledge is an advantage.
2. **PSO2**. Should be able to associate the learning from the courses related to Law and Management.
3. **PSO3**. Should have the capability to understand the laws at national and global levels and to solve the client's problem.
4. **PSO4**. Should possess the skills to communicate in both oral and written forms and the ability to formulate legal problems and use appropriate concepts and methods to solve them.
5. **PSO5** should use skills in specific areas (e.g. Criminal, industrial-organizational, clinical, counselling, social, and community).
6. **PSO6** should be analyzing social problems and understanding social dynamics.

COURSE OUTCOMES (COs)

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER 1	
Constitutional Law-I (LLB 101)	**CO1** Identify the various dimensions of constitutional law. **CO2** Understand the process of Executive, legislative and judicial mechanisms under the constitution. **CO3** Enumerate the constitutional remedies available. **CO4** Apply the real spirit of distribution of power between centre and state government.
Law of Contract-I (LLB 102)	**CO1** Understand the list and define the specific contracts. **CO2** Know the explanation of why specific contracts are important to our legal and economic system. **CO3** Analyse how sale transactions of moveable property take place. **CO4** They will find out how partnership firms are formed, and the duties and liabilities of the partners in a partnership firm.
Family Law-I (LLB 103)	**CO1** Understand the general concept and provisions of Hindu law.

	CO2 Basic ideas including marriage, divorce, parental custody, domestic abuse, and children's rights are taught to students of family law. **CO3** Family law investigates how historical and social settings have impacted how families are defined and governed in the present. **CO4** Students will learn to think critically, analyse information, and communicate ideas orally and in writing.
Law of Torts, Consumer Protection and MV. Act (LLB 104)	**CO1** Identify the various conceptual aspects of the Law of Torts. **CO2** Apply various defences under tortuous liability and specific kinds of torts. **CO3** Enumerate the remedies available for specific torts. **CO4** Know the relation of torts with various other laws.
General English-I (LLB 105)	**CO1** Describe the importance of General English and Legal Language. **CO2** Identify the correct usage of grammar in legal drafting during the draft of any document. **CO3** Draft documents for legal correspondence to use in the legal drafting. **CO4** Analyse characters of literary texts and apply skills of interpreting poetry.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER II	
CONSTITUTIONAL LAW - II (LLB 201)	**CO1** Understand the Concept of 'State' in reference to fundamental rights. **CO2** Fundamental rights and the method for ensuring conformity with fundamental rights, as well as Writ jurisdiction of the supreme court and high court under Articles 32 and 226. **CO3** The state's duty and relationship with the interdependence of fundamental rights and directive principles. **CO4** Know the provisions regarding fundamental rights under the national and international legal system.
LAW OF CRIMES-II (LLB 202)	**CO1** Understand how society views crime against women, the human body and property.

	CO2 Demonstrate a thorough understanding of aspects of criminal justice or law, as well as their relevance to larger social issues. **CO3** Identify and apply the principles of criminal law covered in the whole course. **CO4** Know the provisions of the various offences under criminal law and apply them in a court of law.
FAMILY LAW-II (LLB 203)	**CO1** Analyse Muslim law, its sources, Schools, the concept of marriage, and the various matrimonial remedies **CO2** Understand the legal or statutory provisions relating to maintenance, Dower Guardianship they will be able to solve disputes of property by reading the above course. **CO3** Know the legal solutions to some very sensitive disputes relating to Waqf, Will, Inheritance and Guardianship etc. **CO4** The Students recognize the recent development under Muslim Law through the judiciary.
INDIAN PENAL CODE (LLB 204)	**CO1** Understand the conceptual analysis of the law of crimes. **CO2** Analyse the spirit of legal provisions of crimes and apply it before the court of law. **CO3** Apply the practical aspects of the law of crime in the different types of courts in India. **CO4** Assess the real approach to the law of crime in the present context of Indian Society.
ADMINISTRATIVE LAW (LLB 205)	**CO1** State the need for the development of Administrative Law. **CO2** Express the concept of delegated legislation and its control mechanisms. **CO3** Demonstrate natural justice and its exceptions and examine the recent innovations in administrative Law. **CO4** Appraise the judicial control of administrative action.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER III	
JURISPRUDENCE (LLB 301)	**CO1** Understand the basic principles of learning of law and sources of law.

	CO2 Perform that you have a thorough understanding of the political, social, historical, philosophical, and economic framework of law. **CO3** Identify, articulate, and critically assess legal theory, as well as its consequences for policy. **CO4** Critically evaluate and explore intricate legal and theoretical issues and select the best course of action among available options.
PUBLIC INTERNATIONAL LAW (LLB 302)	**CO1** Understand the basic concept and sources of international law. **CO2** Demonstrate knowledge and understanding of the international rights framework, its origins and justifying theories. **CO3** Establish the capacity to assess how specific human rights may be asserted, enforced or violated. **CO4** Critically evaluate the relationship between international and domestic law.
CORPORATE LAW (LLB 303)	**CO1** Apply the practical aspect of company law in the global system of economics. **CO2** Understand multinational companies in the legal system. **CO3** Frame the legal requirement for registration for companies. **CO4** Contest the cases pertaining to corporate law.
INTELLECTUAL PROPERTY LAW (LLB 304)	**CO1** Understand the international origin of IPR. **CO2** Think over the Indian IPR law in relation to the International legal system. **CO3** Critically analyses the IPR law for protecting the intellectual property. **CO4** Apply critically the principles of IPR laws for the protection of creative activities.
CODE CRIMINAL PROCEDURE (LLB 305)	**CO1** Understand the criminal procedure in India includes the following information: who prosecutes; process to compel production of things; right to a quick trial; and process to compel the appearance of persons. **CO2** Know the Criminal Procedure Act's legal guidelines for arrest and bail, the rights of those who have been detained, and how to apply these laws in a real-world situation.

	CO3 Describe the rules that govern the right to legal representation in criminal proceedings in India and demonstrate how to use them in a real-world situation. **CO4** Apply the various provisions of the criminal procedure code in the different courts.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER V	
CIVIL PROCEDURE CODE (LLB 401)	**CO1** Demonstrate the knowledge and understanding of substantive law, procedural law, and Constitutional Law. **CO2** Develop the ability to perform legal analysis and reasoning, legal research, problem-solving, and written and oral communication in the legal context and apply it in legal practice and real-life situations. **CO3** Demonstrate the professional skills of pleading, argument, drafting and conveyancing, collaboration, counselling, and negotiation required for legal practice. **CO4** Develop the ability to analyse the law in relation to contemporary developments at the national level.
PROPERTY LAW (LLB 402)	**CO1** Understand and explain the basic principles of transfer of property with real-life examples. **CO2** Demonstrate the various kinds of transfer of properties with practical examples. **CO3** Know the draft of various deeds relating to the transfer of property. **CO4** Recognize the elementary rights in India.
PRIVATE INTERNATIONAL LAW (LLB 403)	**CO1** Analyse the fundamental principles of private international law and conduct legal research and assess legal data. **CO2** Apply private international law principles to difficult challenges and difficulties and assess how they work theoretically. **CO3** Examine the effects of private international law from a comparative and global viewpoint, taking social and cultural diversity into consideration.

	Build and maintain clear, convincing writing for a legal and professional audience.
CYBER LAW (LLB 404)	**CO1** Clarify and apply the key legal principles of information technology law presented in the course. **CO2** Choose and use a variety of written and spoken communication techniques, as well as the critical thinking skills necessary to find answers to challenging legal issues in the field of information technology law. **CO3** Demonstrate knowledge of the various ways that the law can be affected by and changed by quickly developing technology in a way that can help clients with their planning or lawmakers with their recommendations. **CO4** Apply the provisions of law relating to Information Technology in the judicial proceedings.
ENVIRONMENTAL LAW (LLB 405)	**CO1**: Analyze a complex body of information in environmental law with an advanced and integrated understanding. **CO2**: Gain the ability to recognized new law and apply old law in the quickly changing environmental law landscape. **CO3**: Understanding of the specialized area of environmental law and related disciplinary topics. **CO4**: Know the different provisions related to Environmental Law in different legislations.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
	SEMESTER V
LAW OF EVIDENCE (LLB 501)	**CO1** Identify and enumerate the various categories of evidence, their general characteristics, and the relevant legal processes. **CO2** Examine the rule governing the admissibility of evidence in court and its importance. **CO3** Analyse the regulations governing dying declarations and their admissibility. **CO4** Understand the whole concept of the law of evidence and correlate it with other laws.

INTERPRETATION OF STATUTES (LLB 502)	**CO1** Understand the real thing of interpretation. **CO2** Apply the principles of interpretation in the courts. **CO3** Understanding the capacity of the students will increase for the real application of the law. **CO4** Practically understands the construction of various statutes.
LABOUR LAWS (LLB 503)	**CO1**. Know the development and the judicial setup of Labour Laws. **CO2**. Understand the 4 new codes of labour laws and knowledge of Labour Law in General HRD Practice. **CO3**. Learned about the rules governing labour relations and working conditions as well as the inquiry process and industrial discipline. **CO4**. Identify the new provisions and amendments under the labour laws.
PRINCIPLES OF TAXATION (LLB 504)	**CO1** Apply the principles of taxation laws to complex legal problems. **CO2** Understand the technical aspects of taxation laws. **CO3** To file and contest cases writ pertaining to taxation laws before the competent authorities. **CO4** Supervise and guide the persons whose matters are related to taxation laws.
Alternative Dispute Resolution (LLB 505)	**CO1.** Understand the fundamental principles of equity, justice, and good conscience. **CO2.** Know the real spirit of the equity which was prevailing in Great Britain. The application of these principles will analyse for providing real justice in India. **CO3.** Apply the provisions of equity with reference to constitutional law in India. **CO4.** Analyse the principles and maxims of equity for the application of the spirit of justice.

Course	**Course Outcomes: After Completion of these courses the students should be able to learn**
SEMESTER VI	
HUMAN RIGHTS (LLB 601)	**CO1** Understand the meaning and historical development of human rights. **CO2** Classify relevant documents on human rights.

	CO3 Interpret legal provisions on human rights under Indian laws. **CO4** Examine the effective implementation of human rights of vulnerable groups.
Land Laws (LLB 602)	**CO1**. Identify and characterize the revenue board courts, as well as their role in appeal revision and review in case of any dispute. **CO2**. Demonstrate knowledge of the legal and regulatory framework for tribunals, as well as the regulatory requirements. **CO3**. Provide that you are aware of the professional abilities required by urbanization, particularly analytical abilities. **CO4**. Understand the basic concept of Land and Agricultural Laws.
PROFESSIONAL ETHICS (LLB 603)	**CO1**. Develop critical thinking skills to evaluate and analyze ethical issues from multiple perspectives and recognize the complexities involved in ethical decision-making. **CO2**. Learn the process of ethical decision-making, which includes identifying ethical issues, considering alternatives, and making well-reasoned ethical choices. **CO3**. Understanding of various ethical theories, such as deontology, utilitarianism, virtue ethics, and consequentialism, and be able to apply these theories to ethical dilemmas. **CO4**. Recognize personal and professional ethical responsibilities and obligations, including duties to clients, colleagues, employers, and society as a whole.
ALTERNATIVE DISPUTE RESOLUTION (LLB 604)	**CO1.** Understand the fundamental principles of equity, justice, and good conscience. **CO2.** Know the real spirit of the equity which was prevailing in Great Britain. The application of these principles will be analysed for providing real justice in India. **CO3.** Apply the provisions of equity with reference to constitutional law in India. **CO4.** Analyse the principles and maxims of equity for the application of the spirit of justice.

MOOT COURT & INTERNSHIP (LLB 605)	**CO1**. Develop proficiency in legal research techniques, including using databases, libraries, and online resources to find relevant case law, statutes, regulations, and legal precedents. **CO2**. Enhance the ability to analyze legal cases, statutes, and regulations in depth, focusing on relevant legal issues and precedents. **CO3**. Improve oral advocacy skills by participating in mock appellate court arguments, including developing persuasive arguments. **CO4**. Understand the procedural rules and protocols specific to appellate courts, including the rules for filing briefs, presenting oral arguments, and interacting with judges.

School of Pharmacy

Program: Diploma in Pharmacy (Two Years Course)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

Programme Specific Outcomes (PSOs)

Course Outcomes (COs)

and

Lesson Plans

RAFFLES
UNIVERSITY

Raffles University, Neemrana
NEEMRANA, ALWAR, RAJASTHAN

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Diploma in Pharmacy (Two Years Course)

1. Vision

To educate and inspire capable and competent leaders with a futuristic business acumen & entrepreneurial spirit.

2. Mission

To equip the students of school of commerce & management with the ability to explore, examine, think critically and develop professional skills to become responsible global leaders who can contribute meaningfully to the industry and society through excellence in learning and practice-oriented research.

3. Program Educational Objectives

PEO1: To acquire the contemporary knowledge of the Business Concepts and their application in problem solving.

PEO2: To develop and apply different tools for decision making required for solving complex managerial problems with a passion to innovate.

PEO3: To develop the leaders who are able to adapt to the needs of the domestic and global Business requirements.

4. Programme Outcomes (POs)

After completing the program students will be able to

PO.1 Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy.
PO.2 Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
PO.3 Leadership skills: Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfilment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and wellbeing.
PO.4 Professional Identity: Understand, analyse, and communicate the value of their professional roles in society (e.g., healthcare professionals, promoters of health, educators, managers, employers, and employees).
PO.5 Pharmaceutical Ethics: Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behaviour that recognizes cultural and personal variability in values, communication, and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
PO.6 Communication: Communicate effectively with the pharmacy community and with society, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
PO.7 The Pharmacist and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, and legal issues and the consequent responsibilities relevant to professional pharmacy practice.
PO.8 Environment and sustainability: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.
PO.9 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

5. Programme Specific Outcomes (PSOs):

After completing the program students will be able to:

- **PSO 1: Demonstrate** effective leadership skills and **build** the ability to face the challenges of corporate world.
- **PSO 2: Develop** judgments about information, validity of ideas, or quality of work based on a set of criteria,
- **PSO 3: Improve** their competency in working with and managing multi-disciplinary teams.

COURSE OUTCOMES (COs):

Course	Course outcomes: - After completion of these courses' students should be able to
	Diploma 1 year
ER20-11T Pharmaceutics – Theory	**Course Outcomes:** Upon successful completion of this course, the students will beable to **CO.1** Describe the different dosage forms and their formulation aspects **CO.2** Explain the advantages, disadvantages, and quality control tests of differentdosage forms. **CO.3** Discuss the importance of quality assurance and good manufacturing practices.
ER20-12T Pharmaceutical Chemistry – Theory	**Course Outcomes:** Upon successful completion of this course, the students will be able to **CO.1** Describe the chemical class, structure and chemical name of the commonlyused drugs and pharmaceuticals of both organic and inorganic nature **CO.2** Discuss the pharmacological uses, dosage regimen, stability issues and storage conditions of all such chemical substances commonly used as drugs **CO.3** Describe the quantitative and qualitative analysis, impurity testing of thechemical substances given in the official monographs **CO.4** Identify the dosage form & the brand names of the drugs and Pharmaceutical spopular in the marketplace.
ER20-13T Pharmacognosy – Theory	**Course Outcomes:** Upon successful completion of this course, the students will be able to **CO1:** Identify the important/common crude drugs of natural origin **CO2:** Describe the uses of herbs in nutraceuticals and cosmeceuticals **CO3:** Discuss the principles of alternative system of medicines **CO4:** Describe the importance of quality control of drugs of natural origin
ER20-14T Human Anatomy & Physiology – Theory	**Course Outcomes:** Upon successful completion of this course, the students will be able to **CO1:** Describe the various organ systems of the human body. **CO2:** Discuss the anatomical features of the important human organs and Tissues. **CO3:** Explain the homeostatic mechanisms regulating the normal physiology in the human system. **CO4:** Discuss the significance of various vital physiological parameters of the human body.
ER20-15T Social Pharmacy – Theory	**Course Outcomes:** Upon successful completion of this course, the students will be able to **CO1:** Discuss about roles of pharmacists in the various national health programs **CO2:** Describe various sources of health hazards and disease preventive measures **CO3:** Discuss the healthcare issues associated with food and nutritional substances **CO4:** Describe the general roles and responsibilities of pharmacists in public Health

Course	Course outcomes: - After completion of these courses' students should be able to
Year - II	
ER20-21T Pharmacology – Theory	**Course Outcomes:** Upon successful completion of this course, the students will be able to 1. Describe the basic concepts of pharmacokinetics and Pharmacodynamics 2. Enlist the various classes and drugs of choices for any given disease condition 3. Advice the dosage regimen, route of administration and contraindications for a given drug 4. Describe the common adverse drug reactions
ER20-22T Community Pharmacy & Management – Theory	**Course Outcomes:** Upon successful completion of this course, the students will be able to 1. Describe the establishment, legal requirements, and effective administration of a community pharmacy 2. Professionally handle prescriptions and dispense medications 3. Counsel patients about the disease, prescription and or non-prescription medicines 4. Perform basic health screening on patients and interpret the reports in the community pharmacy settings
ER20-23T Biochemistry & Clinical Pathology – Theory	**Course Outcomes:** Upon successful completion of this course, the students will be able to 1. Describe the functions of biomolecules 2. Discuss the various functions of enzymes in the human system 3. Explain the metabolic pathways of biomolecules in both physiological and pathological conditions 4. Describe the principles of organ function tests and their clinical significances 5. Determine the biomolecules / metabolites in the given biological samples, both qualitatively and quantitatively 6. Describe the clinical pathology of blood and urine

ER20-24T Pharmacotherapeutics – Theory T	**Course Outcomes:** Upon successful completion of this course, the students will be able to 1. Help assessing the subjective and objective parameters of patients in common disease conditions 2. Assist other healthcare providers to analyse drug related problems and provide therapeutic interventions 3. Participate in planning the rational medicine therapy for common diseases 4. Design and deliver discharge counselling for patients
ER20-25T Hospital & Clinical Pharmacy – Theory	**Course Outcomes:** Upon successful completion of this course, the students will be able to 1. Explain about the basic concepts of hospital pharmacy administration 2. Manage the supply chain and distribution of medicines within the hospital settings 3. Assist the other healthcare providers in monitoring drug therapy and address drug related problems 4. Interpret common lab investigation reports for optimizing drug therapy
ER20-26T Pharmacy Law & Ethics	**Course Outcomes:** Upon successful completion of this course, the students will be able to 1. Describe the history and evolution of pharmacy law in India 2. Interpret the act and rules regulating the profession and practice of pharmacy in India 3. Discuss the various codes of ethics related to practice standards in pharmacy 4. Interpret the fundamentals of patent laws from the perspectives of pharmacy

School of Pharmacy

Program: Bachelors Of Pharmacy (Four Years Course)

Program Educational Objective (PEO) Program Outcomes (POs) Program Specific Outcomes (PSOs) Course Outcomes (COs) and Lesson Plans

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Bachelors Of Pharmacy (Four Years Course)

1. Vision

To educate and inspire capable and competent leaders with a futuristic business acumen & entrepreneurial spirit.

2. Mission

To equip the students of school of commerce & management with the ability to explore, examine, think critically and develop professional skills to become responsible global leaders who can contribute meaningfully to the industry and society through excellence in learning and practice-oriented research.

3. Program Educational Objectives

PEO1: To acquire the contemporary knowledge of the Business Concepts and their application in problem solving.

PEO2: To develop and apply different tools for decision making required for solving complex managerial problems with a passion to innovate.

PEO3: To develop the leaders who are able to adapt to the needs of the domestic and global Business requirements.

4. Programme Outcomes (POs)

After completing the program students will be able to

PO1: Pharmacy Knowledge: Graduates will acquire strong fundamental concepts and adequate scientific information regarding basic principles of pharmaceutical, biomedical; behavioral, social, administrative and manufacturing practices by which they will able to handle drugs safely and ensure the rationale use of drugs.

PO2: Drug development: Graduates will acquire the ability to develop and/or evaluate various pharmaceuticals and their formulations including cosmeceuticals and quality assurance of various pharmaceutical dosage forms including those of herbal origin as per standards of official monographs, WHO, and other regulatory agencies.

PO3: Explain contemporary management issues and their implications in real life situations.

PO4: Identify solutions to the problems relating to new situations by applying acquired knowledge, facts, techniques and rules in a different way.

PO5: Apply effective strategies to solve future problems and constraints, and devise feasible solutions.

PO6: Utilize the knowledge of statistics, accounting, finance, marketing and HR for devising effective business models,

PO7: Analyze and break information into parts by identifying motives or causes. Make interfaces and find evidence to support generalizations.

PO8: Appraise techniques, skills and latest management tools to meet the competition,

PO9: Present and defend opinions clearly and effectively in the corporate and business world,

PO10: Develop the right social, ethical and legal knowledge and value systems to become responsible citizens of the country.

PO11: Create innovative strategies in their chosen field of specialization like Finance, HR, Operations and Marketing.

PO12: Engage in a lifelong learning process

5. Programme Specific Outcomes (PSOs):

After completing the program students will be able to:

- **PSO 1: Demonstrate** effective leadership skills and **build** the ability to face the challenges of corporate world.
- **PSO 2: Develop** judgements about information, validity of ideas, or quality of work based on a set of criteria,
- **PSO 3: Improve** their competency in working with and managing multi-disciplinary teams.

COURSE OUTCOMES (COs):

Course	Course outcomes: - After completion of these courses' students should be able to
	1.1 Semester – I
BP 101 (Human Anatomy & Physiology)	**CO1**: Understand the scope of anatomy, physiology with basic anatomical terminology. Cellular level and tissue level organization of human body. **CO2**: Learn the structure and function of skin. CO3: Recognise skeletal system with types of bone, joints and their functions. CO4: Understand the classification of nervous system, peripheral nervous system with their structure, function and reflex activities. CO5: Understand the structure and function of sense organs, classification of hormones with mechanism of action
BP102T. PHARMACEUTICAL ANALYSIS	**CO-01:** Learning this subject content will develop the ideas with the fundamental of analytical chemistry among the pupil. **CO-02**: It constructs the fundamental methodology to prepare different strength of solutions. **CO-03:** It facilitates the fellow pupil to predict the sources of mistakes and errors. **CO-04:** The student interpretation skills will be improved by the course content in terms of choice of analytical techniques to perform the estimation of different category drugs **CO-05:** It peculates the basic knowledge in the principles of electrochemical analytical techniques
BP103T. PHARMACEUTICS I	1. Know the history of profession of pharmacy. 2. Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations. 3. Understand the professional way of handling the prescription. 4. Preparation of various conventional dosage forms.

BP104T Pharmaceutical Inorganic Chemistry –I (Theory)	**CO-1.** Knowledge about the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals **CO-2.** Well acquainted with the principles of limit tests. **CO-3.** Identification of different anions, cations and different inorganic pharmaceuticals **CO-4.** Understand the medicinal and pharmaceutical importance of inorganic compounds. **CO-5.** Familiar with different classes of inorganic pharmaceuticals and their analysis.
BP106T – REMEDIAL BIOLOGY	**CO1**: Employ A Broad Understanding Biology. **CO2**: Understand And Employ the Basics of Morphology, **CO3**: Know The Classification and Salient Features of Five Kingdoms **CO4**: Understand The Basic Components of Anatomy Physiology of Plant

Course	Course outcomes: - After completion of these courses' students should be able to
7.1 Semester – II	
BP201T (Human Anatomy & Physiology II)	CO1-Understand the scope of anatomy, physiology with basic anatomical terminology. Cellular level and tissue level organization of human body. CO2-Learn the structure and function of skin. CO3-Recognise skeletal system with types of bone, joints and their functions. CO4-Understand the classification of nervous system, peripheral nervous system with their structure, function and reflex activities. CO5-Understand the structure and function of sense organs, classification of hormones with mechanism of action
BP202T PHARMACEUTICAL ORGANIC CHEMISTRY	CO-01 Understand and remember about structure, name of the organic compound CO-02 Knowledge about the type of isomerism CO-03 Learn about preparation and orientation of reactions of organic molecules CO-04 Knowledge about the naming reactions of carbonyl compounds CO-05 understand effect of substituents on their properties of organic aliphatic Acids, amines
EP203T BIOCHEMISTRY	**CO-01:** To understand the basic principles of protein and polysaccharide structure. To understand the importance of metabolism of substrates. **CO-02:** Will acquire chemistry and biological importance of biological macromolecules. **CO-03:** To acquire knowledge in qualitative and quantitative estimation of the biological macromolecules. **CO-04:** To know the interpretation of data emanating from a Clinical Test Lab. **CO-05:** To know how physiological conditions influence the structures and re -activities of biomolecules.

BP204T PATHOPHYSIOLOGY	CO1- Diagnosis and treatment of diseases. CO2- Employ a broad understanding pathophysiology. CO3- Understand and employ the etiology of diseases CO4- Mention the complications of the diseases.
BP205T COMPUTER APPLICATIONS	**CO1:** know the various types of application of computers in pharmacy CO-2. know the various types of databases CO-3. know the various applications of databases in pharmacy
BP206T ENVIORNMENATAL SCIENCE	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	Course outcomes: - After completion of these courses' students should be able to
8.1 Semester - III	
BP301T POC II	CO-1. Apply Basic knowledge methods of preparation and reactions of organic compounds. CO-2. Understand the reactions reactivity and mechanisms and orientation of chemical reactions of some organic compounds. CO-3 Understand the analysis of fats and oils CO-4. To acquire knowledge in Polynuclear aromatic compounds CO-5. Understand the stability of cycloalkanes
BP302T PHYSICAL PHARMACEUTICS	CO1-Know the types, properties, purification, stabilization and applications of colloids in the formulations CO2- Illustrate the different types of flow in order to identify and choose suitable flow characteristics for the formulation and study of deformation of solids. CO3- Distinguish the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations CO4- Understand the properties of particles and pharmaceutical powders, their significance in formulating pharmaceutical products, and the common methods for characterizing these properties and application in pharmacy. CO5- Demonstrate the behaviour, physicochemical properties and mechanism of drugs and excipients in the formulation development and evaluation of dosage forms
BP303T PHARMACEUTICAL MICROBIOLOGY	CO1. Students can able to Understand methods of identification, cultivation and preservation of various microorganisms CO2. Students can able to to understand the importance and implementation of sterlization in pharmaceutical processing and industry CO3. Students can able to learn sterility testing of pharmaceutical products.

	CO4. Students can able to carried out microbiological standardization of Pharmaceuticals. CO5. Students can able to understand the cell culture technology and its applications in pharmaceutical industries.
BP304T PHARMACEUTICAL ENGINEERING	CO1. Students can able to Understand unit operations used in pharmaceutical industries. CO2. Students can able to understand material handling techniques CO3. Students can able to understand various processes involved in pharmaceutical manufacturing process. CO4. Students can able to understand various test to prevent environmental pollution. CO5. Students can able to understand the various preventive methods used for corrosion control in Pharmaceutical industries

Course	Course outcomes: - After completion of these courses' students should be able to
9.1 Semester - IV	
BP401T POC III	CO-01 Understand the Stereo-chemical features including optical isomerism and stereo electronic effects. CO-02 Understand the Geometrical isomers and biphenyl compounds and reactions. CO-03 To acquire the knowledge and understanding of the basic experimental principles of heterocyclic chemistry. CO-04 To draw the structures and synthesize simple pharmaceutically active organic compounds having five and six membered heterocyclic compounds. CO-05To describe detailed mechanisms for common naming reactions.
BP402T MEDICINAL CHEMISTRY I	**CO-1.** Understand the chemistry of drugs concerning their pharmacological activity. **CO-2.** The Students will be able to know the various physiochemical properties of the drugs. **CO-3.** Knowledge about the mechanism pathways of different classes of medicinal compounds **CO-4.** Understanding the drug metabolic pathways, adverse effects, and therapeutic value of drugs. **CO-5.** Know the Structural Activity Relationship (SAR) of different classes of drugs.
BP403T PHYSICAL PHARMACEUTICS	CO1-Know the types, properties, purification, stabilization and applications of colloids in the formulations CO2- Illustrate the different types of flow in order to identify and choose suitable flow characteristics for the formulation and study of deformation of solids. CO3- Distinguish the principles of chemical kinetics & to use them for stability testing and determination of expiry date of formulations CO4- Understand the properties of particles and pharmaceutical powders, their significance in formulating pharmaceutical products, and the common methods for characterizing these properties and application in pharmacy. CO5- Demonstrate the behaviour, physicochemical properties and mechanism of drugs and excipients in the formulation development and evaluation of dosage forms

BP404T PHARMACOLOGY I	CO1. Students would have understood the pharmacological actions of different categories of drugs CO2. They would have studied in detailed about mechanism of drug action at organ system/sub cellular/ macromolecular levels. CO3. They would have understood the application of basic pharmacological knowledge in the prevention and Treatment of various diseases. CO4. They would get an idea about correlation of pharmacology with other bio medical sciences. CO5. They would have understood the signal transduction mechanism of various receptors
BP405T PHARMACOGNOSY AND PHYTOCHEMISTRY	CO1-Understand metabolic pathways involved in biosynthesis of secondary metabolites and application of biogenetic studies CO2- Explain source, chemistry, therapeutic application of various secondary metabolites containing drugs. CO3- Discuss isolation, identification and analysis of some phytoconstituents. CO4- Describe methods for industrial production, estimation and utilization of some therapeutically important secondary metabolites

Course	Course outcomes: - After completion of these courses' students should be able to
V SEM	
BP501T MEDICINAL CHEMISTRY II	**CO-1.** Understand the chemistry of drugs concerning their pharmacological activity. **CO-2.** To acquire knowledge in chemotherapy for cancer and microbial diseases and different anti-viral agents. **CO-3.** Know about the mechanism pathways of different classes of medicinal compounds **CO-4.** Know the Structural Activity Relationship (SAR) of different classes of drugs. **CO-5.** Study the chemical synthesis of selected drugs..
BP502T INDUSTRIAL PHARMACY I	CO1- Know the various pre formulation parameters in pharmaceutical dosage. forms CO2- Understand the concepts of solid dosage form design &formulation. CO3- Describe liquid orals, formulation development, manufacturing, excipients use and their evaluation. CO4- Understand the concepts of parental products design &formulation. CO5- Formulation and preparation of the various cosmetic preparations.
BP503T PHARMACOLOGY II	CO-1: Pharmacology of drugs acting on the cardiovascular system like hemodynamic and electrophysiology Drugs used in congestive heart failure and anti-hypertensive drugs.Anti-anginal drugs, Antiarrhythmic drugs, Anti-hyperlipidemic drugs. CO-2: The students shall be able to know about Drugs used in the therapy of shock, Hematinics, coagulants and anticoagulants Fibrinolytic and anti-platelet drugs, Plasma volume expanders, Diuretics, Anti- diuretics CO-3: Autacoids and classification.

	CO-4. Principles and applications of bioassay
BP504T PHARMACOGNOSY AND PHYTOCHEMISTRY	CO-01 understand and gain the knowledge of Metabolic pathways in higher plants and their determination CO-02 chemistry & chemical classes, bio sources, therapeutic uses of some Phyto chemical constituents CO-03 understand the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents CO-04 understand and gain the knowledge of preparation and development of herbal formulation. CO-05 understand the herbal and drug interactions
BP505T PHARMACEUTICAL JURISPRUDENCE	CO-01 Understand the Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals. CO-02 understand and gain the knowledge Various Indian pharmaceutical Acts and Laws CO-03 understand and gain the knowledge regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals CO-04 Gain the knowledge of code of ethics during the pharmaceutical practice

Course	Course outcomes: - After completion of these courses' students should be able to
11.1 VI SEM	
BP601T MEDICINAL CHEMISTRY III	**CO-1**: To develop an understanding of the Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification. **CO-2**: To understand about basic concept of prodrugs. **CO-3**: To acquire knowledge in microbial diseases . **CO-4**: To understand various parameterts and strategy about drug design and development
BP602T PHARMACOLOGY III	CO-01 Understand the mechanism of drug action and its relevance in the treatment of different drugs acting on the Respiratory system. C0-02 Understand the mechanism of drug action and its relevance in the treatment of different drugs acting on the Gastrointestinal Tract. CO-03 Understand the mechanism of chemotherapy. CO-04 Understand Immunopharmacology, Immunostimulants, Immunosuppressant. CO-05 the student be able to: understand the Principles of toxicology. C-06 the student be able to: understand Chronopharmacology

BP603T HDT	**CO1:** Recall the WHO and ICH guidelines for evaluation of herbal drugs **CO2:** Understand raw material a ssource of herbal drugs from cultivation to herbal drug product. **CO3:** Discuss the herbal cosmetics, natural sweeteners, nutraceuticals. **CO4:** Appreciate patenting of herbal drugs and regulatory bodies for ASU..
BP604T BIOPHARMACEUTICS AND PHARMACOKINETICS	CO1. Know about the plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination CO2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals. CO3. Know about the concepts of bioavailability and bioequivalence of drug products and their significance. CO4. Know about the various pharmacokinetic parameters, their significance & applications.
BP605T PHARMACEUTICAL BIOTECHNOLOGY	CO1-Understand and Apply Pilot Plant Scale-up Techniques for Different Dosage Forms CO2-Manage Technology Development and Transfer Processes Effectively CO3-Navigate Regulatory Affairs and Understand Drug Approval Processes CO4-Implement and Maintain Quality Management Systems and Standards: CO5-Comprehend Indian Regulatory Requirements and Procedures for Drug Approval
BP606T QUALITY ASSURANCE	CO-1 Understand the cGMP aspects in a pharmaceutical industry CO-2 Appreciate the importance of documentation CO-3 Understand the scope of quality certifications applicable to pharmaceutical industries CO-4 Understand the responsibilities of QA & QC departments CO-5 Elaborate on the role of validation in assurance of quality in pharmaceutical

Course	Course outcomes: - After completion of these courses' students should be able to
12.1 VII SEM	
BP701T- IMA	**CO-01:** The basic theoretical knowledge of the instrumentation techniques available. **CO-02:** Theoretically understand the aspects of separation for multi components. **CO-03:** Practical skills for the analysis of drugs and excipients using various instrumentation techniques. **CO-04:** To make accurate analysis and report the results in defined formats. **CO-05:** To understand the professional and safety responsibilities for working in the analysis laboratory.
BP702T- IP II	CO1- Understand and apply pilot plant scale-up techniques for different dosage forms. CO2- Manage technology development and transfer processes effectively. CO3- Navigate regulatory affairs and understand drug approval processes. CO4-Implement and maintain quality management systems and standards
BP703T- PHARMACY PRACTICE	CO-1 Student as a Pharmacist will have knowledge of Hospital, Hospital Pharmacy and Community Pharmacy, and will promote rational use of drugs. CO-2 Student as a Hospital Pharmacist will be aware of the hospital distribution system, Hospital Formulary, Therapeutic drug monitoring and Patient medication adherence. CO-3 Student as a Hospital Pharmacist will understand the working of Pharmacy and Therapeutic Committee, and can participate in patient counselling, training and education program, and have effective communication skills. CO-4 Students will be able to explain the roles and responsibilities of a Clinical Pharmacist. CO-5 Student as a Hospital Pharmacist will have knowledge of inventory control drug store management, investigation new drug, and will be able to interpret common clinical laboratory tests.

Course	Course outcomes: - After completion of these courses' students should be able to
13.1 VIII SEM	
BP805ET	CO1. Understanding about the process of drug discovery and development. CO2. Understanding of the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals. CO3. Understanding of the regulatory approval process and their registration in Indian and international markets.
BP809ET	CO1-Student will be able to know about the role of pharmaceutics in formulation of cosmetic CO2- Student will be able to understand principles and building block of skin care and hair care products. CO3-Student will know about SPF and analytical cosmetics CO4-Student will come to know different principles of cosmetics evaluation. CO5-Student will come to know about different Cosmetic problems associated with skin.

School of Pharmacy

Program: Masters of Pharmacy (Two Years Course)

Programme Educational Objective (PEO)

Programme Outcomes (POs)

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MASTERS OF PHARMACY- 2 Years

1. Vision

To establish the institute as a center of academic excellence in the pharmaceutical sciences by using top-notch facilities and technologies to deliver instruction

2. Mission

To prepare pharmacy students for industrial research and societal requirements through student-centered teaching and learning methods.

3. Program Educational Objectives

PEO 1: To train graduates of the program with a strong foundation to pursue higher studies and adapt to a globe of constantly developing trends.

PEO 2: To prepare graduates of the program to attain a broad array of professional skills for a successful career in pharmaceutical and healthcare systems.

PEO 3: To produce graduates of the program to exhibit professionalism, ethical attitude, communication skills, and teamwork in their profession and adapt to current trends by engaging in lifelong learning

4. Programme Outcomes (POs)

After completing the program students will be able to

PO 1	**Scientific knowledge**: To design and develop pharmaceutical dosage forms and drug delivery systems that are effective in achieving superior therapeutic outcomes by applying scientific and technological principles.
PO 2	**Technological applications**: To make use of technological expertise and pinpoint any elements influencing pharmaceutical production quality. .
PO 3	**Modern tool usage:** Acquire knowledge about, and use suitable techniques, protocols, materials, and computer tools connected to modern pharmacy, while being aware of their limitations. .
PO 4	**Entrepreneurship:** Tocomprehend pharmaceutical basics of establishing and company administration.the fundamentals of creating .
PO 5	**Practical skills:** to develop practical experience in the formulation and assessment of innovative drug release systems for conditions ranging from minor illnesses to serious illnesses.
PO6	**Applied science:** Using current scientific understanding in fields like pharmacology and biotechnology to create medications that are disease-specific.
PO 7	**Computational and statistical methodologies:** using and making use of statistical tools to optimize the formulations with the help of computer software.
PO 8	**Pharmaceutical ethics:** To uphold moral standards and behave morally in social and professional settings. Act in a way that acknowledges individual differences in communication styles, values, and lifestyles. Employ moral frameworks, make decisions based on moral principles, and accept accountability for the results of your choices.
PO 9	**Environment and sustainability:** must be aware of, defend, and work together on environmental issues in order to maintain biodiversity. .
PO10	**Life-long learning:** To make it a habit to periodically update one's knowledge in order to satisfy societal and industrial standards and have a successful career.

5. Programme Specific Outcomes (PSOs):

After completing the program students will be able to:

- PSO 1: Formulation strategies: To transfer practical knowledge and skills to create, target, and develop disease-centric formulations utilizing cutting-edge scientific concepts for improved patient care and compliance.

- PSO 2: Emerging science: The aim of this course is to provide an overview of cutting-edge technologies that are emerging and how they might be applied in the pharmaceutical area to create more effective treatment formulations.

- PSO 3: Computational literacy: To show how artificial intelligence can be used, computer programs or software applications that are helpful for validating experimental data, screening formulations, and interpreting the results.

- PSO 4: Pharmaceutical regulations: to comprehend the goals, duties, and responsibilities of the many pharmaceutical regulatory agencies that oversee the effectiveness, safety, and quality of drugs from production to patient door.

COURSE OUTCOMES (COs):

Course	Course outcomes: - After completion of these courses' students should be able to
6.1 Semester - I	
Modern Pharmaceutical Analytical Techniques MPH 101 T (Theory)	**CO1:** To understand instrumental analytical techniques (spectroscopic, related to volumetric analysis **CO2:** To gain knowledge on the interaction of NMR with matter, affinity of matter, and ability to find out the relative position of hydrogen and carbon. **CO3:** Able To build an understanding of the mass spectrophotometry and their applications in pharmacy **CO4:** To categorize different organic and inorganic compounds using suitable spectroscopy, chromatography, electrophoresis, thermal and immune assay **CO5:** To utilize knowledge of thermal and X-Ray crystallographic
Drug Delivery System MPH 102 T (Theory)	**CO1:** To understand the basic concepts of sustained release, controlled release, polymer science, and personalized medicine. **CO2:** To explain the principles and fundamentals of controlled drug delivery systems, protein-peptide drug delivery, and vaccine drug delivery systems. **CO3:** To (train) develop the formulations of gastro retentive, ocular,transdermal, protein-peptide, and vaccine drug delivery systems **CO4:** To analyze the formulations of gastroretentive and ocular drug delivery systems. **CO5:** To assess the transdermal and protein-peptide drug delivery systems. **CO6**: To evaluate the formulated vaccine drug delivery systems.
Modern Pharmaceutics : MPH 103 T	**CO1:** To understand concepts of pre-formulation and relate them to formulation development. CO2: To illustrate the parameters of optimization and its applications in formulation development CO3: To develop validation and calibration master plan as per regulatory guidelines CO4: To categorize the policies of cGMP, the layout of buildings, equipment, and management of production. CO5: To explain the principles of tablet compression and compaction CO6: To compile the consolidation parameters to determine the stability of a dosage form

Regulatory Affair MPH 104 T	**CO1:** To understand the basic concepts of sustained release, controlled release, polymer science and personalized medicine. **CO2:** To explain the principles and fundamentals of controlled drug delivery systems, protein-peptide drug delivery, and vaccine drug delivery systems **CO3:** To (train) develop the formulations of gastro retentive, ocular, transdermal, protein-peptide, and vaccine drug delivery systems. CO4: To analyze the formulations of gastroretentive and ocular drug delivery systems. C05: To assess the transdermal and protein-peptide drug delivery systems. C06: To evaluate the formulated vaccine drug delivery systems.

6.2 Mapping: Semester – I

MPH 101 T	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	0	2	2	2	0	0	2
CO2	3	2	3	0	2	2	2	0	0	2
CO3	3	2	3	0	2	2	2	0	0	2
CO4	3	2	3	0	2	2	2	0	0	2
CO5	3	2	3	0	2	2	2	0	0	2

MPH 102 T	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	0	3	2	2	0	0	2
CO2	3	2	3	0	3	2	2	0	0	2
CO3	3	2	3	0	3	2	2	0	0	2
CO4	3	2	3	0	3	2	2	0	0	2
CO5	3	2	3	0	3	2	2	0	0	2
CO6	3	2	3	0	3	2	2	0	0	2

MPH 103 T	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	0	1	2	2	0	0	2
CO2	3	2	3	0	1	2	2	0	0	2
CO3	3	2	3	0	1	2	2	0	0	2
CO4	3	2	3	0	1	2	2	0	0	2
CO5	3	2	3	0	1	2	2	0	0	2
CO6	3	2	3	0	1	2	2	0	0	2

MPH 104 T	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	3	0	1	2	2	0	0	2