

PROGRAMME DETAILS

NAME OF THE PROGRAMME: Bachelor of Commerce

DURATION : 3 Years

ELIGIBILITY FOR ENROLMENT: A pass in +2 examination recognized by any State Board/ Central Board or any other Board accepted by SASTRA as equivalent to 10+2 examination.

PROGRAMME FEE : Tuition fee of Rs.20000/- per semester.



SASTRA
ENGINEERING · MANAGEMENT · LAW · SCIENCES · HUMANITIES · EDUCATION
DEEMED TO BE UNIVERSITY
(U/S 3 of the UGC Act, 1956)



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B.Com. (Online mode)

Scheme of Study

I Semester (20 Credits)

Course Code	Course Name	Credits
ENGOL134	English –I	2
CIVOL112	Environmental Studies-I	2
BCOMOL102	Economic Analysis	4
BCOMOL103	Business Organisation	4
BCOMOL104	Business Communication	4
BCOMOL105	Financial Accounting – I	4
TOTAL		20

II Semester (20 Credits)

Course Code	Course Name	Credits
ENGOL135	English –II	2
CIVOL222	Environmental Studies -II	2
BCOMOL106	Business Management	4
BCOMOL203	Banking Theory, Law and Practice	4
BCOMOL108	Financial Accounting – II	4
BCOMOL109	Business Mathematics & Statistics	4
TOTAL		20

III Semester (20 Credits)

Course Code	Course Name	Credits
BCOMOL201	Business Laws	4
BCOMOL202	Corporate Accounting – I	4
BCOMOL107	Insurance - Law and Practice	4
BCOMOL204	Securities Market Operations	4
BCOMOL205	Basics of Computing	4
TOTAL		20

IV Semester (20 Credits)

Course Code	Course Name	Credits
BCOMOL206	Principles of human resource management	4
BCOMOL207	Fundamentals of E-Commerce	4
BCOMOL208	Corporate Accounting – II	4
BCOMOL209	Auditing	4
BCOMOL210	Financial Services	4
TOTAL		20

V Semester (20 Credits)

Course Code	Course Name	Credits
BCOMOL301	Management Accounting	4
BCOMOL302	Cost Accounting – I	4
BCOMOL303	Principles of Income Tax	4
BCOMOL304	Principles of Marketing	4
BCOMOL305	Entrepreneurship Development	4
TOTAL		20

VI Semester (20 Credits)

Course Code	Course Name	Credits
BCOMOL306	Financial Management	4
BCOMOL307	Cost Accounting – II	4
BCOMOL308	Indirect Tax	4
BCOMOL309	Company Law & Secretarial Practice	4
BCOMOL310	Enterprise Resource Planning	4
TOTAL		20

CREDITS DISTRIBUTION

Semester	I	II	III	IV	V	VI
Credits	20	20	20	20	20	20
Grand Total	120					

Course Code: ENGOL134

Semester: I

ENGLISH - I

Course Objectives:

The course introduces learners to classic literary texts and aims to develop their literary appreciation skills.

The course helps the learners to learn basic grammar and letter writing skills.

The course enables the learners to acquire the basic study habits.

UNIT- I: Poetry

- Rabindranath Tagore – Where the mind is without Fear
- William Wordsworth – The Solitary Reaper
- Shelley - Ode to West Wind
- Robert Frost – The Road Not Taken
- Oliver Goldsmith – The Village School Master

UNIT- II: Prose

- A.P.J. Abdul Kalam – My Visions for India
- Francis Bacon – Of Studies
- Dr. S. Radhakrishnan - The Emerging World Society
- 9. Stephen Leacock - My Financial Career
- 10. C.E.M. Joad - The Way of the Mahatma

UNIT- III: Functional Grammar

- Articles
- Prepositions
- Tense Forms
- Active Voice and Passive Voice
- Phrasal Verbs
- Vocabulary: a. Finding the meaning of words from the context
- Substituting long expressions with single words
- Reported Speech
- Framing Questions

Unit -IV: Composition

- Paragraph Writing
- Essay Writing
- Paraphrasing
- Business Letter

Listening and Speaking: Language Lab Practice**LEARNING OUTCOMES**

At the end of the course, the learners will be able to

Unit I	Develop a sense of appreciation for poetry and its lofty ideals
Unit II	Relate the themes of the essays to their day-to-day life and events
Unit III	Write simple and grammatically correct sentences
Unit IV	Write letters both formal and informal without errors

Course Code: CIVOL112

ENVIRONMENTAL STUDIES - I

Course Objective:

This course aims to introduce the student to the interdisciplinary study of environmental issues in the science and humanities. The main object of this study is, to understand the central role that human environmental perceptions have played and continue to play in the creation of both sustainable and unsustainable relations with nature. It creates environmental awareness amongst the students.

Unit I Introduction and Natural Resources

Natural Resources: Renewable and non-renewable resources – Associated problems – Forest Resources – mineral resources – water resources - Food resources - Energy resources(Renewable and non-renewable) - Land resources - Role of intellectuals in conservation of natural resources .

Unit II Eco-systems and Biodiversity

Eco-systems: Concept of an ecosystem - Structure of an ecosystems – how they work (ecosystem) Elements in living and non-living systems – Energy laws biotic structure – Bio diversity & importance – Conservation of Bio diversity categories of organisms, feeding and non-feeding relationship — Nutrient cycles.

Unit III Environmental Pollution

Pollution – Air pollution, Water pollution, Soil Pollution and Noise Pollution– their sources impacts and control strategies – Role of individual in prevention and control of Pollution

Unit IV Natural Disasters

Disaster Management - Land Slides, Cyclone, Flood and Earth Quake – Causes – their effects – control Strategies - The Changing Nature Of Earth- global warming – International Treaties.

LEARNING OUTCOMES

Unit 1	The learner will understand the importance, causes, effect and remedial measures of various natural resources.
Unit II	The learner will learn the rich biological wealth of our country, threats to it and various conservation methods.

Unit III	The learner will have the understanding of the causes, effects and remedial measures of different types of environmental pollution.
Unit IV	The learner will have the understanding of the causes, effects and control strategies of different environmental disasters.

Semester: I

Course Objective:

The objective of this course is to make the students learn the application of economic laws and principles for decision making.

UNIT – I

Definitions: Wealth, Welfare, Scarcity and Growth - Nature of Economics - Subject matters of Economics - Methods of study - Economic assumptions - Significance of economics.

UNIT – II

Law of demand and Elasticity of demand: Theory of consumer behaviour: Cardinal and Ordinal Utility Analysis - Marginal Utility analysis: Assumptions, the law of diminishing marginal utility and the law of equi-marginal utility - Consumer surplus: Meaning and usefulness of the concept - Demand forecasting.

UNIT – III

Law of supply and Elasticity of supply: Production analysis: Factors of production - Scale of production and Laws of returns.

UNIT – IV

Cost and Revenue analysis: Cost function, Short run cost curve and Long run cost curve - Average revenue, Marginal revenue and Total revenue and relationship between Average revenue and Marginal revenue - Break Even Point.

UNIT – V

Markets: Price and output determination under Perfect competition - Monopoly - Monopolistic competition - Duopoly and Oligopoly competition.

LEARNING OUTCOMES

Unit I	The learner will have an understanding meaning, nature and scope of economics. Further, learner will able to understand how economics is useful to decision making process.
Unit II	The Learner will understand how demand analysis is help to make better managerial decisions related to market strategy, pricing, advertising, production planning, inventory management, financial evaluation and investment decisions
Unit III	The learner will able to understand production function is to address allocative efficiency in the use of factor inputs in production and the resulting distribution of income to those factors
Unit IV	The learner will be able to analyse Cost analysis to determine combination of inputs and reduce cost of production. The learner also will understand various cost concepts and determine cost of production which enables management for correct business decisions

Unit V	The learner will have understanding types of market structure influences how a firm behaves in pricing, supply, barrier of entry, efficiency and competition.
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Course Code: BCOMOL103

BUSINESS ORGANISATION

Semester: I

Course Objective:

This course is meant to acquaint the students with the different forms of business and its combinations.

UNIT - I: Introduction to Business Organisation

Meaning and types of business - Characteristics - Objectives of business - Occupation and Profession - Evolution of business - Importance of Business Organization - Forms of Business Organization - Sole Proprietorship, Partnership, Joint Stock Company, Hindu Undivided Family and Cooperatives - Formation, advantages and disadvantages and suitability of these types of organizations.

UNIT – II: The process of organization

Importance and Principles of organization - Theories of Organization - Types - Line, Line and staff, Functional, Matrix and Committee organization - Advantages and disadvantages and suitability of these types of organizations

UNIT - III: Functional areas

Production - Plant location and layout - Production planning and control - Marketing: Concept and function of marketing – Human resource management and its functions - Finance functions.

UNIT – IV: Business combinations

Causes - Types - Effects of business combinations - Introduction of Limited Liability Partnership - Comparison of traditional partnership and LLP - LLP in India.

UNIT – V: Retail and wholesale trade

Retail trade – Meaning and types, organized retailers, functions - Wholesale trade - types of wholesalers - Functions of wholesaler.

LEARNING OUTCOMES

Unit I	The learner will have an understanding on characteristics and importance of business organisation and types of business organization
Unit II	The learner will know process of organization
Unit III	The learner will be able to know the functional areas like production, marketing, finance and personnel management.
Unit IV	The learner will be able to analyse the causes and effects of business combination.
Unit V	The learner will be able to understand the different types and functions of retailers and wholesalers.

Course Code: BCOMOL104

BUSINESS COMMUNICATION

Semester: I

Course Objective:

The objective of this course is to develop effective business communication skills among the students.

UNIT - I

Introduction to Business Communication: Meaning and importance of communication - Communication process - Principles of effective communication - Types of communication - Media of communications: oral, written, verbal, non-verbal communication - Barriers to communication - Guidelines to overcome barriers.

UNIT – II

Business letters: Need and Functions of Business letter - Kinds of business letter - Layout - heading, date line, inside address, attention line, opening, salutation, body, subject line, message, complimentary closing, signature, references, enclosures, notation, post-script, spacing, and punctuation style.

UNIT - III

Business correspondence: Request for quotations, tenders - Drafting letters of enquiry and replies - Order letters, execution and cancellation of orders - Drafting of sales letters - Circular letters - Customer dues, complaints and follow-up letter.

UNIT - IV

Correspondence with other bodies: Correspondence with banks regarding overdraft, cash credit, statement of account - Correspondence with insurance companies regarding payment of premiums, claims and their settlement, renewal of policies.

UNIT - V

Preparing agenda, Minutes, Precise Writing and Business Reports: - Conduct of meetings - Resolutions - Minutes; Precise Writing - Meaning, need and golden rules for writing a good précis; Report writing - Importance of reports - Special features of a report - Organization of report - Short and long report - Kinds of report - Business report, market report and press report.

LEARNING OUTCOMES

Unit I	The learner will have an understanding about the meaning, importance, principles, types and media of communications.
Unit II	The learner will be able to know how to draft business letters.
Unit III	The learner will be able to prepare different types of business correspondence like sales letters, circular letters etc.
Unit IV	The learner will be able to prepare correspondence with other bodies like banks and insurance companies.
Unit V	The learner will be able to know how to prepare precise writing, Minutes, Resolutions and reports.

Course Code: BCOMOL105 FINANCIAL ACCOUNTING – I

Semester: I

Course Objective:

To impart basic accounting knowledge as applicable to business.

UNIT - I

Basic accounting concepts, conventions - Accounting equation - Relationship of accounting with economics and statistics - Role of accountant in society - Journal - Sub division of journal - Ledger.

UNIT - II

Trial balance - Advanced Final accounts - Adjustments - Adjusting and closing entries - Preparation of Trading account, Profit and loss account and Balance sheet.

UNIT - III

Distinction between Reserves and Provisions - Depreciation accounting including methods thereof.

UNIT - IV

Accounts of Non-Trading Concern - Bank Reconciliation Statement - Rectification of Errors.

UNIT - V

Accounts for special transactions - Bills of exchange and Promissory notes – Consignment account - Joint Ventures - Royalty accounts.

LEARNING OUTCOMES

Unit I	The learner will have an understanding about concepts and conventions of Accounting; and will be able to prepare entries in journal, Ledger and Trial Balance and Subsidiary Books.
Unit II	The learner will be able to prepare Final Accounts of Sole Trading Organizations.
Unit III	The learner will have an understanding about Depreciation, Provisions and Reserves; and will be able to estimate the rate of depreciation.
Unit IV	The learner will be able to prepare the financial Statements of Non- Trading Organizations.
Unit V	The learner will have an understanding of Bills of exchange, Promissory Note, Consignment and Joint Venture Accounting; and will be able to prepare the royalty Accounts.

Course Code: ENGOL135

Semester: II

ENGLISH- II

Course Objectives:

- The course aims to develop in the learners the appreciation of the language of poetry and its message.
- The course introduces famous short stories and one-act plays as a source for language learning.
- The course introduces the different modes of writing and gives practice in writing essays using the specified strategies

UNIT – I: Poetry

- Sri Aurobindo – The Tiger and the Deer
- G. M. Hopkins – Binsey Poplar
- John Keats – Ode to a Nightingale
- Robert Burns – A Winter Night
- W. H. Auden - The Unknown Citizen

UNIT – II: Short Stories and One-Act Plays

- O. Henry - The Gift of the Magi
- Tagore - The Cabuliwallah
- Oscar Wilde - The Devoted Friend
- Farrell Mitchell - The Best Laid Plans
- Mazie Hall - The Trial of Billy Scott

Unit - III Functional Grammar

- Agreement of the Verb with the Subject
- Pronoun-Antecedent Agreement
- Modal Auxiliaries
- Common Errors in Sentences
- Tightening Rambling Sentences with reference to simplicity, clarity and precision

Unit IV: Writing

- Modes of Writing: Narration, Description, Comparison and Contrast, Argument, Enumeration, Persuasion, Cause and Effect, Process Writing

- Writing Essays using Specific Strategies
- Paraphrasing

LEARNING OUTCOMES:

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

Unit I	Appreciate great poetry and share their insights on great thoughts.
Unit II	Have great writers as their model and practice to write on their own.
Unit III	Spell out the main and supporting ideas in any prose work and write simple summaries of their own.
Unit IV	Comprehend texts, write essays, make notes, and get exposed to Standard English.

Course Code: CIVOL222

Semester: II

ENVIRONMENTAL STUDIES II

Course Objective:

This course aims to introduce the student to the interdisciplinary study of environmental issues in the science and humanities. The main object of this study is, to understand the central role that human environmental perceptions have played and continue to play in the creation of both sustainable and unsustainable relations with nature. It creates environmental awareness amongst the students.

Unit I Municipal Solid Waste and Hazardous Waste

Basics Of Municipal Solid Waste, Management Of Municipal Solid Waste, Agony Of Seas, The Price Of Panacea - Biomedical Waste, Effects And Controls Of Water Pollution due to biomedical waste, Nuclear Hazards, Industries & Waste, Dealing With Industrial Waste, Environmental Rights, Environmental Threats.

Unit II Legislation and Sustainable Development

Public Environmental Awareness, Ethics Of Environmental Education, Environmental Values, Indian Legislative Steps To Protect Our Environment, Water Management Practices, Sustainable Development, Urban Problems Related To Energy, Resettlement And Rehabilitation.

Unit III Human Population and human Health

Environment And Climate Change, Sex Ratio, Population Explosion, Impact Of Human Population On Environment, Infectious Diseases and Waterborne Diseases, HIV/Aids, Cancer & the Environment, Environment And Human Health, Chemicals In Food.

Unit IV Varieties of Plants and Trees

Typha : A Bioremedial Plant, Castor Bean, Pinus, Malaria, Machla : A Serene Village, The Secret Of Taste – Chilli, Common Avenue – Trees, Common Village Trees, Flower - The Beautiful Gift Of Nature, Silk Cotton Tree : Kapok, Cotton Yarn.

LEARNING OUTCOMES

Unit 1	The learner will understand the importance, causes, effect and remedial measures of municipal solid waste and hazardous waste.
Unit II	The learner will learn the Indian Legislative steps to protect our Environment and Sustainable Development
Unit III	The learner will have the understanding the importance of population control and

	different deceases due to environmental degradation.
Unit IV	The learner will learn the various plants, trees, yarns and their importance on Environment.

Course Code: BCOMOL106

BUSINESS MANAGEMENT

Semester: II

Course Objective:

This course familiarizes the students with the basics of principles and functions of management.

UNIT - I

Introduction to Management: Meaning, role, features, functions, process and importance - Management as an art - Management as a science - Management as a profession - Management Vs. Administration - Levels of Management - Principles of management - Henry Fayol - Taylor's Scientific Management.

UNIT – II

Planning: Nature, characteristics and importance - Advantages and limitations - Steps in planning - Types of plans - Standing plans - Objectives - Concept of MBO - Policies - Procedure - Rules - strategies - Single use plans, programmes and budgets - Decision making - Individuals and group decisions.

UNIT - III

Organizing: Importance of organization - Formal and Informal - Authority and Responsibility - Delegation of authority - Principles, types, advantages and barriers of delegation - Differentiation and Integration (including Centralization and Decentralization) - Departmentation.

UNIT - IV

Staffing: Nature and importance - Manpower planning - Recruitment, selection, training and performance appraisal - Motivation and behaviour - Theories of motivation - Leadership - Leadership theories and styles - Formal and informal leaders - Communication process - Communication network - Grapevine - Oral and written communications - Barriers to communications.

UNIT – V

Directing and Controlling: - Significance - Supervision - Span of supervision - Factors determining span of supervision - Control - Traditional and modern devices - Co-ordination - Need and importance, Principles and techniques of co-ordination.

LEARNING OUTCOMES

Unit I	The learner will have an understanding about the Management principles, features and functions.
Unit II	The learner will have an understanding about the planning and MBO. Will be able to make a successful planning for the business problem.
Unit III	The learner will be able to Organize, Delegate Authority and perform departmentalisation
Unit IV	The learner will have an understanding about the Recruitment, Motivation, Leadership and Communications.
Unit V	The learner will have an understanding about the Direction, Supervision and Co-ordination.

Course Code: BCOMOL107

INSURANCE - LAW AND PRACTICE

Semester: II

Course Objective:

This course enables the students to know the fundamentals of insurance law and practice.

UNIT - I

Introduction to Insurance: Meaning, significance - Definition of risk and uncertainty, essential requirements and principles of risk insurance - Reinsurance - Nationalization of insurance business in India - Agents - Classification, duties, rights and termination of agency.

UNIT - II

Life Insurance: Law relating to Life insurance - General principles of life insurance contract - Proposals and policy - Assignment and nomination - Title and claims - Concept of trusts in life policy - Life Insurance Corporation - Role and functions.

UNIT - III

General Insurance – Fire Insurance: Law relating to General insurance - Different types of general insurance - general insurance and life insurance; Fire Insurance - Nature of fire insurance - Various types of fire policy - Subrogation - Double insurance - Contribution - Proximate cause.

UNIT - IV

General Insurance – Marine Insurance: Law relating to Marine insurance - Types; insurable interest, proximity cause, voyage and warranties; Health and Medical insurance - Motor insurance - Accidents insurance.

UNIT - V

Insurance Innovation: Insurance surveyorship - Appointment, legal provisions and licensing, functions - Bancassurance and its benefits.

LEARNING OUTCOMES

Unit – I	The learner will be able to understand the meaning of insurance, the concept of risk and uncertainty, nationalization of insurance business, concept of reinsurance and the insurance agents.
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Unit – II	The learner will have an understanding about the Life Insurance Corporation of India, its role and functions, principle of life insurance and the law relating to the life insurance
Unit – III	The learner will acquire knowledge about the concept of general insurance- its types, fire insurance-its principles and double insurance
Unit – IV	The learner will be able to understand the concepts of marine, health and medical, motor and accident insurance
Unit – V	The learner will have an understanding about Insurance innovation, Insurance surveyorship and banc assurance

Course Code: BCOMOL108

FINANCIAL ACCOUNTING – II

Semester: II

Course Objective:

The objective of this course is to expose students to single entry, Hire purchase and partnership accounts.

UNIT - I

Single entry system - Definition and salient features - Statement of affairs method - Conversion of single entry into double entry system - Self-balancing ledgers.

UNIT - II

Insolvency accounts - Average due date - Account current - Insurance Claims

UNIT - III

Hire purchase and Installment purchase system - Branch accounts (Excluding foreign branches) and Departmental accounts.

UNIT - IV

Partnership accounts - Fundamentals - Admission of a Partner - Retirement of a partner - Death of a partner - Amalgamation of firms.

UNIT - V

Dissolution of partnership - Insolvency of partners (Garner Vs Murray) - Piecemeal distribution.

LEARNING OUTCOMES

Unit I	The learner will be able to prepare accounts for sole trading organization in single entry system.
Unit II	The learner will be able estimate the Insurance Claim amount and prepare the Insolvency Accounts.

Unit III	The learner will have an understanding about Hire purchase and Installment Accounts; and will be able to prepare Branch and Departmental Accounts.
Unit IV	The learner will have an understanding about the Partnership accounts and prepare partnership accounts for admission, retirement and death.
Unit V	The learner will be able to prepare the accounts for Dissolution and Insolvency of partners.

Course Code: BCOMOL109 BUSINESS MATHEMATICS AND STATISTICS

Semester: II

Course Objective:

This course enables the students to have knowledge of Mathematics and Statistics as is applicable to business and economic situations.

UNIT – I

Matrix Algebra: Matrices – Types of matrices – Matrix operation – Inverse matrix not more than 3rd order – solving simultaneous linear equation – Determinants – Properties – Cramer’s rule

UNIT – II

Mathematics of Finance and Series: Simple interest – Compound interest – annuity – present value annuity – Arithmetic progression: sum up to n terms - Geometric progression: sum upto n terms, sum to infinity

UNIT – III

Description Statistics: Introduction, Definition of Statistics, Functions, Applications, Limitations – Classification of Data: types, formation of discrete frequency and construction of frequency distributions – Tabulation: roles, rules, types, classification vs. tabulation – Diagrammatic and graphical presentation – Simple problems

UNIT - IV

Measures of Central Tendency: Introduction – Types of averages – Arithmetic Mean (Simple and Weighted) – Median – Mode for raw, frequency and class interval data.

Measure of Dispersion: Range – Quartile Deviation – Mean Deviation – Standard Deviation and Coefficient of Variation for class interval data.

Unit - V:

Correlation and Regression Analysis: Meaning – Types- Karl Pearson’s Coefficient of Correlation and Rank Correlation – Linear Regression lines – Methods of least square – Regression Coefficients

LEARNING OUTCOMES

Unit I	The learner will have an understanding of fundamental concepts of matrices and able solve the system of equation using matrix
Unit II	The learner will be able to understand the fundamental concepts of interest and series.
Unit III	The learner will have an understanding of the concepts of collection, tabulation and diagrammatic and graphical representation of data
Unit IV	The learner will be able to understand the concepts of statistics like mean, median, mode
Unit V	The learner will be able to understand the relationship and nature of variables and predict the future value using regression.

Course Code: BCOMOL201

BUSINESS LAWS

Semester: III

Course Objective:

The objective of this course is to provide a brief idea about the framework of Indian business laws.

UNIT - I

The Indian Contract Act, 1872: Nature and kinds of contracts - Offer and Acceptance - Consideration - Capacity to contract - Free consent - Legality of object and consideration - Doctrine of Public Policy - Void agreements - Illegal agreements - Contingent contracts - Performance of contracts - Discharge of Contracts - Breach of Contract - Remedies for breach - Damages for breach of contract.

UNIT - II

Special Contracts: Indemnity and Guarantee - Bailment and Pledge - Contract of Agency - Relations of principal with his agent and third parties - Termination of Agency - Quasi Contracts.

UNIT - III

The Sale of Goods Act, 1930: Nature of contract of sale - Conditions and Warranties - Transfer of ownership - Performance of contract of sale - Rights of an unpaid seller - Auction Sale.

UNIT - IV

The Indian Partnership Act, 1932: Nature of Partnership - Registration of Firms - Relations of partners with one another and with third parties - Reconstitution of firms - Dissolution of Firms.

UNIT - V

The Information Technology Act, 2000: Definitions - Digital Signature and Electronic Signature - Electronic Governance - Attribution, Acknowledgement and Despatch of Electronic Records - Regulation of certifying Authorities - Electronic Signature Certificates - Duties of Subscribers - Penalties, Compensation and Adjudication - The Cyber Appellate Tribunal - Offences.

LEARNING OUTCOMES

Unit I	The learner will have an understanding about the essential elements of a valid contract and the possibilities of discharge of contract.
Unit II	The learner will be able to understand the various special contracts like indemnity contracts and the relationship between the principal and the agent.
Unit III	The learner will have an understanding about the nature and conditions of Sale of Goods Act, 1930.
Unit IV	The learner will acquire the knowledge about the nature of partnership and the provisions relating to Indian Partnership Act 1932.
Unit V	The learner will be able to understand the concepts of Information Technology Act, 2000 and their offences and penalties.

Course Code: BCOMOL202

CORPORATE ACCOUNTING – I

Semester: III

Course Objective:

This course enables the students to develop awareness about corporate accounting conformity with the provisions of Companies Act.

UNIT - I

Issue of shares: Various kinds of shares - Issue of shares at par, premium and at discount - Forfeiture of shares - Reissue of forfeited shares.

Underwriting of shares and debentures: Purpose and importance of underwriting - Types of underwriting - Determining the liability of underwriters - Redemption of Preference shares - Capital profits and Revenue profits - Minimum Fresh Issue of shares.

UNIT - II

Issue of debentures: Consideration for issue of debentures - Redemption of debentures -Different methods of redemption of debentures. Meaning of Acquisition - Reasons for conversion - Accounting treatment - When new set of Books are opened - Accounting entries in the books of purchasing company - Accounting entries in the books of vendor - When same set of books are continued.

UNIT - III

Profits prior to incorporation: Methods of ascertaining profit or loss prior to incorporation - Apportionment of expenses - Ascertaining pre & post incorporation profits.

Final Accounts of companies: Profit and Loss Account - Balance sheet - Calculation of managerial remuneration.

UNIT - IV

Goodwill: Definition of Goodwill - Nature of Goodwill - Sources of Goodwill - Need for valuing Goodwill - Factors affecting value of Goodwill - Methods of valuation of Goodwill. Valuation of shares - Need for valuation of shares - Factors affecting the value of shares - Methods of valuation of shares.

UNIT - V

Holding Company: Meaning and definition of Holding company and Subsidiary company - Consolidated financial statement - Preparation of consolidated Profit and Loss account and Balance Sheet.

LEARNING OUTCOMES

Unit I	The learner will have an understanding about Shares and will be able to prepare the accounts for Issue of Shares and Underwriting.
Unit II	The learner will be able to prepare the accounts for Issue of Debentures and Acquisition of Business.
Unit III	The learner will be able to prepare the final accounts of Companies.
Unit IV	The learner will have an understanding about goodwill; and will be able to estimate the value of goodwill and shares.
Unit V	The learner will be able to prepare the consolidated balance sheet for Holding and its Subsidiary companies.

Course Code: BCOMOL203 BANKING THEORY, LAW AND PRACTICE

Semester: III

Course Objective:

The objective of this course is to facilitate understanding of the conceptual frame work of banking law and practice.

UNIT - I

Banking: Origin of banks - Banking systems - Unit banking - Branch banking - Investment banking and Mixed banking - features, merits and demerits - Classification of banks - Co-operative banks, Regional Rural Banks, Central bank, Commercial banks, Development Banks and Foreign banks - features, functions. Role of banks in the economic development of a country.

UNIT - II

Deposits and Lending: Various types of deposits - Precautions in opening bank accounts of customers particularly individuals including Minors - Joint account holders - Partnership firms - Joint stock companies - Clubs and Associations - Joint Hindu family; Lending - Types - Principles of sound lending - general precautions in lending against various types of securities like stock, Life policies and Gold ornaments.

UNIT - III

Banker and Customer: Meaning and definitions - Relationship between them - General and Special - Obligation to honour customer's cheques - Obligation to maintain secrecy - Banker's lien - Right of appropriation - Rule in Clayton's case - Right to set off - Garnishee order.

Negotiable Instruments Act, 1881 - Negotiable instruments - Characteristics of negotiable instruments - Bill of Exchange - Characteristics of Bill of Exchange - Promissory Note - Characteristics of promissory note; Letter of Credit - Types of letter of credit - Liabilities of parties of letter of credit;

UNIT - IV

Paying and Collecting banker: Cheque - Features - Crossing - Endorsements. Paying Banker - Meaning, duties and responsibilities - Statutory Protection - Payment in due course - Refusal of payment - Consequences of wrongful dishonour - Collecting Banker - Banker as a holder for value - Banker as agent - Statutory Protection - Duties and responsibilities.

UNIT - V

Recent development in banking sector: Relationship banking - Internet Banking - Mobile Banking - Digital Cheques - Smart Cards - Electronic Clearing service (ECS) - Electronic Funds Transfer (EFT) System - Core Banking - Bank-assurance.

LEARNING OUTCOMES

Unit I	The learner will be able to understand the banking systems and role of banks in economic development of the country.
Unit II	The learner will be able to understand various deposits and lending, precautions in opening accounts and lending.
Unit III	The learner will be able to understand the banker-customer relationship, garnishee order and provisions related to Negotiable Instruments Act, 1881.
Unit IV	The learner will be able to cross and endorse cheques; understand the statutory protection for collecting banker.
Unit V	The learner will be able to understand the recent developments in the banking sector.

Course Code: BCOMOL204 SECURITIES MARKET OPERATIONS

Semester: III

Course Objective:

This course enables the students to know the working of the primary and secondary markets in India.

UNIT - I

Investment: Meaning, options available for investment - Short-term and long term - Financial options; Interest - Meaning, factors determining interest rates.

Securities and securities market: Meaning, functions, SEBI's role, participants and segments of securities market - Securities market and Financial system - Securities market and Economic development.

UNIT - II

Primary market: Meaning, functions, role; Issue of shares - Need, different kinds of issues, issue price, market capitalization, Public issue Vs Private placement, Initial Public Offer, Price discovery through book building process, cut-off price, floor price, price band, role of a registrar, draft offer document, abridged prospectus, prospectus, lock-in; listing of securities, listing agreement, delisting of securities, SEBI's role in an issue; Foreign capital issuance - ADR and GDR.

UNIT - III

Secondary Market: Meaning, role, Primary market Vs Secondary market; Stock Exchange - Meaning, functions, role, membership in Stock Exchange; Stock trading - Trading mechanism, screed based trading, NEAT, placing of orders with brokers, contract note, trading rules; Clearing and Settlement mechanisms - settlement guarantee mechanism; Products in the secondary market - equity investments and debt investments; Market index - index numbers, S&P CNX NIFTY - India Index Services and Products Limited.

UNIT - IV

Derivatives Market: Meaning, types - Financial derivatives and commodity derivatives, participants, functions - Derivative markets in India; Financial derivatives - Forwards, Futures, Options and Swaps;

Commodity derivatives market - Meaning, difference between Commodity and Financial derivatives; Trading, clearing and settlement mechanism.

Depository systems - Meaning, objectives, and depository process - Trading in a depository system, depository participants, depository system in India - National Securities Depository Limited (NSDL) - Central Depository Services (India) Limited.

UNIT - V

Mutual Funds: Meaning, origin, benefits and risk in investing in mutual funds, mutual fund products - Equity fund - Index fund, diversified large cap funds, mid-cap funds, sectoral funds, other equity schemes - Arbitrage funds, multicap funds, quant funds, P/E Ratio fund, international equities fund - Debt funds - Features, interest rate risks, credit risk, debt mutual fund schemes - Liquid funds - Features, floating rate scheme, portfolio churning in liquid funds - Golf ETFs - Features and working; Registration of mutual funds - Entry/ exit load - Different investment plans offered by mutual funds - Net Asset Value - Risks involved in investing in Mutual Funds.

LEARNING OUTCOMES

Unit I	The learner will have an understanding various Investment options and concepts Securities market and Financial system
Unit II	The learner will able to understand the functions of primary market, different kinds of issues, Price discovery through book building process and listing of securities. Further learner will understand how firms obtain funds in the financial markets and at what cost
Unit III	The learner will have an understanding different types of financial instruments, Clearing and Settlement mechanisms in secondary market. The Learner also will understand how secondary market work, and how financial instruments are used for sound investment decisions
Unit IV	The learner will able to understand different types of derivative instruments such as options, futures, swaps and other derivative securities and how these instruments helps in managing the risk of investing and hedging activity at the individual and the corporate level.
Unit V	The learner will have understanding different type's mutual fund schemes, investment plans offered by mutual funds companies and Risks involved in investing in Mutual Funds.

Course Code: BCOMOL205 BASICS OF COMPUTING

Semester: III

Course Objective: To help the learners understand the underlying principles of various concepts available for solving the problems.

UNIT I

Computer Basics: Characteristics, Evolution of Computers, Generations, Classification, Applications of computers. Number Systems: Number Systems, Conversion between number bases, Arithmetic System, signed and unsigned numbers, overflow. Logic Gates: Binary coding, Logic gates, Boolean algebra, Combination of Logic gates

UNIT II

Primary Memory: Memory Hierarchy, RAM and its types, ROM and its types Secondary Storage: Classification, Magnetic tape, Disk, Optical Disk Input Devices: Keyboard, Pointing-Mouse, Light Pen, Touch Screen, Speech Recognition, Digital camera, Scanners, optical Scanners Output Devices: Classification of Output, printers, monitors, audio output, projectors, Terminals.

UNIT III

Problem Solving with Computers: Introduction Defining problem-characteristics of problem-Working Backwards towards solution-Top down design, Breaking problems into sub problems ,Introduction to Pseudo code and flowcharting, exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function, generation of the Fibonacci sequence, base conversion.

UNIT IV

Algorithms For Problem Solving: Finding the square root of a number, smallest divisor of an integer, GCD, generating prime numbers, Generation of pseudo – random numbers, raising a number to a large power, computing the nth Fibonacci numbers

UNIT V

Arrays and Sorting techniques: Array Concepts; Sorting of Arrays, Array order reversal, Histogramming, finding the maximum and minimum number in a set, removal of duplicates from an ordered array. Sorting: Sorting by exchange, selection, insertion. Text processing- Characters to numbers conversion Keyword searching in a text

LEARNING OUTCOMES

Unit I	The learner will have an understanding of number systems, various gates and basic concepts of computer.
Unit II	The learner will have understanding of Memory, Input and Output devices.
Unit III	The learner will be able to write algorithms for solving the various problems.
Unit IV	The learner will be able to write algorithms for solving the various problems.
Unit V	The learner will be able to understand array and sorting techniques and some text processing techniques.

Course Code: BCOMOL206 PRINCIPLES OF HUMAN RESOURCE MANAGEMENT

Semester: IV

Course Objective:

This course aims at familiarizing the fundamental concepts, different dimensions of Human Resource Management and to achieve the organizational goals.

UNIT – I

Nature, Functions and Importance of Human Resource Management, Role of Human Resource Manager- Human Resource Planning: Objectives of HRP and factors influencing HRP, Process of HRP, Job Analysis: Job Description and Job specification. Recruitment: Sources of Recruitment, Selection process Tests and Interviews, Induction.

UNIT – II

Training and Development: Concepts and Importance. Identification of Training Needs, Types of Training, On-the-job and Off-the-job methods of training Methods of Executive Development, Career Planning: Meaning, Objectives Process Career Development Cycle.

UNIT – III

Concept and Objectives, Methods of Performance Appraisal; Problems in Performance Appraisal, Job changes: Transfers, Promotions, Demotion and retrenchment. Job evaluation: Concept and methods

UNIT – IV

Wages and salary Administration (WASA) - Objectives, factors, Methods of Payment of wages, Executive compensation, Incentives and fringe benefits - HR analytics – Significance and Benefits

UNIT – V

Employee welfare: Meaning, Significance & types. Industrial relations: Objectives, significance- Trade unionism: Functions and principles; Introduction to Collective Bargaining and Grievance

LEARNING OUTCOMES

Unit I	The Learner will be able to understand the basic concepts, HR process, recruitment, selection models and functions of HRM.
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Unit II	The Learner will be able to explain the types of training, need for the training, executive development and effects of training practices.
Unit III	The Learner will be able to understand the performance appraisal methods, transfer, promotion and demotion principles.
Unit IV	The Learner will be able to understand wage and salary administration, incentive plans and executive compensation.
Unit V	The Learner will be able to understand employee welfare, industrial relations, trade union practices, collective bargaining, grievance handling mechanism and industrial disputes

Course Code: BCOMOL207 FUNDAMENTALS OF E-COMMERCE

Semester: IV

Course Objective:

This course will help the learner to describe the fundamentals of e-commerce, identify e-commerce domains, hardware, software, service providers, and challenges. It will also help the learner to identify planning techniques and measures of effectiveness for an e-commerce application.

UNIT – I

Overview of E-commerce: Evolution of internet and E-Commerce – Definition, Types of E-commerce, Traditional commerce vs. E-commerce, E-commerce Framework, Convergence, anatomy of E-commerce – OSI layer architecture – E-commerce myths - Web commerce.

UNIT – II

The E-commerce domain: Problems with non ERP system, ERP system architecture, ERP applications, configurations and vendors, OLAP vs OLTP, Customer relationship management (CRM), Supply Chain Management (SCM) - Components of knowledge management E-Procurement and its types.

UNIT – III

Facing challenges in E-commerce: Costs involved in E-commerce – Starting online store – Security threats, Need for network and cyber security – Internet Transactions and Payment Systems - Staffing concerns - International market place.

UNIT – VI

Achieving goals in E-commerce: Planning techniques for implementing E-commerce solutions - Evaluating risk in E-commerce - Measuring the success of E-commerce initiatives

UNIT – V

E-commerce: Hardware, Software and Service providers: Identifying software involved in E-commerce - Identifying hardware involved in E-commerce - identifying service providers involved in E-commerce.

LEARNING OUTCOMES

The learner will be able to

Unit – I	Discuss fundamental concepts of e-commerce.
Unit – II	Identify e-commerce domains such as ERP, OLAP and OLTP Describe management concepts like CRM, SCM.
Unit – III	Appraise the security challenges in e-commerce. Compare internet transaction methods.
Unit – IV	Identify the planning method and measuring factors for successful ecommerce business.
Unit – V	Describe the importance of hardware, software and service provider requirements for Ecommerce business.

Course Code: BCOMOL208

CORPORATE ACCOUNTING – II

Semester: IV

Course Objective:

The objective of this course is to enable the students to learn the preparation of various accounts of different sectors of business.

UNIT - I

Alteration of share capital: Different kinds of Alteration of share capital - Internal reconstruction or Capital reduction - Reduction of Share capital - Procedure for reducing share capital.

Amalgamation, Absorption & External Reconstruction: Meaning - Types of Amalgamation - Purchase consideration - Computation of purchase consideration - Accounting problem relating to Amalgamation, Absorption and External Reconstruction.

UNIT - II

Electricity Company Account or Double Account System: - Special features of Double Account system - Double account system Vs Double Entry system - Double account system Vs Single account system - Advantages and disadvantages of Double Account system. Replacement of assets - Final accounts of Electricity supply companies.

UNIT - III

Banking Company Accounts: Business of Banking Companies - Legal Requirements -Preparation of Profit and Loss Account - Balance sheet - Classification of Bank Advances - Performing and Non-Performing Assets.

UNIT - IV

Insurance Company Accounts: Insurance - Types of Insurance - Life Insurance - Preparation of Final Accounts of Insurance Companies - Revenue Account - Profit and Loss Account - Balance sheet. General Insurance - Fire and Marine Insurance - Preparation of final accounts - Revenue Account - Profit and Loss Account - Balance sheet.

UNIT - V

Service Sector Accounts: Software Companies - Hospitals - Educational Institutions - Hotels.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of the different kinds of Alteration of Share capital, Accounting problems relating to Amalgamation, Absorption and External Reconstruction
Unit II	The learner will be able to apply the principles of Electricity Company Accounts, Replacement of Assets and special features of Double Account, Single Account System and Double Entry System
Unit III	The learner will be able to analyse the Banking Company Accounts, its legal requirements, preparation of Profit and Loss account and Balance Sheet
Unit IV	The learner will have an understanding of the types of Insurance, Preparation of Final Accounts of Insurance Companies
Unit V	The learner will be able to apply and know the principles of Service sector accounts namely Software Companies, Hospitals, Educational Institutions and Hotels.

Course Code: BCOMOL209

AUDITING

Semester: IV

Course Objective:

This course aims at imparting knowledge about the principles and methods of auditing and their principles.

UNIT – I

Introduction to Auditing: Definition of audit - Nature, scope and limitation of audit - Distinction between book-keeping, accounting and auditing - Distinction between investigation and auditing - Audit process - Objectives of auditing - Detection and Prevention of errors and frauds - Basic principles governing audit - Classification of audit - Internal audit and External audit.

UNIT – II

Audit Planning: Concept of Materiality - Standard auditing practices - Audit engagement - Audit planning - Factors to be kept in mind before commencing a new audit - Audit programme - Audit working papers - Audit files - Audit note book - Control of quality of audit work.

Verification of evidence: Detailed checking Vs. Sample checking - Audit procedure for obtaining evidence - Source of evidence - Methods of obtaining audit evidence - Physical verification, documentation and direct confirmation - Audit sampling - Test checking - Techniques of test checks.

UNIT – III

Internal control and Internal Check: Objectives of internal control - Characteristics of an effective internal control system - Methods of evaluation of internal control system - Elements of internal control - Internal check - Objectives, principles and advantages of internal check system - Internal check as regards cash receipts, cash payments and sales, purchases and stores - Internal Audit - Meaning, objectives and need.

UNIT – IV

Vouching: Meaning, objectives and importance - Vouching of cash receipts and cash payments - Vouching of trading transactions - Vouching of special transactions - Examination of books of accounts.

Capital and Revenue expenditure - Verification and Valuation of assets and liabilities - Depreciation - Reserve - Distinction between reserve and provision.

UNIT – V

Company audit: Appointment, remuneration, removal of auditors - Qualification and disqualification of auditors - Powers, duties and liabilities of auditors - Audit of share capital - Share transfer audit.

Statutory report and audit - Audit of branch office accounts - Audit report - Special purpose audit - Proprietary audit - Efficiency audit - Government audit.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of the basic concepts of auditing. In addition the learner will be able to know the principles of audit and its classification.
Unit II	The learner will be able to learn about the auditing process as well as auditing procedures and evidence verification.
Unit III	The learner will be able to understand about the internal check, internal control and internal audit.
Unit IV	The learner will have an understanding of the principles pertaining to vouching process. In addition, the learner will be able to learn about verification and valuation of assets.
Unit V	The learner will be able to apply the principles concerning company audit. In addition the learner will be able know the process of audit report and Government audit.

Course Code: BCOMOL210

FINANCIAL SERVICES

Semester: IV

Course Objective:

The objective of this course is to acquaint the students with the basics of different financial services available in the Indian Financial market.

UNIT - I

Introduction: Meaning, definition and features of financial services - Significance of financial services - Types of financial services - Growth and development of financial services in India - Regulation of financial services.

UNIT - II

Merchant Banking: Meaning, definition, scope, functions and objectives of merchant banking - Classifications of merchant bankers - regulation of merchant bankers by SEBI; Management of New Issues - Indian experience.

UNIT - III

Venture Capital: Meaning, features, scope, importance - Methods of venture financing - Indian scenario.

Lease Financing: Meaning, definition and types of leases; advantages and disadvantages - Evaluation of lease financing - purchase v/s leasing; borrowing v/s leasing; evaluation from lessor and lessee's point of view - Accounting for leases as per AS-19 in India.

UNIT - IV

Factoring: Meaning, objectives and types of factoring; factoring v/s bill discounting; advantages and disadvantages of factoring - Factoring in India.

Forfaiting: Definition, factoring v/s forfaiting - working of forfaiting, benefits and drawbacks of forfaiting - Forfaiting in India.

Dematerialisation and Rematerialisation: Meaning, objectives, functions, scope and process of dematerialization and rematerialisation - Merits and demerits; progress of DEMAT account in India - NSDL & CDSL - Growth and functioning.

UNIT - V

Stock Broking: Stock brokers, Sub-brokers & Foreign brokers - Registration, payment of fee, code of conduct - General obligations and responsibilities - Capital adequacy norms for brokers; Stock market trading - Segments for cash trading - Wholesale Debt Market (WDM), Capital Market (CM), and Central Government Securities; Derivatives trading - Meaning, types - clearing and settlement.

LEARNING OUTCOMES

Unit I	The learner will be able to understand different types of financial services and need for Regulation of financial services in India.
Unit II	The learner will have an understanding of important and needs merchant banking services in India and different kinds of services offered by Merchant bankers. Further, learners will understand the role of merchant banking in primary market issue management.
Unit III	The learner will be able to understand risks involved in venture capitalist and how companies generate revenue for growth. The learners will understand venture capital funds are established and the venture capital funding process.
Unit IV	The learner will have an understanding of importance and needs of factoring and forfeiting in India and mechanism.
Unit V	The learner will be able to understand different types of brokers and importance of brokers in placing different market orders.

Course Code: BCOMOL301

MANAGEMENT ACCOUNTING

Semester: V

Course Objective:

This course provides the students an understanding of the application of accounting techniques for management.

UNIT - I

Management accounting: Nature, scope, objectives, Functions - Distinction between management accounting and financial accounting - Distinction between management accounting and cost accounting - Tools of Management accounting - Limitations of management accounting - Financial statement analysis - Comparative statement - Common size statements and trend analysis - Ratio analysis: Liquidity, solvency and profitability ratios.

UNIT - II

Fund flow analysis: Meaning of fund - Importance of fund flow statement - Preparation of fund flow statement: Schedule of changes in working capital - Fund from operation - Fund flow statement.

Cash flow analysis: Meaning, difference between Fund flow Statement and Cash flow statement - Preparation of cash flow statement; cash from operation and cash flow statement.

UNIT - III

Budget, Budgeting and Budgetary Control: Objectives, features, essentials of successful budgetary control - Preparation of various budgets: Fixed and Flexible budget, Sales Budget, Production Budget, Material Budget, Cash Budget, Zero base budgeting and Master Budget.

UNIT - IV

Capital Budgeting: Nature of investment decisions - Investment evaluation criteria: Pay Back Period - Accounting Rate of Return - Net Present Value - Internal Rate of Return - Profitability Index - NPV and IRR comparison - Capital rationing.

UNIT - V

Marginal costing: Features of marginal costing - Absorption costing and Marginal costing - Break Even Analysis - P/V ratio - Margin of safety - Application of marginal costing in decision making regarding: profit planning - Fixation of selling price - key factor - Make or Buy decision - Level of activity planning - Profit planning and product mix.

LEARNING OUTCOMES

Unit I	The learner will be able to know how to prepare Ratio analysis, comparative statement and common size statement and meaning and importance of management accounting
Unit II	The learner will have an understanding about how to prepare fund flow and cash flow analysis.
Unit III	The learner will be able to know how to prepare budget and various types of budgeting.
Unit IV	The learner will have an understanding about capital budgeting and its various methods.
Unit V	The learner will be able to know marginal costing, Break even analysis and margin of safety and also applications of marginal costing in decision making.

Course Code: BCOMOL302

COST ACCOUNTING – I

Semester: V

Course Objective:

This course exposes the students to the basic concepts and tools used in cost accounting.

UNIT – I

Introduction to Cost Accounting: Nature and significance of Cost Accounts - Limitations of financial accounts - Financial Vs Cost Accounting - Definition of Cost, Costing - Meaning, scope, objectives, functions, importance - Advantages and limitations of cost accounting - Types of cost - Cost unit - Cost center - Cost classification and cost concepts - Elements of cost - Preparation of Cost sheet - Tenders, quotations and preparation of estimates.

UNIT – II

Material Management: Purchase routine - Stores control - Function of store keeper - Stock levels - Maximum, minimum, re-order and danger levels - Economic Ordering Quantity - Different methods of calculation of EOQ - Stock turnover ratio - Bin card - Perpetual inventory system - ABC method of stores control - Control of wastage, scrap, spoilage, defectives - Pricing of issues - Various cost methods - Simple and weighted average, standard price, inflated price and market price methods.

UNIT – III

Labour cost: Importance of labour cost control - Time card - Job cards - Time booking - Time keeping - Time recording - Overtime and idle time - Methods of wage payment - Methods of incentive schemes - Labour cost statement - Payroll accounting - Labour Turnover - Causes of LTO - Methods of reduction of LTO - Calculation of LTO

UNIT - IV

Overheads: Meaning, classification of overheads, allocation and apportionment, basis of apportionment, primary and secondary distribution summaries - Methods of apportionment, reciprocal and non - reciprocal method; Absorption of overheads - Machine hour rate - Computation of machine hour rates - Under and over absorption of overheads, causes and their treatment

UNIT – V

Cost control accounts: Non integral accounts, ledgers in financial books, ledgers in cost books; Control accounts and journal entries; Integral accounting - Meaning advantages, features and journals; Reasons for variation in profits shown by cost accounts and financial accounts and their reconciliation.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of the Elements of Cost, Preparation of Cost Sheet, Tenders, Quotations and Preparation of estimates.
Unit II	The learner will be able to apply the Principles of ABC techniques, Pricing of Issues, Inflated and Market Price methods.
Unit III	The learner will be able to analyse the importance of labour cost Control, methods of incentives schemes, Labour turn over and its Reduction.
Unit IV	The learner will have an understanding of the Classification of overheads, Absorption of overheads, Causes and their treatment.
Unit V	The learner will be able to apply Cost control accounts, Integral accounting, Cost accounts and Financial accounts and their Reconciliation

Course Code: BCOMOL303

Principles of Income Tax

Semester: V

Course Objective:

To gain basic knowledge in the provisions of income tax law relating to assessment of individuals and appeal provisions.

UNIT – I

Basic Concepts

Assessment year, Previous year, Person, Assessee, Income, Gross Total Income, Total income and tax Liability, Agricultural Income, Casual Income, Assessment, Capital receipts Vs Revenue receipts, Capital expenditure Vs Revenue expenditure - Residential status - Resident, Resident but not ordinarily resident, Non-resident - Receipt of Income - Accrual of Income - Income deemed to accrue or arise in India. Income exempt under Sec.10

UNIT – II

Salaries and House Properties

Salaries - Basis of charge – Allowances – Perquisites - Deductions from salary income -Tax rebate under sec. 88 - Relief under sec. 89 - Tax planning, House Property – Chargeability - Property income exempt from tax - Unrealized rent - Arrears of rent

UNIT – III

Profits and Gains of Business or Profession

Chargeability - Method of Accounting -Deductions and Allowances – Depreciation - Expenditure on Scientific Research, Acquisition of Patents and Copyrights, Know-how - Payment to Associations and Institutions Carrying Rural Development Programmer - Special Provisions

UNIT – IV

Capital Gains and Income from other sources

Chargeability - Capital asset - Computation of Capital Gains – Capital Gains Exempt from Tax. Other Sources - Basis of Charge and computation

UNIT – V

Computation of Tax Liability

Set off and Carry Forward of Losses - Deductions from Gross Total Income – Assessment of Individual - Tax Deduction at Source - Permanent Account Number - Assessment Procedure –Types of assessment- Filing of Returns – E-Filing - Income tax Authorities – appointment - power and functions

LEARNING OUTCOMES

Unit I	The learner will have an understanding of the basic terminologies used in Income tax act. Further learner will also understand the residential status of an individual and about the basic exempted income.
Unit II	The learner will gain the ability to solve simple problems concerning assessee with the status of Individual covering the income from salaries and the income from house property
Unit III	The learner will gain the ability to solve simple problems concerning assessee with the status of Individual covering the profits or gains from Business or profession.
Unit IV	The learner will gain the ability to solve simple problems concerning assessee with the status of Individual covering the income from capital gains, income from other sources.
Unit V	The learner will have an understanding on the procedures relating to E-filing of income tax returns and the procedure relating to assessment of income.

Semester: V

Course Objectives: To facilitate the students to understand the conceptual framework of marketing and its applications in decision making.

Unit - I: Introduction

Marketing- Meaning- Concept, Functions, Marketing planning and implementing Marketing programmes- Marketing Environment- Market Segmentation- Consumer behaviour- marketing research and Marketing Information System.

Unit - II: Product Development

Product- Meaning- product Planning- Policies New product development- Product Life Cycle- branding – Packing and Labeling

Unit - III: Promotion

Promotion- promotion Mix- Advertisement- Message- Copywriting- Advertisement- Budgeting- Measuring Advertisement Effectiveness- Media strategy- sales promotion- Personal selling and publicity

Unit - IV: Distribution Management

Physical distribution- Distribution Mix- Managing Channel- intermediaries- Transport and Warehousing- distribution strategies- Distribution Cost analysis

Unit – V: Marketing Strategies

Tools for competitive differentiation of product, Strategies for competitors- lenders- challenges - Marketing of services-Consumerism and Consumer Protections- evaluating and controlling marketing performance- direct selling, Direct marketing – E Marketing – Mobile Marketing – Social Media Marketing.

LEARNING OUTCOMES

Unit – I	The learner will have to understand the concepts in marketing and analyse the marketing environment. Further they will have exposure on consumerism and marketing strategies.
Unit – II	The learner will be able to understand the process of production and other associated activities for his better knowledge enhancement.
Unit – III	The learner will be able acquire knowledge about Promotion, Promotion Mix- Advertisement Strategies.
Unit – IV	The learner will have an understanding of the Physical distribution- Distribution Mix. Managing Channel. Intermediaries. Transport and Warehousing.

Unit – V	The learner will be able to understand the marketing strategies.
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Course Code: BCOMOL305 ENTREPRENEURSHIP DEVELOPMENT

Semester: V

Course objectives: To provide basic knowledge in the field of entrepreneurship, Women & Rural Entrepreneurship, and Small Scale and to gain insight into the preparation of a project report/business plan.

UNIT – I Introduction to Entrepreneurship

Meaning, types of entrepreneurs, role and importance of entrepreneurship - Factors Influencing entrepreneurial development - Entrepreneurs - Definition, Qualities, Types, Functions, barriers, Entrepreneurial motivation - Legal formalities/policies for establishing new ventures.

UNIT – II Women and Rural Entrepreneurship

Women entrepreneurs – Recent trends in the development of women entrepreneurship - Role of women entrepreneurs in India, problems faced by women entrepreneurs - Rural entrepreneurship – Need – Problems & types of rural entrepreneurs

UNIT – III Micro Small & Medium Enterprises

Introduction – Characteristics, objectives, and role of SSI / MSME, Problems faced by MSMEs - factors - Sickness in Small Scale Industries - Governmental support for small-scale industries – Supports of Financial institutions such as SFC, SIDBI, IFCI, IDBI, SIDO to small scale industries

UNIT – IV Business Plan Preparation

Sources of business idea, idea processing - Criteria for selection of a product - Feasibility study - Marketing feasibility - Financial feasibility - Technical feasibility - Legal and managerial feasibility

UNIT – V Project Report and Appraisal

Project Report – Contents - Significance – Specimen of project report - Project appraisal – Concept - Methods of project appraisal

LEARNING OUTCOMES

Unit I	The learner will be able to understand the role and importance of entrepreneurship and policies and measures towards entrepreneurial development.
Unit II	The learner is able to understand the recent trends in the development of women entrepreneurship and rural entrepreneurship.
Unit III	The learner is able to understand the growth and problems, Governmental & Institutional supports for small-scale industries.
Unit IV	The learner is able to understand the sources of business ideas, idea processing, and feasibility study.
Unit V	The learner will be able to prepare the project report.

Course Code: BCOMOL306

FINANCIAL MANAGEMENT

Semester: VI

Course Objective:

The objective of this course is to help students understand the conceptual framework of financial management.

UNIT - I

Financial Management: Importance of Finance - Meaning of business finance - Functions of finance – Meaning, objectives of financial management - Scope and importance of financial management - Liquidity Vs Profitability - Profit Maximization Vs Wealth Maximization - Methods of financial management - Organization of finance function.

UNIT - II

Working capital management: Classification of working capital - Need and importance of working capital - Factors determining working capital - Working capital financing mix - Working capital forecasting - Management of cash and Marketable securities: Motives, managing cash flow and models - Receivable management - Forming of credit policy, executing the credit policy - Inventory management - Motives, objectives, tools and techniques of inventory management

UNIT - III

Cost of capital: Cost of different sources of finance - Computation of specific cost of capital - Weighted average cost of capital - Marginal cost of capital; Leverages - operating, financial and combined leverages.

UNIT - IV

Capital structure: Points of indifference - Optimum capital structure - Theories: Net Income approach - Net operating income approach - Traditional and M.M. Hypotheses - Without taxes and with taxes - Factor determining capital structure.

UNIT - V

Dividend: Determinants of dividend policy - Types of dividend policies - Theory of irrelevance concept: MM models - Relevant concept: Gordon's models and Walter's models.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of the importance of finance and functions of finance. They also have gathering scope & objectives of financial management, methods of financial management, liquidity Vs. profitability.
Unit II	The learner will be able to understand an importance of working capital, factors determining working capital. They also collected credit policy methods in receivable management and tools and techniques of inventory management
Unit III	The learner will be able to analyse the cost of capital and different sources of finance. They also analyse various leverages-operating, financial and combined leverages.
Unit IV	The learner will have an understanding of the capital structure theories-Net income approach, Net operating income approach, and Traditional approach and MM approach.
Unit V	The learner will be able to apply different types of dividend policy – MM model, Gordon's model and Walter's model

Course Code: BCOMOL307

COST ACCOUNTING - II

Semester: VI

Course Objective:

The objective of the course is to acquaint students to learn various method of cost accounting.

UNIT - I

Methods of costing: Job costing - Features, objectives essential prerequisites for introduction, merits and limitations - Cost estimation - Contract costing - Profits on incomplete contracts, escalation clause, cost plus contract and work in progress

UNIT - II

Batch costing: determination of Economic Lot Size - Operating costing - Meaning, cost unit, characteristics, transport costing, power house costing, cinema house costing, hospital costing and canteen costing.

UNIT - III

Process costing: Features, advantages, disadvantages, costing procedure, normal and abnormal loss, abnormal gain, scrap, and defective - Concept of equivalent production - Joint and by product accounting - Inter process profits.

UNIT - IV

Standard costing and variance analysis: Meaning, advantages and limitations of standard cost - Determination of standard cost, Revision of standards; Meaning and uses of variance analysis - Material variances - Labour variances - Overhead variances and Sales variances.

UNIT - V

Modern methods of costing: Activity based costing - Life Cycle Costing - Target Costing - Just-in-time Approach.

LEARNING OUTCOMES

Unit I	The learner will be able to know how to prepare job costing and contract costing
Unit II	The learner will have an understanding about various services costing preparation like transport costing, Power house costing etc.
Unit III	The learner will be able to prepare process costing, usage of process costing at the time of normal loss, abnormal loss etc.
Unit IV	The learner will have an understanding about Standard costing, how to prepare different variances etc.
Unit V	The learner will be able to know the modern methods of costing like Activity based costing, Life cycle costing and Target costing

Course Code: BCOMOL308

INDIRECT TAX

Semester: VI

Course objectives:

To gain knowledge about the indirect tax laws in force for the relevant accounting year and to provide an insight into procedural aspects for filing tax returns for various types of assesses.

UNIT – I

Goods and Services Tax an Introduction

Indirect taxes before the GST; Concept of VAT: Meaning and Methods; Major Defects in Indirect taxes prior to GST; Need of GST in India; Genesis and salient features of GST; Taxes subsumed in GST; Advantages and challenges of GST; Present Structure including SGST, CGST, UTGST and IGST

Supply of Goods and Services

Definitions of GST- Scope of GST (Section 1), Definitions (Section 2): Adjudicating Authority, Business, Business vertical, Capital goods, Continuous supply of goods, Continuous supply of services, exempt supply, fixed establishment, goods, Input, input service, input service distributor, inward supply, outward supply, Agent, Aggregate Turnover, Assessment

UNIT – II

Registration process in GST

Meaning of registration, Types of registration, Compulsory, Deemed; Casual dealer, non – resident supplier - Registration process for new applicants, Compounding dealer, Black listing dealer, Surrender of registration, Cancellation and revocation of registration

Payment process in GST

Features of payment process - Methods of payment in GST - by tax payers by internet banking through authorized banks; Over counter payment through NEFT (RTGS) from any bank

UNIT – III

Levy and Collection of GST

Meaning of supply goods & supply of services - Conditions for taxability of supply of goods and services - Place of supply of goods and service rules (including electronically supplied goods and services), GST Rates: Zero rating, Zero rating of exemptions, Exemption and lower rate of tax for certain items such as food and health care, Abatements (i.e deductions), GST structure rates

Valuations under GST

Introduction to valuation under GST, Valuation rules, a) General valuation rules; b) Special valuation rules; Other cases for valuation of supply, Imported goods & services, Valuation for discount, Transaction value meaning, conditions for transaction value, Inclusions in and exclusions from transaction value. Methods of valuation, Computed value method, Residual value method, Rejection of declared value. Exemption from GST; Small supplies and Composition Scheme; Classification of Goods and Services; Composite and Mixed Supplies

UNIT – IV

Input Tax Credit

Eligible and Ineligible Input Tax Credit; Apportionment of Credit and Blocked Credits; Tax Credit in respect of Capital Goods; Recovery of Excess Tax Credit; Availability of Tax Credit in special circumstances; Transfer of Input Credit (Input Service Distribution); Payments of Tax; Refund; Doctrine of unjust enrichment; TDS, TCS. Reverse Charge Mechanism, Job work

Procedures

Tax Invoice, Credit and Debit Notes, Returns, Audit in GST, Assessment: Types of Assessment, Summary and Scrutiny, Payment of Taxes, Maintenance of Records and Submission of Return

UNIT – V

Return & Refund under GST

Return in GST

Meaning of returns - Obligations for filing return - Assessee required to file return in GST - Types of Return - return for outward suppliers made by tax payer; return for inward suppliers received by the tax

payer; Monthly return; Quarterly return for computing dealer, Return for non – resident foreign tax payer, ISD return, TDS return, Annual return - Time period for filing return under GST

Refund under GST: Meaning and types of refund, Excess payment due to mistake, Export of goods or services under claim of rebate, Refund - in case of provisional assessment - pre – deposit for filing appeals - during investigations where no or lesser actual liability arises - due to year end or volume based discount by credit note

LEARNING OUTCOMES

Unit I	The learner will be able to understand the basic principles underlying the Indirect tax system and be able to differentiate the GST from the indirect taxes prior to GST
Unit II	The student will be able to learn the Registration and the Payment processes as suggested by GST Act
Unit III	The learner will be able to understand the valuation rules for goods and services under GST Act
Unit IV	The learner will be able to understand the concepts related to Input tax credit and be able to remember the procedure of assessment and audit under CST Act.
Unit V	The learner will be able to demonstrate an understanding on the procedures relating to filing of return and refund of taxes under GST Act.

Course Code: BCOMOL309 COMPANY LAW AND SECRETARIAL PRACTICE

Semester: VI

Course Objective:

The objective of this course is to provide basic knowledge of the provisions of the Companies Act, 1956 along with relevant case laws.

UNIT - I

Introduction to Company: Nature of company - Kinds of companies - Formation and Incorporation of a company - Company secretary - Legal position of secretary - Qualification, appointment, rights, duties liabilities and dismissal of a company secretary - Incorporation of company -Duties of a secretary at promotion stage.

UNIT - II

Memorandum of Association: Secretary's duties - Doctrine of ultra vires - Articles of Association - Procedure to be followed by secretary - Doctrine of Indoor Management -Prospectus - Duties of secretary at commencement stage - Steps to be taken by secretary at subscription stage - Share capital - Secretary's duties regarding rights issue.

UNIT - III

Membership in company: Shares - Secretarial duties before allotment - Duties of secretary regarding bonus shares - Share certificates and share warrants - Duties of secretary regarding renewal and share warrants - Calls, forfeiture and surrender of shares - Duties of secretary regarding calls - Transfer and transmission of shares - Duties of secretary - Dividends - Duties of secretary regarding dividends.

UNIT - IV

Borrowing powers: Debentures - Duties of secretary regarding debentures - Meetings and Proceedings - Secretarial work relating to meetings - Motions and resolutions -Agenda and minutes - Directors - Managerial remuneration - Accounts and auditors -Secretarial duties regarding accounts.

UNIT - V

Winding up: Compulsory winding up - Duties of secretary in respect of compulsory winding up - Voluntary winding up - Members' and Creditors' voluntary winding up -Duties of secretary in respect of voluntary winding up - Reports - Duties of secretary in respect of reports.

LEARNING OUTCOMES

Unit I	The learner will be able to understand the nature and kinds of companies; laws related to qualification, appointment, rights, duties, liabilities and dismissal of Company Secretary.
Unit II	The learner will be able to understand the provisions related to Memorandum of Association and Prospectus; secretarial duties at various stages of formation of company and rights issue.
Unit III	The learner will be able to understand provisions related to membership in company and shares; also the secretarial duties related to allotment, bonus shares, renewal and share warrants, call on shares and dividends. .
Unit IV	The learner will be able to understand the provisions related to borrowing powers, debentures, managerial remuneration and meetings; secretarial duties related to debentures, meetings and accounts.
Unit V	The learner will be able to understand provisions related to winding- up of company and secretarial duties related to winding-up.

Course Code: BCOMOL310 ENTERPRISE RESOURCE PLANNING

Semester: VI

Course Objective:

This course will help the learner to discuss the technology and business process involved in the implementation of ERP. It also helps the learner to identify the impact of ERP on business modules, acquire knowledge of ERP products in the market and the integration of ERP products into the business process.

UNIT - I (ERP AND TECHNOLOGY):

Introduction: Business process-concepts - Risks and Benefits of ERP Technology - Related Technologies – Business Intelligence – Business Analytics - E-Commerce and E-Business –Business Process Re-engineering – Data Warehousing – Data Mining – OLAP – Product life Cycle management – SCM – CRM- GIS-ERP security.

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 - Success and failure Factors of ERP implementation.

UNIT - III (ERP IN ACTION & BUSINESS MODULES):

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):

Marketplace: Dynamics – SAP AG – SAP BW - Oracle – PeopleSoft – JD Edwards – SSA Global: Baan, ERP LN, and ERP LX.

UNIT - V (SYSTEM INTEGRATION):

Enterprise Application Integration: ERP and E-Business – ERP II – TQM: Total quality management – Trends in ERP.

LEARNING OUTCOMES

Unit – I	The learner will be able to describe the basic tools and technology involved in ERP.
Unit - II	The learner will be able to describe the process involved in implementation of ERP.
Unit - III	The learner will be able to identify the impact of ERP on business modules.

Unit - IV	The learner will be able to compare the ERP products in the market.
Unit - V	The learner will be able to discuss the ERP integration into the real time environment and its quality control.

NAME OF THE PROGRAMME: Bachelor of Business Administration

DURATION : 3 Years

ELIGIBILITY FOR ENROLMENT: A pass in +2 examination recognized by any State Board/ Central Board or any other Board accepted by SASTRA as equivalent to 10+2 examination.

PROGRAMME FEE : Tuition fee of Rs.20000/- per semester.



SASTRA DEEMED UNIVERSITY

THANJAVUR – 613 401

BBA: (Online mode)

Scheme of Study

I Semester (22 Credits)

Course Code	Course Name	Credits
BBAOL101	Business Communication	4
BBAOL102	Business Mathematics & Statistics	4
BBAOL103	Business Management	4
BBAOL104	Fundamentals of Logistics	4
BBAOL105	Materials Management	4
CIVOL112	Environmental Studies - I	2
TOTAL		22

II Semester (18 Credits)

Course Code	Course Name	Credits
BBAOL201	Business Organisation	4
BBAOL202	Principles of Financial Accounting	4
BBAOL203	Managerial Economics	4
BBAOL204	Retail Supply Chain and Logistics Management	4
CIVOL222	Environmental Studies - II	2
TOTAL		18

III Semester (20 Credits)

Course Code	Course Name	Credits
BBAOL301	Basics of Computing	4
BBAOL302	Insurance – Law & Practice	4
BBAOL303	Warehousing & Distribution Operations	4
BBAOL304	Fundamentals of Management Accounting	4
BBAOL305	Principles of Marketing	4
TOTAL		20

IV Semester (20 Credits)

Course Code	Course Name	Credits
BBAOL401	Financial Services	4
BBAOL402	Principles of Human Resources Management	4
BBAOL403	Banking Theory, Law and Practice	4
BBAOL404	Cost Accounting	4
BBAOL405	Air Cargo Operations Processes	4
TOTAL		20

V Semester (20 Credits)

Course Code	Course Name	Credits
BBAOL501	Fundamentals of E-Commerce	4
BBAOL502	Auditing	4
BBAOL503	Business Law	4

BBAOL504	Managing Global Business	4
BBAOL505	Surface Transportation	4
TOTAL		20

VI Semester (20 Credits)

Course Code	Course Name	Credits
BBAOL601	Principles of Financial Management	4
BBAOL602	Business Data Analytics	4
BBAOL603	International Logistics Management	4
BBAOL604	Enterprise Resource Planning	4
BBAOL605	Company Law and Secretarial Practice	4
TOTAL		20

CREDITS DISTRIBUTION

Semester	I	II	III	IV	V	VI
Credits	22	18	20	20	20	20
Grand Total	120					

Course Code: BBAOL101

BUSINESS COMMUNICATION

Semester: I

Course Objective:

The objective of this course is to develop effective business communication skills among the students.

UNIT - I

Introduction to Business Communication: Meaning and importance of communication - Communication process - Principles of effective communication - Types of communication - Media of communications: oral, written, verbal, non-verbal communication - Barriers to communication - Guidelines to overcome barriers.

UNIT – II

Business letters: Need and Functions of the Business letter - Kinds of business letter - Layout - heading, date line, inside address, attention line, opening, salutation, body, subject line, message, complimentary closing, signature, references, enclosures, notation, post-script, spacing, and punctuation style.

UNIT - III

Business correspondence: Request for quotations, tenders - Drafting letters of enquiry and replies - Order letters, execution and cancellation of orders - Drafting of sales letters - Circular letters - Customer dues, complaints and follow-up letter.

UNIT - IV

Correspondence with other bodies: Correspondence with banks regarding overdraft, cash credit, statement of account - Correspondence with insurance companies regarding payment of premiums, claims and their settlement, renewal of policies.

UNIT - V

Preparing agenda, Minutes, Precise Writing and Business Reports: - Conduct of meetings - Resolutions - Minutes; Precise Writing - Meaning, need and golden rules for writing a good précis; Report writing - Importance of reports - Special features of a report - Organization of report - Short and long report - Kinds of report - Business report, market report and press report.

LEARNING OUTCOMES

Unit I	The learner will have an understanding about the meaning, importance, principles, types and media of communications.
Unit II	The learner will be able to know how to draft business letters.
Unit III	The learner will be able to prepare different types of business correspondence like sales letters, circular letters etc.
Unit IV	The learner will be able to prepare correspondence with other bodies like banks and insurance companies.
Unit V	The learner will be able to know how to prepare precise writing, Minutes, Resolutions and reports.

Course Code: BBAOL102 BUSINESS MATHEMATICS AND STATISTICS

Semester: I

Course Objective:

This course enables the students to have knowledge of Mathematics and Statistics as is applicable to business and economic situations.

UNIT – I

Matrix Algebra: Matrices – Types of matrices – Matrix operation – Inverse matrix not more than 3rd order – solving simultaneous linear equation – Determinants – Properties – Cramer’s rule

UNIT – II

Mathematics of Finance and Series: Simple interest – Compound interest – annuity – present value annuity – Arithmetic progression: sum up to n terms - Geometric progression: sum upto n terms, sum to infinity

UNIT – III

Description Statistics: Introduction, Definition of Statistics, Functions, Applications, Limitations – Classification of Data: types, formation of discrete frequency and construction of frequency distributions – Tabulation: roles, rules, types, classification vs. tabulation – Diagrammatic and graphical presentation – Simple problems

UNIT - IV

Measures of Central Tendency: Introduction – Types of averages – Arithmetic Mean (Simple and Weighted) – Median – Mode for raw, frequency and class interval data.

Measure of Dispersion: Range – Quartile Deviation – Mean Deviation – Standard Deviation and Coefficient of Variation for class interval data.

Unit - V:

Correlation and Regression Analysis: Meaning – Types- Karl Pearson’s Coefficient of Correlation and Rank Correlation – Linear Regression lines – Methods of least square – Regression Coefficients

LEARNING OUTCOMES

Unit I	The learner will have an understanding of fundamental concepts of matrices and able solve the system of equation using matrix
Unit II	The learner will be able to understand the fundamental concepts of interest and series.
Unit III	The learner will have an understanding of the concepts of collection, tabulation and diagrammatic and graphical representation of data
Unit IV	The learner will be able to understand the concepts of statistics like mean, median, mode
Unit V	The learner will be able to understand the relationship and nature of variables and predict the future value using regression.

Course Code: BBAOL103

BUSINESS MANAGEMENT

Semester: II

Course Objective:

This course familiarizes the students with the basics of principles and functions of management.

UNIT - I

Introduction to Management: Meaning, role, features, functions, process and importance - Management as an art - Management as a science - Management as a profession - Management Vs. Administration - Levels of Management - Principles of management - Henry Fayol - Taylor's Scientific Management.

UNIT – II

Planning: Nature, characteristics and importance - Advantages and limitations - Steps in planning - Types of plans - Standing plans - Objectives - Concept of MBO - Policies - Procedure - Rules - strategies - Single use plans, programmes and budgets - Decision making - Individuals and group decisions.

UNIT - III

Organizing: Importance of organization - Formal and Informal - Authority and Responsibility - Delegation of authority - Principles, types, advantages and barriers of delegation - Differentiation and Integration (including Centralization and Decentralization) - Departmentation.

UNIT - IV

Staffing: Nature and importance - Manpower planning - Recruitment, selection, training and performance appraisal - Motivation and behaviour - Theories of motivation - Leadership - Leadership theories and styles - Formal and informal leaders - Communication process - Communication network - Grapevine - Oral and written communications - Barriers to communications.

UNIT – V

Directing and Controlling: - Significance - Supervision - Span of supervision - Factors determining span of supervision - Control - Traditional and modern devices - Co-ordination - Need and importance, Principles and techniques of co-ordination.

LEARNING OUTCOMES

Unit I	The learner will have an understanding about the Management principles, features and functions.
Unit II	The learner will have an understanding about the planning and MBO. Will be able to

	make a successful planning for the business problem.
Unit III	The learner will be able to Organize, Delegate Authority and perform departmentalitation
Unit IV	The learner will have an understanding about the Recruitment, Motivation, Leadership and Communications.
Unit V	The learner will have an understanding about the Direction, Supervision and Co-ordination.

Semester: I

Course Objectives:

This course aims at providing a conceptual background and understanding of logistics functions. The student gets acquainted with the value of logistics customer service and related warehousing, transportation decisions in managing the business supplies.

UNIT-I : Introduction to Logistics

Introduction-Concept-scope-objectives-importance-logistics system concept-logistics-functions-logistics for business excellence-Information & Communication technology in logistics-global logistics-differences in local and global logistics-logistics future

UNIT-II: Customer Service

Logistics value proposition -Customer Service benefits- cost minimization- work of logistics-order processing-inventory-transportation-warehousing, material handling-facility network design- logistical operations-supply chain synchronization-sourcing logistics strategies- 3PL & 4PL and e-procurement

UNIT- III: Integrated Logistics

Integrated logistics -Inventory flow-information flow-operating objectives-barriers to internal integration-logistical measurement-dimensions of performance measurement-characteristics of logistical measurement system-Internal and external measurement-comprehensive supply chain measurement-levels of measurement-report structures

UNIT- IV: Warehousing

Warehouse, meaning, types of warehouses, functions and benefits of warehousing. Transportation meaning, types of transportation, efficient transportation system and its benefits, e-commerce logistics, definition, and general categories of e-commerce, structure and operations brief of fulfillment centers, Reverse logistics its scope and leveraging its use in modern economy.

UNIT- V: Logistics in International Trade

Logistics in international trade – fundamentals of export-import, role of export and import in Indian economy. Custom clearance and agencies, Intermodal shipping and Multimodal shipping. Types of liner services, bulk break, ro-ro, dry bulk, liquid bulk and cold chain infrastructure.

LEARNING OUTCOMES

Unit I	The learner will be able to understand logistics concepts and its contribution in business
Unit II	The learner will be able to describe the value proposition and customer service and

	its synchronization
Unit III	The learner will be able to identify integrated logistics structure and logistical measurement system
Unit IV	The learner will be able to understand the functions of warehousing, concepts & application of e-commerce and reverse logistics
Unit V	The learner will be able to describe the fundamental concepts of export & import and custom clearance.

Course Code: BBAOL105 MATERIALS MANAGEMENT

Semester: I

Course Objectives:

The objective of this course is to know the conceptual frame work of materials purchasing, handling and management of materials in industries.

UNIT-I: Introduction

Materials Management - Evolution, Importance, Scope and Objectives- Interface with other functions. Role of materials management in business. Organizing for materials management – Basis for forming organizations – Conventional and modern approaches to organizing materials management- Standardization – need and importance - Codification – concept and benefits.

UNIT-II: Purchase Management

Purchase parameters, Scientific purchasing - Purchase Department - Duties, 8R's of purchasing - Buying procedure – Methods-Vendor Development- Scope - Source selection - Evaluation of potential vendors - Vendor Rating-- Factors and methods, Public buying.

UNIT-III: Material Handling and Storing

Objectives, Importance, Relationship between plant layout and material handling - Methods, Principles, Equipment of material handling - Computation of material cost - Material Handling ratios- Organization of stores & Stores layout. Stores procedure – documentation- Safety and security of materials

UNIT-IV: Management of Inventories

Objectives of inventory management - Kinds of inventories - Benefits of holding inventory - Determination of EOQ, P&Q system, Economic Batch Quantity -Assumption - Determination of stock levels, Reorder level, Maximum and Minimum level- Material Requirement Planning (MRP)

UNIT-V: Sub-contracting and Global sourcing

Value Engineering and Value Analysis – Concept and process – Outsourcing- Sub-contracting – Reasons for subcontracting-- Criteria for selecting sub-contractors and types – Sub-contract rate

fixing metrics – Global Sourcing and buying - Importance - Green purchasing and recent trends.

LEARNING OUTCOMES

Unit I	The learner will be able to understand the basic concepts of materials management and its significance
Unit II	The learner will be able to know the purchase management and its parameters.
Unit III	The learner will be able to analyse of material handling system-layout, methods and principles of material handling
Unit IV	The learner will be able to discuss about the material control and inventory management techniques
Unit V	The learner will be able to understand about global sourcing and sub-contracting

Course Code: CIVOL112
Semester: I

ENVIRONMENTAL STUDIES - I

Course Objective:

This course aims to introduce the student to the interdisciplinary study of environmental issues in the science and humanities. The main object of this study is, to understand the central role that human environmental perceptions have played and continue to play in the creation of both sustainable and unsustainable relations with nature. It creates environmental awareness amongst the students.

Unit I Introduction and Natural Resources

Natural Resources: Renewable and non-renewable resources – Associated problems – Forest Resources – mineral resources – water resources - Food resources - Energy resources (Renewable and non-renewable) - Land resources - Role of intellectuals in conservation of natural resources .

Unit II Eco-systems and Biodiversity

Eco-systems: Concept of an ecosystem - Structure of an ecosystems – how they work (ecosystem) Elements in living and non-living systems – Energy laws biotic structure – Bio diversity & importance – Conservation of Bio diversity categories of organisms, feeding and non-feeding relationship — Nutrient cycles.

Unit III Environmental Pollution

Pollution – Air pollution, Water pollution, Soil Pollution and Noise Pollution– their sources impacts and control strategies – Role of individual in prevention and control of Pollution

Unit IV Natural Disasters

Disaster Management - Land Slides, Cyclone, Flood and Earth Quake – Causes – their effects – control Strategies - The Changing Nature Of Earth- global warming – International Treaties.

LEARNING OUTCOMES

Unit 1	The learner will understand the importance, causes, effect and remedial measures of
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	various natural resources.
Unit II	The learner will learn the rich biological wealth of our country, threats to it and various conservation methods.
Unit III	The learner will have the understanding of the causes, effects and remedial measures of different types of environmental pollution.
Unit IV	The learner will have the understanding of the causes, effects and control strategies of different environmental disasters.

Course Code: BBALOL201

BUSINESS ORGANISATION

Semester: II

Course Objective:

This course is meant to acquaint the students with the different forms of business and its combinations.

UNIT - I: Introduction to Business Organisation

Meaning and types of business - Characteristics - Objectives of business - Occupation and Profession - Evolution of business - Importance of Business Organization - Forms of Business Organization - Sole Proprietorship, Partnership, Joint Stock Company, Hindu Undivided Family and Cooperatives - Formation, advantages and disadvantages and suitability of these types of organizations.

UNIT – II: The process of organization

Importance and Principles of organization - Theories of Organization - Types - Line, Line and staff, Functional, Matrix and Committee organization - Advantages and disadvantages and suitability of these types of organizations

UNIT - III: Functional areas

Production - Plant location and layout - Production planning and control - Marketing: Concept and function of marketing – Human resource management and its functions - Finance functions.

UNIT – IV: Business combinations

Causes - Types - Effects of business combinations - Introduction of Limited Liability Partnership - Comparison of traditional partnership and LLP - LLP in India.

UNIT – V: Retail and wholesale trade

Retail trade – Meaning and types, organized retailers, functions - Wholesale trade - types of wholesalers - Functions of wholesaler.

LEARNING OUTCOMES

Unit I	The learner will have an understanding on characteristics and importance of business organisation and types of business organization
Unit II	The learner will know process of organization
Unit III	The learner will be able to know the functional areas like production, marketing, finance and personnel management.
Unit IV	The learner will be able to analyse the causes and effects of business combination.
Unit V	The learner will be able to understand the different types and functions of retailers and wholesalers.

Course Code: BBAOL202 PRINCIPLES OF FINANCIAL ACCOUNTING

Semester: II

Course Objective:

To impart the learners the fundamental knowledge of accounting and various concepts in financial accounting

UNIT I

Definition of book- keeping Accounting and Accountancy - Scope of financial accounting - objectives and limitations of financial accounting - Kinds of Accounts - Double entry system of accounting - Rules of debit and credit.

UNIT II

Journal - subdivision of journal - Purchases Book - Sales Book – purchases Returns Book – Sales returns Book - Bills Receivable Book -Bills Payable book - Cash Book - Single, Double and Triple column Cash Book - Analytical Petty Cash Book – Journal Proper - Ledger – ledger posting closing and balancing - Different kinds of balances - Trial Balance and its preparation.

UNIT III

Financial Statements – Manufacturing, Trading, and Profit and Loss accounts - Preparation of Financial statements (With adjustments) – Balance Sheet

UNIT IV

Depreciation – straight line, diminishing balance method of providing depreciation Inventory Valuation – FIFO, LIFO, Simple & Weighted average methods of Inventory valuation - Bank Reconciliation statement

UNIT V

Accounts of Non-Trading Institutions – Revenue vs. Capital items - Receipts & Payments account – Income & Expenditure account – Construction of Balance Sheet.

LEARNING OUTCOMES

Unit I	The learner will have an understanding towards accounting concepts and conventions.
Unit II	The learner will be able to understand the process of accounting
Unit III	The learner will be able to prepare the financial statements.
Unit IV	The learner will acquire knowledge about the various methods of depreciation and the different methods in inventory valuation.
Unit V	The learner will have an understanding about the accounts of Non-trading concerns.

Course Code: BBAOL203

MANAGERIAL ECONOMICS

Semester: II

Course Objectives: To provide a strong foundation in economic theory and to use economic analysis to the problems of business.

Unit - I: Introduction to Economics

Meaning, Nature and Scope of Economics - Micro and Macro - Basic Economic Problems – Different Economic systems –Production Possibility curve- Role of a Managerial Economist – Decision making.

Unit - II: Demand and Supply

Demand: Concept, Law of Demand, Types, Law of Diminishing Marginal Utility, Elasticity of Demand, Demand forecasting methods. Supply: Law of Supply, Elasticity of Supply, Market Equilibrium - Consumer Behavior & Consumer Equilibrium.

Unit - III: Theory of Production & Cost Analysis

Production function-factors of production-factor payments-Theory of Production, relationship among total, average and marginal product functions, -production with two variable inputs – Cost analysis-Types of costs – Relationship between cost curves- Economies of scale and economies of scope.

Unit - IV: Different Market forms

Market structure- total and average cost curves in the long term and short run-relationship between average and marginal cost curves - Price and output determination under perfect, monopolistic, monopoly and oligopoly market conditions-long term and short term.

Unit - V: Macro economics

Objectives of Macro economics - Circular Flow of Income - National income - concepts and measurement - Credit creation – Role of Financial institutions - Inflation- meaning - measure and effects – Role of MNCs in India - Foreign Trade –Balance of Trade & Balance of Payments- Role of WTO in regulating trade among countries.

LEARNING OUTCOMES

Unit - I	The learner will understand the fundamental aspects of managerial economics and also the role of managerial economist.
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Unit - II	The learner will be able to understand demand, supply and consumer behaviour and also about consumer equilibrium.
Unit - III	The learner will understand the production function and also learn about the managerial application with regard to the economies of scale and economies of scope.
Unit – IV	The learner will understand the market structure and managerial applications in price fixation.
Unit – V	The learner will understand the various aspects of managerial economics like national income, inflation etc.

Course Code: BBAOL204 RETAIL SUPPLY CHAIN AND LOGISTICS MANAGEMENT

Semester: II

Unit-I: Fundamentals of Retailing

Retailing significance and functions: Retail formats and trends: Retail Marketing Mix: Organised and Unorganised Retail in India: Role of retailing in distribution: Retail Locations and Factors influencing location choice: Concept of Retail Merchandising: Concept of retail Store Operations: e-Tailing and Trends.

Unit -II: Retail Supply Chain & Channel management

Supply Chain Management- Concept, Objectives and Significance: Process view and components of supply chain: Integrated Channel Management- HMS,VMS: Omni Channel Management: Channels for consumer and industrial goods: Transportation – Types and achieving trade-off between customer service and cost.

Unit -III: Retail Logistics -Concept and Scope

Concepts of Retail Logistics and supply chain- Dimension of Logistics: Macro and Micro aspects- Supply chain contours: Backward and forward linkages- Supply chain efficiency- Logistics as a competitive edge driver

Unit-IV: Logistics and Retail Marketing

Logistics as a Support function of Order Fulfilment, Assembling & Labelling from Multi-storage points and Delivery- Logistics as an interface of Market forecasting, Stock level management, invoice or sales documentation, picking products, consolidation, transport packaging, packing, marking, preparing outbound documentation and shipping out by loading into containers- customer facilitation tracking outbound shipments: Reverse Logistics.

LEARNING OUTCOMES

Unit – I	The learner will get a basic idea on Retailing
Unit – II	The learner will gain insights on the dimensions of supply chain and marketing channels
Unit – III	The learner will know the conceptual clarity on retail logistics and certain contours of it
Unit – IV	The learner will be able to comprehend the role of logistics in retail marketing

Course Code: CIVOL222

ENVIRONMENTAL STUDIES II

Semester: II

Course Objective:

This course aims to introduce the student to the interdisciplinary study of environmental issues in the science and humanities. The main object of this study is, to understand the central role that human environmental perceptions have played and continue to play in the creation of both sustainable and unsustainable relations with nature. It creates environmental awareness amongst the students.

Unit I Municipal Solid Waste and Hazardous Waste

Basics Of Municipal Solid Waste, Management Of Municipal Solid Waste, Agony Of Seas, The Price Of Panacea - Biomedical Waste, Effects And Controls Of Water Pollution due to biomedical waste, Nuclear Hazards, Industries & Waste, Dealing With Industrial Waste, Environmental Rights, Environmental Threats.

Unit II Legislation and Sustainable Development

Public Environmental Awareness, Ethics Of Environmental Education, Environmental Values, Indian Legislative Steps To Protect Our Environment, Water Management Practices, Sustainable Development, Urban Problems Related To Energy, Resettlement And Rehabilitation.

Unit III Human Population and human Health

Environment And Climate Change, Sex Ratio, Population Explosion, Impact Of Human Population On Environment, Infectious Diseases and Waterborne Diseases, HIV/Aids, Cancer & the Environment, Environment And Human Health, Chemicals In Food.

Unit IV Varieties of Plants and Trees

Typha : A Bioremedial Plant, Castor Bean, Pinus, Malaria, Machla : A Serene Village, The Secret Of Taste – Chilli, Common Avenue – Trees, Common Village Trees, Flower - The Beautiful Gift Of Nature, Silk Cotton Tree : Kapok, Cotton Yarn.

LEARNING OUTCOMES

Unit 1	The learner will understand the importance, causes, effect and remedial measures of municipal solid waste and hazardous waste.
Unit II	The learner will learn the Indian Legislative steps to protect our Environment and Sustainable Development
Unit III	The learner will have the understanding the importance of population control and different deceases due to environmental degradation.
Unit IV	The learner will learn the various plants, trees, yarns and their importance on Environment.

Course Code: BBAOL301

BASICS OF COMPUTING

Semester: III

Course Objective: To help the learners understand the underlying principles of various concepts available for solving the problems.

UNIT I

Computer Basics: Characteristics, Evolution of Computers, Generations, Classification, Applications of computers. Number Systems: Number Systems, Conversion between number bases, Arithmetic System, signed and unsigned numbers, overflow. Logic Gates: Binary coding, Logic gates, Boolean algebra, Combination of Logic gates

UNIT II

Primary Memory: Memory Hierarchy, RAM and its types, ROM and its types Secondary Storage: Classification, Magnetic tape, Disk, Optical Disk Input Devices: Keyboard, Pointing-Mouse, Light Pen, Touch Screen, Speech Recognition, Digital camera, Scanners, optical Scanners Output Devices: Classification of Output, printers, monitors, audio output, projectors, Terminals.

UNIT III

Problem Solving with Computers: Introduction Defining problem-characteristics of problem-Working Backwards towards solution-Top down design, Breaking problems into sub problems ,Introduction to Pseudo code and flowcharting, exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function, generation of the Fibonacci sequence, base conversion.

UNIT IV

Algorithms For Problem Solving: Finding the square root of a number, smallest divisor of an integer, GCD, generating prime numbers, Generation of pseudo – random numbers, raising a number to a large power, computing the nth Fibonacci numbers

UNIT V

Arrays and Sorting techniques: Array Concepts; Sorting of Arrays, Array order reversal, Histogramming, finding the maximum and minimum number in a set, removal of duplicates from an ordered array. Sorting: Sorting by exchange, selection, insertion. Text processing- Characters to numbers conversion Keyword searching in a text

LEARNING OUTCOMES

Unit I	The learner will have an understanding of number systems, various gates and basic concepts of computer.
Unit II	The learner will have understanding of Memory, Input and Output devices.
Unit III	The learner will be able to write algorithms for solving the various problems.
Unit IV	The learner will be able to write algorithms for solving the various problems.
Unit V	The learner will be able to understand array and sorting techniques and some text processing techniques.

Course Code: BBAOL302 INSURANCE - LAW AND PRACTICE

Semester: II

Course Objective:

This course enables the students to know the fundamentals of insurance law and practice.

UNIT - I

Introduction to Insurance: Meaning, significance - Definition of risk and uncertainty, essential requirements and principles of risk insurance - Reinsurance - Nationalization of insurance business in India - Agents - Classification, duties, rights and termination of agency.

UNIT - II

Life Insurance: Law relating to Life insurance - General principles of life insurance contract - Proposals and policy - Assignment and nomination - Title and claims - Concept of trusts in life policy - Life Insurance Corporation - Role and functions.

UNIT - III

General Insurance – Fire Insurance: Law relating to General insurance - Different types of general insurance - general insurance and life insurance; Fire Insurance - Nature of fire insurance - Various types of fire policy - Subrogation - Double insurance - Contribution - Proximate cause.

UNIT - IV

General Insurance – Marine Insurance: Law relating to Marine insurance - Types; insurable interest, proximity cause, voyage and warranties; Health and Medical insurance - Motor insurance - Accidents insurance.

UNIT - V

Insurance Innovation: Insurance surveyorship - Appointment, legal provisions and licensing, functions - Bancassurance and its benefits.

LEARNING OUTCOMES

Unit – I	The learner will be able to understand the meaning of insurance, the concept of risk and uncertainty, nationalization of insurance business, concept of reinsurance and the insurance agents.
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Unit – II	The learner will have an understanding about the Life Insurance Corporation of India, its role and functions, principle of life insurance and the law relating to the life insurance
Unit – III	The learner will acquire knowledge about the concept of general insurance- its types, fire insurance-its principles and double insurance
Unit – IV	The learner will be able to understand the concepts of marine, health and medical, motor and accident insurance
Unit – V	The learner will have an understanding about Insurance innovation, Insurance surveyorship and banc assurance

Course Code: BBAOL303 WAREHOUSING & DISTRIBUTION OPERATIONS

Semester: II

Course Objectives : To develop competencies and knowledge of students to become Warehouse professionals, To orient students in the field of Logistics and To help Students to understand Warehousing and distribution center operations

Unit-I

Introduction to warehousing - Need and Importance of warehouse - Types of Warehouses - Functions in a warehouse -benefits of warehousing-warehouse layouts– Associate Warehouse-Warehouse manager-role- challenges-lean warehousing-people Management-Warehouse Audit.

Unit-II

Warehousing Process-Receiving and Dispatch of Goods- stages– Stages involved receipt of goods-Advanced shipment notice (ASN)-Procedure for Arranging of goods on dock for counting- Formats for recording of goods unloaded from carriers- Goods Receipt Note (GRN) Put away of Goods- list- need-storage locations - codes and its application- Process of put away activity- Procedure to Prepare Warehouse dispatches.

Unit- III

Warehouse Packaging-Warehouse Activities - Procedure to Prepare Warehouse dispatches- quality parameters - Quality check-need for quality check-importance of quality check. Procedure to develop Packing list / Dispatch Note-Cross docking method - Situations suited for application of cross docking - Information required for coordinating cross docking- Importance of proper Packing-Packing materials - Packing machines -Reading labels.

Unit- IV

Warehouse management-Warehouse Utilization Management - Study on emerging trends in warehousing sector - DG handling- Material Handling Equipment in a warehouse- Inventory Management of a warehouse - Inbound & Outbound operations of a warehouse and handling of Inbound & Outbound operations. Distribution –Need for physical distribution – functions of distribution - Channels of distribution: role of marketing channels – channel functions – channel structure — choice of distribution channels.

Unit-V

Warehouse Safety Rules and Procedures - The safety rules and Procedures to be observed in a Warehouse – Hazardous cargo – Procedure for Identification of Hazardous Cargo – safety data sheet – Instructions to handle hazardous cargo – Familiarization with the industry. Health, Safety & Environment - safety Equipment's and their uses – 5S Concept on shop floor. Personal protective Equipment's (PPE) and their uses.

LEARNING OUTCOMES

- Students will be able to apply the Basic knowledge of Warehousing and distribution centre operations in the real-life situation
- This subject will enable them to enhance their ability and professional skills

Course Code: BBAOL304 FUNDAMENTALS OF MANAGEMENT ACCOUNTING

Semester: III

UNIT - I

Management accounting: Nature, scope, objectives, Functions - Distinction between management accounting and financial accounting - Distinction between management accounting and cost accounting - Tools of Management accounting - Limitations of management accounting - Financial statement analysis - Comparative statement - Common size statements and trend analysis - Ratio analysis: Liquidity, solvency and profitability ratios.

UNIT - II

Fund flow analysis: Meaning of fund - Importance of fund flow statement - Preparation of fund flow statement: Schedule of changes in working capital - Fund from operation - Fund flow statement.

Cash flow analysis: Meaning, difference between Fund flow Statement and Cash flow statement - Preparation of cash flow statement; cash from operation and cash flow statement.

UNIT - III

Budget, Budgeting and Budgetary Control: Objectives, features, essentials of successful budgetary control - Preparation of various budgets: Fixed and Flexible budget, Sales Budget, Production Budget, Material Budget, Cash Budget, Zero base budgeting and Master Budget.

UNIT - IV

Capital Budgeting: Nature of investment decisions - Investment evaluation criteria: Pay Back Period - Accounting Rate of Return - Net Present Value - Internal Rate of Return - Profitability Index - NPV and IRR comparison - Capital rationing.

UNIT - V

Marginal costing: Features of marginal costing - Absorption costing and Marginal costing - Break Even Analysis - P/V ratio - Margin of safety - Application of marginal costing in decision making regarding: profit planning - Fixation of selling price - key factor - Make or Buy decision - Level of activity planning - Profit planning and product mix.

LEARNING OUTCOMES

Unit I	The learner will be able to know how to prepare Ratio analysis, comparative statement and common size statement and meaning and importance of management accounting
Unit II	The learner will have an understanding about how to prepare fund flow and cash flow analysis.
Unit III	The learner will be able to know how to prepare budget and various types of budgeting.

Unit IV	The learner will have an understanding about capital budgeting and its various methods.
Unit V	The learner will be able to know marginal costing, Break even analysis and margin of safety and also applications of marginal costing in decision making.

Course Code: BBAOL305 PRINCIPLES OF MARKETING

Semester: III

Course Objectives: To facilitate the students to understand the conceptual framework of marketing and its applications in decision making.

Unit - I: Introduction

Marketing- Meaning- Concept, Functions, Marketing planning and implementing Marketing programmes- Marketing Environment- Market Segmentation- Consumer behaviour- marketing research and Marketing Information System.

Unit - II: Product Development

Product- Meaning- product Planning- Policies New product development- Product Life Cycle- branding – Packing and Labeling

Unit - III: Promotion

Promotion- promotion Mix- Advertisement- Message- Copywriting- Advertisement- Budgeting- Measuring Advertisement Effectiveness- Media strategy- sales promotion- Personal selling and publicity

Unit - IV: Distribution Management

Physical distribution- Distribution Mix- Managing Channel- intermediaries- Transport and Warehousing- distribution strategies- Distribution Cost analysis

Unit – V: Marketing Strategies

Tools for competitive differentiation of product, Strategies for competitors- lenders- challenges - Marketing of services-Consumerism and Consumer Protections- evaluating and controlling marketing performance- direct selling, Direct marketing – E Marketing – Mobile Marketing – Social Media Marketing.

LEARNING OUTCOMES

Unit – I	The learner will have to understand the concepts in marketing and analyse the marketing environment. Further they will have exposure on consumerism and marketing strategies.
Unit – II	The learner will be able to understand the process of production and other associated activities for his better knowledge enhancement.
Unit – III	The learner will be able acquire knowledge about Promotion, Promotion Mix- Advertisement Strategies.
Unit – IV	The learner will have an understanding of the Physical distribution- Distribution Mix. Managing Channel. Intermediaries. Transport and Warehousing.
Unit – V	The learner will be able to understand the marketing strategies.

Course Code: BBAOL401

FINANCIAL SERVICES

Semester: IV

Course Objective:

The objective of this course is to acquaint the students with the basics of different financial services available in the Indian Financial market.

UNIT - I

Introduction: Meaning, definition and features of financial services - Significance of financial services - Types of financial services - Growth and development of financial services in India - Regulation of financial services.

UNIT - II

Merchant Banking: Meaning, definition, scope, functions and objectives of merchant banking - Classifications of merchant bankers - regulation of merchant bankers by SEBI; Management of New Issues - Indian experience.

UNIT - III

Venture Capital: Meaning, features, scope, importance - Methods of venture financing - Indian scenario.

Lease Financing: Meaning, definition and types of leases; advantages and disadvantages - Evaluation of lease financing - purchase v/s leasing; borrowing v/s leasing; evaluation from lessor and lessee's point of view - Accounting for leases as per AS-19 in India.

UNIT - IV

Factoring: Meaning, objectives and types of factoring; factoring v/s bill discounting; advantages and disadvantages of factoring - Factoring in India.

Forfaiting: Definition, factoring v/s forfaiting - working of forfaiting, benefits and drawbacks of forfaiting - Forfaiting in India.

Dematerialisation and Rematerialisation: Meaning, objectives, functions, scope and process of dematerialization and rematerialisation - Merits and demerits; progress of DEMAT account in India - NSDL & CDSL - Growth and functioning.

UNIT - V

Stock Broking: Stock brokers, Sub-brokers & Foreign brokers - Registration, payment of fee, code of conduct - General obligations and responsibilities - Capital adequacy norms for brokers; Stock market trading - Segments for cash trading - Wholesale Debt Market (WDM), Capital Market (CM), and Central Government Securities; Derivatives trading - Meaning, types - clearing and settlement.

LEARNING OUTCOMES

Unit I	The learner will be able to understand different types of financial services and need for Regulation of financial services in India.
Unit II	The learner will have an understanding of important and needs merchant banking services in India and different kinds of services offered by Merchant bankers. Further, learners will understand the role of merchant banking in primary market issue management.
Unit III	The learner will be able to understand risks involved in venture capitalist and how companies generate revenue for growth. The learners will understand how venture capital funds are established and the venture capital funding process.
Unit IV	The learner will have an understanding of importance and needs of factoring and forfeiting in India and mechanism.
Unit V	The learner will be able to understand different types of brokers and importance of brokers in placing different market orders.

Course Code: BBAOL402 PRINCIPLES OF HUMAN RESOURCE MANAGEMENT

Semester: IV

Course Objective:

This course aims at familiarizing the fundamental concepts, different dimensions of Human Resource Management and to achieve the organizational goals.

UNIT – I

Nature, Functions and Importance of Human Resource Management, Role of Human Resource Manager- Human Resource Planning: Objectives of HRP and factors influencing HRP, Process of HRP, Job Analysis: Job Description and Job specification. Recruitment: Sources of Recruitment, Selection process Tests and Interviews, Induction.

UNIT – II

Training and Development: Concepts and Importance. Identification of Training Needs, Types of Training, On-the-job and Off-the-job methods of training Methods of Executive Development, Career Planning: Meaning, Objectives Process Career Development Cycle.

UNIT – III

Concept and Objectives, Methods of Performance Appraisal; Problems in Performance Appraisal, Job changes: Transfers, Promotions, Demotion and retrenchment. Job evaluation: Concept and methods

UNIT – IV

Wages and salary Administration (WASA) - Objectives, factors, Methods of Payment of wages, Executive compensation, Incentives and fringe benefits - HR analytics – Significance and Benefits

UNIT – V

Employee welfare: Meaning, Significance & types. Industrial relations: Objectives, significance- Trade unionism: Functions and principles; Introduction to Collective Bargaining and Grievance

LEARNING OUTCOMES

Unit I	The Learner will be able to understand the basic concepts, HR process, recruitment, selection models and functions of HRM.
Unit II	The Learner will be able to explain the types of training, need for the training, executive development and effects of training practices.
Unit III	The Learner will be able to understand the performance appraisal methods, transfer, promotion and demotion principles.
Unit IV	The Learner will be able to understand wage and salary administration, incentive plans and executive compensation.
Unit V	The Learner will be able to understand employee welfare, industrial relations, trade union practices, collective bargaining, grievance handling mechanism and industrial disputes

Course Code: BBAOL403

BANKING THEORY, LAW AND PRACTICE

Semester: IV

Course Objective:

The objective of this course is to facilitate understanding of the conceptual framework of banking law and practice.

UNIT - I

Banking: Origin of banks - Banking systems - Unit banking - Branch banking - Investment banking and Mixed banking - features, merits and demerits - Classification of banks - Co-operative banks, Regional Rural Banks, Central bank, Commercial banks, Development Banks and Foreign banks - features, functions. Role of banks in the economic development of a country.

UNIT - II

Deposits and Lending: Various types of deposits - Precautions in opening bank accounts of customers particularly individuals including Minors - Joint account holders - Partnership firms - Joint stock companies - Clubs and Associations - Joint Hindu family; Lending - Types - Principles of sound lending - general precautions in lending against various types of securities like stock, Life policies and Gold ornaments.

UNIT - III

Banker and Customer: Meaning and definitions - Relationship between them - General and Special - Obligation to honour customer's cheques - Obligation to maintain secrecy - Banker's lien - Right of appropriation - Rule in Clayton's case - Right to set off - Garnishee order.

Negotiable Instruments Act, 1881 - Negotiable instruments - Characteristics of negotiable instruments - Bill of Exchange - Characteristics of Bill of Exchange - Promissory Note - Characteristics of promissory note; Letter of Credit - Types of letter of credit - Liabilities of parties of letter of credit;

UNIT - IV

Paying and Collecting banker: Cheque - Features - Crossing - Endorsements. Paying Banker - Meaning, duties and responsibilities - Statutory Protection - Payment in due course - Refusal of payment - Consequences of wrongful dishonour - Collecting Banker - Banker as a holder for value - Banker as agent - Statutory Protection - Duties and responsibilities.

UNIT - V

Recent development in banking sector: Relationship banking - Internet Banking - Mobile Banking - Digital Cheques - Smart Cards - Electronic Clearing service (ECS) - Electronic Funds Transfer (EFT) System - Core Banking - Bank-assurance.

LEARNING OUTCOMES

Unit I	The learner will be able to understand the banking systems and role of banks in economic development of the country.
Unit II	The learner will be able to understand various deposits and lending, precautions in opening accounts and lending.
Unit III	The learner will be able to understand the banker-customer relationship, garnishee order and provisions related to Negotiable Instruments Act, 1881.
Unit IV	The learner will be able to cross and endorse cheques; understand the statutory protection for collecting banker.
Unit V	The learner will be able to understand the recent developments in the banking sector.

Course Code: BBAOL404

COST ACCOUNTING

Semester: IV

Course Objective:

To provide a basic knowledge in the field of cost accounting, material, labour and overhead control and to gain an insight in costing methods, activity based costing and target costing.

UNIT – I: Introduction to Cost Accounting

Introduction – Definition, Scope and nature of cost accounting, Meaning of Cost, costing and Cost Accounting – Comparison between Financial Accounts and Cost Accounts – Application of Cost Accounting – Designing and installing a Cost Accounting system – Cost concepts - Classification of Costs – Demerits of cost accounting - Cost Unit – Cost Center – Elements of Cost – Preparation of cost sheet – Tenders and Quotations.

UNIT – II: Material Costing

Classification of materials – Material Control – Purchasing procedure – Store keeping – Techniques of Inventory control – Setting of stock levels – JIT Inventory - perpetual inventory, ABC Analysis, VED Analysis, EOQ – Stores ledger - Methods of pricing - Materials issues – Treatment of abnormal losses

UNIT – III Labour Costing

Control of labour cost – Labour Turnover – Causes and effects of labour turnover – Meaning of Time and Motion Study, Merit Rating, Job Analysis, Time keeping and Time booking – Idle time, causes and treatment – Overtime – Methods of Wage Payment, Time rate and Piece Rate – Incentive Schemes.

UNIT – IV Overhead Costing & Reconciliation of cost and financial accounts

Definition – Classification of overheads – Procedure for accounting and control of overheads – Allocation of overheads – Apportionment of overheads – Repeated Distribution method – Simultaneous equation method – Absorption of OH's – Methods of Absorption – Treatment of under and over absorption - Reconciliation of cost and financial accounts.

UNIT – V Methods of costing

Process Costing –Transport costing- Job costing – Contract and Batch Costing –Target costing -Activity based costing

LEARNING OUTCOMES

Unit I	The learner will have an understanding of the scope and nature of cost accounting, comparison between financial accounts and cost accounts, cost concepts, classification of costs and cost sheet.
Unit II	The learner will have an understanding of material purchasing procedure, store keeping and techniques of inventory control.
Unit III	The learner will have an understanding of labour cost, labour turnover, methods of wage payment and incentive schemes.
Unit IV	The learner will have an understanding of classification of overheads, procedure for accounting and control of overheads and reconciliation of cost and financial accounts.
Unit V	The learner will have an understanding of costing methods and application of the methods in several industries and services.

Course Code: BBAOL405 AIR CARGO OPERATION PROCESSES

Semester: IV

Course objectives: To develop competencies and knowledge of students to become air cargo professionals; To acquaint with air cargo regulations, To develop knowledge of air cargo documentation; To familiarize students with air cargo industry processes and To create awareness on cargo safety management

Unit-1:

Introduction to Air Cargo: Aviation and airline terminology - IATA areas Country – Special Cargo Handling- Perishables-Dangerous Goods-Carriage of Live –Animals-Valuable Cargo-Human Remains - - Restricted articles on Board-Unaccompanied baggage (UB)/Personal Effect

Unit -II:

Different Types of Cargo Rates-Export Cargo and Import Cargo -Types of Contract between Consignor (Shipper) & Consignee –Currency Regulations- Import & Export Regulations in India, Customs Act, INCO terms, GST

Unit-III:

Air Waybill- Introduction to Air Waybill (AWB), Master Air Waybill (MAWB), House Air Waybill (HAWB)-Consolidation and Mixed Consignment

Unit-IV:

Cargo Warehouse and Buildup - Unit Load devices (ULD) – Importance- types of ULDs- introduction of cargo warehouse, cargo build up procedure, cargo manifest

Unit -V:

Safety of the Aircraft/Passenger/Crew-Safety of the Cargo-Time Management- Handling Cargo in Airport- The Cargo Handling organizations- in Airports -Cargo Handling Procedures-Handling of Equipment at airport loading and unloading

Learning outcomes:

- Students will develop competencies and knowledge to become air cargo professionals
- Students will familiarize about air cargo regulations
- Students will develop knowledge on air cargo documentation
- Students will be familiar on air cargo industry processes
- Students will have awareness on cargo safety management

Course Code: BBAOL501 FUNDAMENTALS OF E-COMMERCE

Semester: V

Course Objective:

This course will help the learner to describe the fundamentals of e-commerce, identify e-commerce domains, hardware, software, service providers, and challenges. It will also help the learner to identify planning techniques and measures of effectiveness for an e-commerce application.

UNIT – I

Overview of E-commerce: Evolution of internet and E-Commerce – Definition, Types of E-commerce, Traditional commerce vs. E-commerce, E-commerce Framework, Convergence, anatomy of E-commerce – OSI layer architecture – E-commerce myths - Web commerce.

UNIT – II

The E-commerce domain: Problems with non ERP system, ERP system architecture, ERP applications, configurations and vendors, OLAP vs OLTP, Customer relationship management (CRM), Supply Chain Management (SCM) - Components of knowledge management E-Procurement and its types.

UNIT – III

Facing challenges in E-commerce: Costs involved in E-commerce – Starting online store – Security threats, Need for network and cyber security – Internet Transactions and Payment Systems - Staffing concerns - International market place.

UNIT – VI

Achieving goals in E-commerce: Planning techniques for implementing E-commerce solutions - Evaluating risk in E-commerce - Measuring the success of E-commerce initiatives

UNIT – V

E-commerce: Hardware, Software and Service providers: Identifying software involved in E-commerce - Identifying hardware involved in E-commerce - identifying service providers involved in E-commerce.

LEARNING OUTCOMES

The learner will be able to

Unit – I	Discuss fundamental concepts of e-commerce.
Unit – II	Identify e-commerce domains such as ERP, OLAP and OLTP Describe management concepts like CRM, SCM.
Unit – III	Appraise the security challenges in e-commerce. Compare internet transaction methods.
Unit – IV	Identify the planning method and measuring factors for successful ecommerce business.
Unit – V	Describe the importance of hardware, software and service provider requirements for Ecommerce business.

Course Code: BBAOL502

AUDITING

Semester: V

Course Objective:

This course aims at imparting knowledge about the principles and methods of auditing and their principles.

UNIT – I

Introduction to Auditing: Definition of audit - Nature, scope and limitation of audit - Distinction between book-keeping, accounting and auditing - Distinction between investigation and auditing - Audit process - Objectives of auditing - Detection and Prevention of errors and frauds - Basic principles governing audit - Classification of audit - Internal audit and External audit.

UNIT – II

Audit Planning: Concept of Materiality - Standard auditing practices - Audit engagement - Audit planning - Factors to be kept in mind before commencing a new audit - Audit programme - Audit working papers - Audit files - Audit note book - Control of quality of audit work.

Verification of evidence: Detailed checking Vs. Sample checking - Audit procedure for obtaining evidence - Source of evidence - Methods of obtaining audit evidence - Physical verification, documentation and direct confirmation - Audit sampling - Test checking - Techniques of test checks.

UNIT – III

Internal control and Internal Check: Objectives of internal control - Characteristics of an effective internal control system - Methods of evaluation of internal control system - Elements of internal control - Internal check - Objectives, principles and advantages of internal check system - Internal check as regards cash receipts, cash payments and sales, purchases and stores - Internal Audit - Meaning, objectives and need.

UNIT – IV

Vouching: Meaning, objectives and importance - Vouching of cash receipts and cash payments - Vouching of trading transactions - Vouching of special transactions - Examination of books of accounts.

Capital and Revenue expenditure - Verification and Valuation of assets and liabilities - Depreciation - Reserve - Distinction between reserve and provision.

UNIT – V

Company audit: Appointment, remuneration, removal of auditors - Qualification and disqualification of auditors - Powers, duties and liabilities of auditors - Audit of share capital - Share transfer audit.

Statutory report and audit - Audit of branch office accounts - Audit report - Special purpose audit - Proprietary audit - Efficiency audit - Government audit.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of the basic concepts of auditing. In addition the learner will be able to know the principles of audit and its classification.
Unit II	The learner will be able to learn about the auditing process as well as auditing procedures and evidence verification.
Unit III	The learner will be able to understand about the internal check, internal control and internal audit.
Unit IV	The learner will have an understanding of the principles pertaining to vouching process. In addition, the learner will be able to learn about verification and valuation of assets.
Unit V	The learner will be able to apply the principles concerning company audit. In addition the learner will be able know the process of audit report and Government audit.

Course Code: BBAOL503

BUSINESS LAW

Semester: V

Course Objective:

The objective of this course is to provide a brief idea about the framework of Indian business laws.

UNIT - I

The Indian Contract Act, 1872: Nature and kinds of contracts - Offer and Acceptance -Consideration - Capacity to contract - Free consent - Legality of object and consideration - Doctrine of Public Policy - Void agreements - Illegal agreements - Contingent contracts - Performance of contracts - Discharge of Contracts - Breach of Contract - Remedies for breach - Damages for breach of contract.

UNIT - II

Special Contracts: Indemnity and Guarantee - Bailment and Pledge - Contract of Agency - Relations of principal with his agent and third parties - Termination of Agency - Quasi Contracts.

UNIT - III

The Sale of Goods Act, 1930: Nature of contract of sale - Conditions and Warranties -Transfer of ownership - Performance of contract of sale - Rights of an unpaid seller -Auction Sale.

UNIT - IV

The Indian Partnership Act, 1932: Nature of Partnership - Registration of Firms -Relations of partners with one another and with third parties - Reconstitution of firms -Dissolution of Firms.

UNIT - V

The Information Technology Act, 2000: Definitions - Digital Signature and Electronic Signature - Electronic Governance - Attribution, Acknowledgement and Despatch of Electronic Records - Regulation of certifying Authorities - Electronic Signature Certificates - Duties of Subscribers - Penalties, Compensation and Adjudication - The Cyber Appellate Tribunal - Offences.

LEARNING OUTCOMES

Unit I	The learner will have an understanding about the essential elements of a valid contract and the possibilities of discharge of contract.
Unit II	The learner will be able to understand the various special contracts like indemnity contracts and the relationship between the principal and the agent.
Unit III	The learner will have an understanding about the nature and conditions of Sale of Goods Act, 1930.
Unit IV	The learner will acquire the knowledge about the nature of partnership and the provisions

	relating to Indian Partnership Act 1932.
Unit V	The learner will be able to understand the concepts of Information Technology Act, 2000 and their offences and penalties.

Course Code: BBAOL504 MANAGING GLOBAL BUSINESS

Semester: V

Course Objectives: To make students familiar with the theoretical background of global business and to understand the functional and strategic aspects relating to global business.

Unit - I: Introduction

International Business –Definition – Internationalizing business - Advantages – factors causing globalization of business - international business environment – country attractiveness –Political, economic and cultural environment – Protection Vs liberalization of global business environment.

Unit - II: International Trade and Investment

Promotion of global business – the role of GATT/WTO – multilateral trade negotiation and agreements – VIII & IX, round discussions and agreements – Challenges for global business –global trade and investment – Theories of international trade and theories of international investment

Unit - III: International Strategic Management

Strategic compulsions - Standardization Vs Differentiation – Strategic options – Global portfolio management - global entry strategy – different forms of international business – advantages - organizational issues of international business – organizational structures – controlling of international business – approaches to control – performance of global business performance evaluation system.

Unit - IV: Management of Global Business Functions

Global production – Location – scale of operations- cost of production – Make or Buy decisions – global supply chain issues – Quality considerations- Globalization of markets, marketing strategy – Challenges in product development, pricing, production and channel management - Investment decisions –

economic- Political risk – sources of fund- exchange – rate risk and management – strategic orientation
– selection of expatriate manager - Training and development – compensation.

LEARNING OUTCOMES

Unit – I	The learner will get a basic idea on the realm of International Business Management
Unit – II	The learner will gain insights on the international trade tariff and agreements with a brief history of it.
Unit – III	The learner will know the international strategic management by looking into various organizational structures.
Unit – IV	The learner will be able to comprehend the management functions with a global management perspective.

Semester: V

Course Objectives: To develop competencies and knowledge of students to become transportation professionals; To orient students in the field of Logistics and; To help Students to understand surface transportation including road and rail transport

Unit-I:

Introduction to surface transportation - Need for transportations - Role of transportations in logistics - Importance of transportations - Types of transportations metrics - functions of transportations - inter modal transport -various land transport carriers and their Load capacities - pricing and availability-verification of carriers and drivers - transit rules - traffic rules inside warehouse premises.

Unit-II:

Tracking of transport: Transportation Optimisation - Documentation for transportation – GST – E Waybill Filing - Transportation Telematics - Vehicle tracking system - Communication with vehicle driver or transport company -Probable reasons for the delay or any issues during transit.

Unit-III:

Types of Trucks and Load capacity/Organisation structure in a Transport organization/ Incident management systems & Processes - Explain types of temperature-controlled carriers - Discus hazmat goods rules -Importance of safety data sheet and labels - Procedure for Consolidation of consignments for optimal loads - Reporting discrepancies, loss or damage of goods in transit.

Unit-IV:

Benefits of efficient transportation systems/Study on an emerging trend in transportation sector/ pricing in transportation sector/govt regulations on transportation in India. Safety procedures during transit and emergency response steps - Importance of consignment number - GPS systems and tracking devices - Procedure for downloading and reading tracking data from devices.

Unit-V:

Customer Management/ Vendor coordination for return truck loads/DG Handling – features and facilities offered by railways factors influencing growth in rail logistics – suitability for different cargo and distance ranges segments – innovative schemes-facilities to popularize rail logistics in India

LEARNING OUTCOMES:

- Students will be able to apply the Basic knowledge of surface transportation in the real-life situation
- This subject will enable them to enhance their ability and professional skills

Course Code: BBAOL601

PRINCIPLES OF FINANCIAL MANAGEMENT

Semester: VI

Course Objective:

The objective of this course is to help students understand the conceptual framework of financial management.

UNIT - I

Financial Management: Importance of Finance - Meaning of business finance - Functions of finance – Meaning, objectives of financial management - Scope and importance of financial management - Liquidity Vs Profitability - Profit Maximization Vs Wealth Maximization - Methods of financial management - Organization of finance function.

UNIT - II

Working capital management: Classification of working capital - Need and importance of working capital - Factors determining working capital - Working capital financing mix - Working capital forecasting - Management of cash and Marketable securities: Motives, managing cash flow and models - Receivable management - Forming of credit policy, executing the credit policy - Inventory management - Motives, objectives, tools and techniques of inventory management

UNIT - III

Cost of capital: Cost of different sources of finance - Computation of specific cost of capital - Weighted average cost of capital - Marginal cost of capital; Leverages - operating, financial and combined leverages.

UNIT - IV

Capital structure: Points of indifference - Optimum capital structure - Theories: Net Income approach - Net operating income approach - Traditional and M.M. Hypotheses - Without taxes and with taxes - Factor determining capital structure.

UNIT - V

Dividend: Determinants of dividend policy - Types of dividend policies - Theory of irrelevance concept: MM models - Relevant concept: Gordon's models and Walter's models.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of the importance of finance and functions of finance. They also have gathering scope & objectives of financial management, methods of financial management, liquidity Vs. profitability.
Unit II	The learner will be able to understand an importance of working capital, factors determining working capital. They also collected credit policy methods in receivable management and tools and techniques of inventory management
Unit III	The learner will be able to analyse the cost of capital and different sources of finance. They also analyse various leverages-operating, financial and combined leverages.
Unit IV	The learner will have an understanding of the capital structure theories-Net income approach, Net operating income approach, and Traditional approach and MM approach.
Unit V	The learner will be able to apply different types of dividend policy – MM model, Gordon's model and Walter's model

Course Code: BBAOL602 BUSINESS DATA ANALYTICS

Semester: VI

Course Objectives: To understand about business analytics applications in managerial decision making; To formulate and solve business problems; To become familiar with the processes needed to develop, report, and analyze business data; To learn how to use and apply various business analytics tools for business problems; and to acquire knowledge on the Analytical Models, Data Dashboards and data visualization

UNIT I

Introduction to Business Analytics- Need-Importance- Types- Fundamentals of Business Analytics-Data types-tools

UNIT II

Descriptive Analytics-Describing and Summarizing Data- Types of Data – Modifying Data- Data Normality-Creating Distributions from Data – Measures of Location – Measures of Variability – Analyzing Distributions – Measures of Association between Two Variables

UNIT III

Predictive Analytics -Linear Regression & Forecasting – Simple Linear Regression Model – Least Square Method- Multiple Regression Model – Time Series Patterns – Forecast Accuracy – Moving Averages and Exponential Smoothing

UNIT IV

Prescriptive Analytics- What-If Analysis – Price Bundling- Excel Functions for Modeling – Linear Optimization Models – Simple Maximization Problem& Minimization Problem – Sensitivity Analysis- Fraud Detection

UNIT V Data Visualization Tools - Data Visualization –Visualization software – Table – Charts – advanced Data Visualization – Data Dashboards- Overview of Tableau, Rapid Miner, Power BI, R & Python

Learning Outcomes

- Students will understand business analytics applications in managerial decision making
- Students will be able to formulate and solve business problems
- Students will be familiar with the processes needed to develop, report, and analyze business data.
- Students will learn how to use and apply various business analytics tools for business problems
- Students will learn the analytical models, data dashboards and data visualization

Course Code: BBAOL603 INTERNATIONAL LOGISTICS MANAGEMENT

Semester: VI

Course Objectives: To develop competencies and knowledge of students to become International logistics management professionals; To orient students in the field of Logistics; and To help Students to understand international Logistics management

Unit-I:

International Logistics: Definition, Evolution, Concept, Components, Importance, Objectives; Logistic Subsectors; The work of Logistics; Integrated Logistics; Barrier to Internal Integration.

UNIT-II:

Customer Focused Marketing; International Marketing: Introduction, Definition, Basis for International Trade, Process, Importance; International Marketing Channel: Role of Clearing Agent, Various Modes of Transport, Choice and Issues for Each Mode, Transport Cost etc.

Unit-III:

Transportation Functionality and Principles; Multimodal Transport: Modal Characteristics; Modal Comparisons; Legal Classifications; International Air Transport; Air Cargo Tariff Structure; Freight: Definition, Rate; Freight Structure and Practice

Unit-IV:

Containerization: Genesis, Concept, Classification, Benefits and Constraints; Inland Container Depot (ICD): Roles and Functions, CFS, Export Clearance at ICD; CONCOR; ICDs under CONCOR; Chartering: Kinds of Charter, Charter Party, and Arbitration.

Unit-V:

International commercial documents - International contracts, terms of payments, international insurance, packaging for export, custom clearance and infrastructure: transportation, communication and utilities - Brokerage

LEARNING OUTCOMES:

- Students will be able to apply the Basic knowledge of International Logistics management in the real-life situation
- This subject will enable them to enhance their ability and professional skills in Logistics

Course Code: BBAOL604 ENTERPRISE RESOURCE PLANNING

Semester: VI

Course Objective:

This course will help the learner to discuss the technology and business process involved in the implementation of ERP. It also helps the learner to identify the impact of ERP on business modules, acquire knowledge of ERP products in the market and the integration of ERP products into the business process.

UNIT - I (ERP AND TECHNOLOGY):

Introduction: Business process-concepts - Risks and Benefits of ERP Technology - Related Technologies – Business Intelligence – Business Analytics - E-Commerce and E-Business –Business Process Re-engineering – Data Warehousing – Data Mining – OLAP – Product life Cycle management – SCM – CRM-GIS-ERP security.

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 - Success and failure Factors of ERP implementation.

UNIT - III (ERP IN ACTION & BUSINESS MODULES):

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):

Marketplace: Dynamics – SAP AG – SAP BW - Oracle – PeopleSoft – JD Edwards – SSA Global: Baan, ERP LN, and ERP LX.

UNIT - V (SYSTEM INTEGRATION):

Enterprise Application Integration: ERP and E-Business – ERP II – TQM: Total quality management – Trends in ERP.

LEARNING OUTCOMES

Unit – I	The learner will be able to describe the basic tools and technology involved in ERP.
Unit - II	The learner will be able to describe the process involved in implementation of ERP.
Unit - III	The learner will be able to identify the impact of ERP on business modules.
Unit - IV	The learner will be able to compare the ERP products in the market.
Unit - V	The learner will be able to discuss the ERP integration into the real time environment and its quality control.

Course Code: BBAOL605 COMPANY LAW AND SECRETARIAL PRACTICE
Semester: VI

Course Objective:

The objective of this course is to provide basic knowledge of the provisions of the Companies Act, 1956 along with relevant case laws.

UNIT - I

Introduction to Company: Nature of company - Kinds of companies - Formation and Incorporation of a company - Company secretary - Legal position of secretary - Qualification, appointment, rights, duties liabilities and dismissal of a company secretary - Incorporation of company -Duties of a secretary at promotion stage.

UNIT - II

Memorandum of Association: Secretary's duties - Doctrine of ultra vires - Articles of Association - Procedure to be followed by secretary - Doctrine of Indoor Management -Prospectus - Duties of secretary at commencement stage - Steps to be taken by secretary at subscription stage - Share capital - Secretary's duties regarding rights issue.

UNIT - III

Membership in company: Shares - Secretarial duties before allotment - Duties of secretary regarding bonus shares - Share certificates and share warrants - Duties of secretary regarding renewal and share warrants - Calls, forfeiture and surrender of shares - Duties of secretary regarding calls - Transfer and transmission of shares - Duties of secretary - Dividends - Duties of secretary regarding dividends.

UNIT - IV

Borrowing powers: Debentures - Duties of secretary regarding debentures - Meetings and Proceedings - Secretarial work relating to meetings - Motions and resolutions -Agenda and minutes - Directors - Managerial remuneration - Accounts and auditors -Secretarial duties regarding accounts.

UNIT - V

Winding up: Compulsory winding up - Duties of secretary in respect of compulsory winding up - Voluntary winding up - Members' and Creditors' voluntary winding up -Duties of secretary in respect of voluntary winding up - Reports - Duties of secretary in respect of reports.

LEARNING OUTCOMES

Unit I	The learner will be able to understand the nature and kinds of companies; laws related to qualification, appointment, rights, duties, liabilities and dismissal of Company Secretary.
Unit II	The learner will be able to understand the provisions related to Memorandum of Association and Prospectus; secretarial duties at various stages of formation of company and rights issue.
Unit III	The learner will be able to understand provisions related to membership in company and shares; also the secretarial duties related to allotment, bonus shares, renewal and share warrants, call on shares and dividends. .
Unit IV	The learner will be able to understand the provisions related to borrowing powers, debentures, managerial remuneration and meetings; secretarial duties related to debentures, meetings and accounts.
Unit V	The learner will be able to understand provisions related to winding- up of company and secretarial duties related to winding-up.

NAME OF THE PROGRAMME: Bachelor of Computer Applications

DURATION : 3 Years

ELIGIBILITY FOR ENROLMENT: A pass in +2 examination recognized by any State Board/ Central Board or any other Board accepted by SASTRA as equivalent to 10+2 examination.

PROGRAMME FEE : Tuition fee of Rs.20000/- per semester.



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ARTS, SCIENCE, TECHNOLOGY & RESEARCH ACADEMY
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TIRUMALAISAMUDRAM, THANJAVUR – 613 401

**BCA (Online Mode)
Scheme of Study**

I Semester (20 Credits)

Course Code	Course Title	Credits
ENGOL134	English –I	2
CIVOL112	Environmental Studies-I	2
MATOL119	Matrices & Calculus	4
COMOL114	Financial Accounting	4
CAPOL101	Basics of Computing	4
CAPOL102	Programming in C	4
TOTAL		20

II Semester (20 Credits)

Course Code	Course Title	Credits
ENGOL135	English –II	2
CIVOL222	Environmental Studies -II	2

MATOL120	Inferential Discrete Mathematics	4
COMOL115	Management Accounting	4
ECSOL104	Digital Logic Circuits & Microprocessors	4
CAPOL105	Programming in C++	4
TOTAL		20

III Semester (16 Credits)

Course Code	Course Title	Credits
MATOL121	Numerical Methods for Computer Applications	4
CAPOL107	Computer Organization & Architecture	4
CAPOL201	Fundamentals of Data Structures & Algorithms	4
CAPOL108	Operating System Concepts	4
TOTAL		16

IV Semester (16 Credits)

Course Code	Course Title	Credits
CAPOL203	Object Oriented Analysis & Design	4
CAPOL204	Computer Networks	4
CAPOL110	Fundamentals of Relational Database Management Systems	4
CAPOL205	Visual Programming	4
TOTAL		16

V Semester (18 Credits)

Course Code	Course Title	Credits
CAPOL301	Java Programming	5
CAPOL207	Basics of Software Engineering	4
CAPOL302	Web Technology	5

CAPOLXXX	Elective – I	4
TOTAL		18

VI Semester (30 Credits)

Course Code	Course Title	Credits
CAPOL305	Ecommerce	4
CAPOL208	Computer Graphics &Multimedia	4
CAPOL306	C# &. Net Technologies	5
CAPOLXXX	Elective-II	5
CAPOL307	Project	12
TOTAL		30

Elective – I

CAPOL112: Programming in PERL
 CAPOL113: Python Programming
 CAPOL210: XML & Applications
 CAPOL211: Basic Linux Programming
 Resource Planning

Infrastructure

Elective – II

CAPOL308: Client Server Computing
 CAPOL309: Mobile Computing
 CAPOL310: Principles of Artificial Intelligence
 CAPOL311: Fundamentals of Enterprise
 CAPOL212: Information Technology &

Management

CREDITS DISTRIBUTION

Semester	I	II	III	IV	V	VI
Credits	20	20	16	16	18	30
Grand Total	120					

Course Code: ENGOL134

ENGLISH - I

Course Objectives:

1. The course introduces learners to classic literary texts and aims to develop their literary appreciation skills.
2. The course helps the learners to learn basic grammar and letter writing skills.
3. The course enables the learners to acquire the basic study habits.

UNIT- I: Poetry

1. Rabindranath Tagore – Where the mind is without Fear
2. William Wordsworth – The Solitary Reaper
3. Shelley - Ode to West Wind
4. Robert Frost – The Road Not Taken
5. Oliver Goldsmith – The Village School Master

UNIT- II: Prose

1. A.P.J. Abdul Kalam – My Visions for India
2. Francis Bacon – Of Studies
3. Dr. S. Radhakrishnan - The Emerging World Society
4. Stephen Leacock - My Financial Career
5. C.E.M. Joad - The Way of the Mahatma

UNIT- III: Functional Grammar

1. Articles
2. Prepositions
3. Tense Forms
4. Active Voice and Passive Voice
5. Phrasal Verbs
6. Vocabulary: a. Finding the meaning of words from the context
b. Substituting long expressions with single words
7. Reported Speech
8. Framing Questions

Unit -IV: Composition

1. Paragraph Writing
2. Essay Writing
3. Paraphrasing
4. Business Letter

Listening and Speaking: Language Lab Practice

LEARNING OUTCOMES

At the end of the course, the learners will be able to

Unit I	Develop a sense of appreciation for poetry and its lofty ideals
Unit II	Relate the themes of the essays to their day-to-day life and events
Unit III	Write simple and grammatically correct sentences

Unit IV

Write letters both formal and informal without errors

Course Code: CIVOL112

ENVIRONMENTAL STUDIES I

Course Objective:

This course aims to introduce the student to the interdisciplinary study of environmental issues in the science and humanities. The main object of this study is, to understand the central role that human environmental perceptions have played and continue to play in the creation of both sustainable and unsustainable relations with nature. It creates environmental awareness amongst the students.

Unit I Introduction and Natural Resources

Natural Resources: Renewable and non-renewable resources – Associated problems – Forest Resources – mineral resources – water resources - Food resources - Energy resources(Renewable and non-renewable) - Land resources - Role of intellectuals in conservation of natural resources .

Unit II Eco-systems and Biodiversity

Eco-systems: Concept of an ecosystem - Structure of an ecosystems – how they work (ecosystem) Elements in living and non-living systems – Energy laws biotic structure – Bio diversity & importance – Conservation of Bio diversity categories of organisms, feeding and non-feeding relationship — Nutrient cycles.

Unit III Environmental Pollution

Pollution – Air pollution, Water pollution, Soil Pollution and Noise Pollution– their sources impacts and control strategies – Role of individual in prevention and control of Pollution

Unit IV Natural Disasters

Disaster Management - Land Slides, Cyclone, Flood and Earth Quake – Causes – their effects – control Strategies - The Changing Nature Of Earth- global warming – International Treaties.

LEARNING OUTCOMES

Unit 1	The learner will understand the importance, causes, effect and remedial measures of various natural resources.
Unit II	The learner will learn the rich biological wealth of our country, threats to it and various conservation methods.

Unit III	The learner will have the understanding of the causes, effects and remedial measures of different types of environmental pollution.
Unit IV	The learner will have the understanding of the causes, effects and control strategies of different environmental disasters.

Course Code: MATOL119

MATRICES & CALCULUS

Semester: I

Course Objective: The aim of this course is to introduce the basic tools in Mathematics used in the theory of computer science. The basic problems of solving Matrices, Differential equations, Integral problems and finding the curve of best fit are introduced.

UNIT I

(MATRIX THEORY)Types of matrices – Basic Matrix operations – Rank of a matrix – Gauss Jordan method of finding inverse - Normal form of a matrix – Computation of rank using normal forms – Consistency of linear system of equations - Linear and orthogonal transformations — Eigen values and eigenvectors – Properties of eigen values – Cayley Hamilton theorem (without proof) – Reduction to diagonal form

UNIT II

(Difference Equations)Introduction - Definitions – Formation of difference equations – Linear difference equations – Rules for finding Complementary Functions – Rules for finding Particular Integral– Simultaneous difference equations with constant coefficients – Application to deflection of a loaded string.

UNIT III

(Linear Differential Equations)Definition - Complete solution - Operator D - Rules for finding complementary function - Inverse operator - Rules for finding the particular integral - Working procedure to solve the equation - Method of variation of parameters - Cauchy's and Legendre's linear equations.

UNIT IV

(Definite Integrals) Reduction formula – Evaluating the integrals with integrands of forms $\sin^n x, \cos^n x, \sin^m x \cos^n x, \tan^n x, \cot^n x, \sec^n x, \operatorname{cosec}^n x$, Reduction formulas for $\int x^n e^{ax} dx, \int x^m (\log x)^m dx$, - Reduction formulas for $\int x^n \sin mx dx, \int x^n \cos mx dx$ - Definite integrals – integrals as the limit of a sum- Areas of curves – length of curves.

UNIT V

(Empirical law and Curve fitting) Graphical method- laws reducible to linear law- principle of least squares- fitting of other curves- method of group averages and moments-fitting a parabola

LEARNING OUTCOMES

On completing this course, the candidate can be able to understand the concept of eigen values and vectors in Matrices, solving difference and differential equations. Also they can evaluate the definite integrals and in addition to this they can be finding the curve (straight line or parabola) of best fit using the empirical laws.

Course Code: COMOL114

FINANCIAL ACCOUNTING

Semester: I

Course Objective:

To impart the learners the fundamental knowledge of accounting and various concepts in financial accounting

UNIT I

Definition of book- keeping Accounting and Accountancy - Scope of financial accounting - objectives and limitations of financial accounting - Kinds of Accounts - Double entry system of accounting - Rules of debit and credit.

UNIT II

Journal - subdivision of journal - Purchases Book - Sales Book – purchases Returns Book - Salesreturns Book - Bills Receivable Book -Bills Payable book - Cash Book - Single, Double and Triple column Cash Book - Analytical Petty Cash Book – Journal Proper - Ledger – ledger posting closing and balancing - Different kinds of balances - Trial Balance and its preparation.

UNIT III

Financial Statements – Manufacturing, Trading and Profit and Loss accounts - Preparation of Financial statements (With adjustments) – Balance Sheet

UNIT IV

Depreciation – straight line, diminishing balance method of providing depreciation Inventory Valuation – FIFO, LIFO, Simple & Weighted average methods of

Inventory valuation - Bank Reconciliation statement

UNIT V

Accounts of Non Trading Institutions – Revenue vs. Capital items - Receipts & Payments account – Income & Expenditure account – Construction of Balance Sheet.

LEARNING OUTCOMES

Unit I	The learner will have an understanding towards the accounting concepts and conventions.
Unit II	The learner will be able to understand the process of accounting
Unit III	The learner will be able to prepare the financial statements.
Unit IV	The learner will acquire the knowledge about the various methods of depreciation and the different methods in inventory valuation.
Unit V	The learner will have an understanding about the accounts of Non-trading concerns.

Semester: I

Course Objective: To help the learners understand the underlying principles of various concepts available for solving the problems.

UNIT I

Computer Basics: Characteristics, Evolution of Computers, Generations, Classification, Applications of computers. Number Systems: Number Systems, Conversion between number bases, Arithmetic System, signed and unsigned numbers, overflow. Logic Gates: Binary coding, Logic gates, Boolean algebra, Combination of Logic gates

UNIT II

Primary Memory: Memory Hierarchy, RAM and its types, ROM and its types Secondary Storage: Classification, Magnetic tape, Disk, Optical Disk Input Devices: Keyboard, Pointing-Mouse, Light Pen, Touch Screen, Speech Recognition, Digital camera, Scanners, optical Scanners Output Devices: Classification of Output, printers, monitors, audio output, projectors, Terminals.

UNIT III

Problem Solving with Computers: Introduction Defining problem-characteristics of problem-Working Backwards towards solution-Top down design, Breaking problems into sub problems, Introduction to Pseudo code and flowcharting, exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function, generation of the Fibonacci sequence, base conversion.

UNIT IV

Algorithms For Problem Solving: Finding the square root of a number, smallest divisor of an integer, GCD, generating prime numbers, Generation of pseudo – random numbers, raising a number to a large power, computing the nth Fibonacci numbers

UNIT V

Arrays and Sorting techniques: Array Concepts; Sorting of Arrays, Array order reversal, Histogramming, finding the maximum and minimum number in a set, removal of duplicates from an ordered array. Sorting: Sorting by exchange, selection, insertion. Text processing- Characters to numbers conversion Keyword searching in a text

LEARNING OUTCOMES

Unit I	The learner will have an understanding of number systems, various gates and basic concepts of computer.
Unit II	The learner will have understanding of Memory, Input and Output devices.
Unit III	The learner will be able to write algorithms for solving the various problems.
Unit IV	The learner will be able to write algorithms for solving the various problems.
Unit V	The learner will be able to understand array and sorting techniques and some text processing techniques.

Course Code: CAPOL102

PROGRAMMING IN C

Semester: I

Course Objective: To help the learners understand the programming concepts using C language and be able to write programs in C language.

UNIT I

Getting started with C: Character sets, Constants and Variables- Data types and sizes-Declarations-Arithmetic Operators-Relational & Logical operators-Type conversions-Increment and decrement operators-Bit wise operators-Assignment operators and Expressions-Conditional Expressions-Precedence and Order of evaluation-Statements and Blocks-Input-Output operations-Simple programs

UNIT II

Control structures , Arrays and Functions: Go to statement-If, If else ,if-else-if & Switch statements-While, Do-while, For loops-Arrays-1-D & 2-D, Multidimensional arrays-Initializing Array Elements-Character arrays- Multidimensional Arrays-Functions and Program Structure: Basics of Functions-Function call-Passing values as Arguments- Returning values from Functions-Functions returning non integers- Local variables-External variables- static variables -Strings and String Functions- Recursive functions.

Unit III

Pointers: Introduction to Pointers -Pointers and functions- pass by reference- Pointers and arrays- Pointers to structures- Operations on pointers

UNIT IV

Structures, Unions: Basics of structures and Unions-Structures and functions-Arrays of structures - structures within structures. -a linked list example

UNIT V

Files and Command Line arguments:Introduction to Files, Basic file manipulation functions. Command line arguments and Pre-processor directives

LIST OF EXPERIMENTS

1. Write a C Program to generate Prime, Armstrong & Perfect numbers.

2. Write a C program to find the value of a^b where b is very large number (without using built-in Functions)

3. Programs using arrays

i) Find the largest and smallest of 'n' numbers.

ii) Sort a set of given numbers in ascending/descending order.

iii) Removal of duplicates from an array.

iv) To check whether a given string is palindrome.

v) To arrange n names in alphabetical order.

4. Write a C Program to find the square root of a number , GCD and the LCM of two numbers

(without using built-in Functions)

5. Write a C Program to implement all bitwise operators with suitable example.
6. Write a C Program to generate psuedo Random numbers (without using built-in Functions)
7. Write a C Program to generate permutation , combination and sampling with recursive call.
8. Write a C Program to find the number of words , numbers, special characters , alphabets, and replacing substring in a given string.
9. Write a C Program to find nth term in a fibonacci series. Implement it by using recursion.
10. Write a C Program to find the value of sin(x) without applying library functions.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of data types, tokens, variables and various types of operators.
Unit II	The learner will have understanding of conditional control, looping statements, arrays, strings and user-defined and pre-defined functions.
Unit III	The learner will have understanding of Pointers.
Unit IV	The learner will have an understanding of structures and union.
Unit V	The learner will be able to understand files, command line arguments and pre-processor directives.

Course Code: ENGOL135

ENGLISH- II

Course Objectives:

1. The course aims to develop in the learners the appreciation of the language of poetry and its message.
2. The course introduces famous short stories and one-act plays as a source for language learning.
3. The course introduces the different modes of writing and gives practice in writing essays using the specified strategies

UNIT – I: Poetry

1. Sri Aurobindo – The Tiger and the Deer

2. G. M. Hopkins – Binsey Poplar
3. John Keats – Ode to a Nightingale
4. Robert Burns – A Winter Night
5. W. H. Auden - The Unknown Citizen

UNIT – II: Short Stories and One-Act Plays

1. O. Henry - The Gift of the Magi
2. Tagore - The Cabuliwallah
3. Oscar Wilde - The Devoted Friend
4. Farrell Mitchell - The Best Laid Plans
5. Mazie Hall - The Trial of Billy Scott

Unit - III Functional Grammar

1. Agreement of the Verb with the Subject
2. Pronoun-Antecedent Agreement
3. Modal Auxiliaries
4. Common Errors in Sentences
5. Tightening Rambling Sentences with reference to simplicity, clarity and precision

Unit IV: Writing

- Modes of Writing: Narration, Description, Comparison and Contrast, Argument, Enumeration, Persuasion, Cause and Effect, Process Writing
- Writing Essays using Specific Strategies
- Paraphrasing

LEARNING OUTCOMES:

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

Unit I	Appreciate great poetry and share their insights on great thoughts.
Unit II	Have great writers as their model and practice to write on their own.
Unit III	Spell out the main and supporting ideas in any prose work and write simple summaries of their own.
Unit IV	Comprehend texts, write essays, make notes, and get exposed to Standard English.

Course Objective:

This course aims to introduce the student to the interdisciplinary study of environmental issues in the science and humanities. The main object of this study is, to understand the central role that human environmental perceptions have played and continue to play in the creation of both sustainable and unsustainable relations with nature. It creates environmental awareness amongst the students.

Unit I Municipal Solid Waste and Hazardous Waste

Basics Of Municipal Solid Waste, Management Of Municipal Solid Waste, Agony Of Seas, The Price Of Panacea - Biomedical Waste, Effects And Controls Of Water Pollution due to biomedical waste, Nuclear Hazards, Industries & Waste, Dealing With Industrial Waste, Environmental Rights, Environmental Threats.

Unit II Legislation and Sustainable Development

Public Environmental Awareness, Ethics Of Environmental Education, Environmental Values, Indian Legislative Steps To Protect Our Environment, Water Management Practices, Sustainable Development, Urban Problems Related To Energy, Resettlement And Rehabilitation.

Unit III Human Population and human Health

Environment And Climate Change, Sex Ratio, Population Explosion, Impact Of Human Population On Environment, Infectious Diseases and Waterborne Diseases, HIV/Aids, Cancer & the Environment, Environment And Human Health, Chemicals In Food.

Unit IV Varieties of Plants and Trees

Typha : A Bioremedial Plant, Castor Bean, Pinus, Malaria, Machla : A Serene Village, The Secret Of Taste – Chilli, Common Avenue – Trees, Common Village Trees, Flower - The Beautiful Gift Of Nature, Silk Cotton Tree : Kapok, Cotton Yarn.

LEARNING OUTCOMES

Unit 1	The learner will understand the importance, causes, effect and remedial measures of municipal solid waste and hazardous waste.
Unit II	The learner will learn the Indian Legislative steps to protect our Environment and Sustainable Development
Unit III	The learner will have the understanding the importance of population control and different deceases due to environmental degradation.
Unit IV	The learner will learn the various plants, trees, yarns and their importance on Environment.

Course Code: MATOL120

INFERENTIAL DISCRETE MATHEMATICS

Semester: II

Course Objective: The aim of this course is to introduce the students the theory of Discrete Mathematics, the basic concept required to understand the theory of computer science.

UNIT I

Logic Introduction – TF-statements – Well formed statements – Truth tables- Tautology- Tautological Implications- Equivalences – Replacement process – Functionally complete sets – Normal forms – Theory of inference – predicate calculus

UNIT II

Relations and functions Cartesian product of sets – relations – representations of a relation – Operations – Equivalence relations- closure and Warshall algorithm. Functions and operators – one-to-one and onto functions – special types – Invertible functions – composition of functions

UNIT III

Recurrence relations and Generating functions Polynomials and their evaluations – Recurrence relations – Solution of finite order Homogeneous relation – Solution of non-homogeneous relation – Generating functions – Common recurrence relations – Primitive recursive functions – Recursive and partial recursive functions.

UNIT IV

Groups Binary operation – Algebraic systems – Groups – subgroup – Cyclic groups – Cosets – Normal subgroups – Quotient groups – Homomorphism and Isomorphisms – Symmetric Group – Cayley-representation theorem

UNIT V

Lattices and Boolean algebra Lattices – Properties – New lattices – Modular and distributive lattices – Boolean algebras- Boolean polynomials – Karnaugh Map

LEARNING OUTCOMES

On completing the course the student will be able to identify the logical correctness of the given problem through the theory of logic. Also they can be able to understand the concept of group theory using the fundamentals of relations and functions. Finally they can solve the problem of set theory through Boolean algebra and Lattices.

Course Code: COMOL115

MANAGEMENT ACCOUNTING

Semester: II

Course objective

The objective of the course is to help the students understand the various concepts in management accounting

UNIT I

Management Accounting – Cost Accounting - Definitions - Distinction between Cost Accounting and Management Accounting - Cost Accounting and Financial Accounting – Management Accounting and Financial Accounting

UNIT II

Financial Statements - Vertical column and Common size Statements - Trend Analysis – Ratio Analysis - Merits and demerits of ratio analysis - Accounting ratios - Classification of ratios -Profitability - Liquidity - Solvency -Turnover ratio - ratios of capital structure.

UNIT III

Fund Flow and Cash Flow Analysis - Working capital statements -Fund from, operation – cash from operation - preparation of fund flow and cash flow statements -calculation of working capital requirements.

UNIT IV

Marginal costing - break even analysis - P/V ratio - margin of safety - application of marginal costing in decision making regarding profit planning - fixation of selling price - key factor – make or buy decisions - Level of activity planning and product mix.

UNIT V

Budgeting and Budgetary Control - Preparation of various functional budgets - Sales Budget, Production Budget, Material Budget, Cash Budget - Flexible Budget - Master Budget

LEARNING OUTCOMES

Unit I	The learner will have an understanding about management accounting.
Unit II	The learner will be able to understand the different methods of financial statement analysis
Unit III	The learner will have an understanding towards fund flow and cash flow analysis
Unit IV	The learner will be able to understand the marginal costing techniques.
Unit V	The learner will be able to understand how to prepare the different functional budgets.

Course Code: ECSOL104

DIGITAL LOGIC CIRCUITS & MICROPROCESSORS

Semester: II

Course Objective: To help the learners understand and construct digital logic circuits and be able to write simple 8085 assembly language programs.

UNIT I

Basic Gates and Boolean Algebra: Logical Multiplication- AND ,OR gates – Compliment and Invertors
Evaluation of Logical Expression – NAND & NOR gates. Basic Laws of Boolean algebra – Proof by perfect
Induction – Simplification of Boolean Expressions – Algebraic Method , K-Map method, Tabulation
Method with Don't Cares.

UNIT II

Flip Flops: Flip Flops – Transfer Circuits – clocks – Flip Flop Design – Gated Flip Flops – JK – RS – Master –
Slave Flip Flops.

UNIT III

Counters and Adders: Shift Register – Binary Counter – BCD Counter – Binary Half, Full adder – Parallel
Binary Adder – BCD adder – Encoder, Decoders, Multiplexers- Floating point number systems.

UNIT IV

Microprocessor Architecture and Microcomputer: Microprocessor Architecture and its Operation –
memory – i/o devices – Example of a microcomputer system-8085 MPU 96 – Example of an 8085 Based
Microcomputer – Memory interfacing – interfacing the 8155 memory segment – basic interfacing
concepts – interfacing I/O devices – memory mapped I/O.

UNIT V

Instructions and programming Techniques: Introduction to 8085 Instructions – data transfer – arithmetic
– logical and Branch Operation sample assembly language programmes. Looping, counting and indexing
– 16 bit arithmetic instructions – logic operations – rotate, compare, stack and subroutine counters and
time delays – code conversion and BCD.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of basic gates, simplification of Boolean expression and K-map techniques.
Unit II	The learner will have understanding of different types of flip-flops and able to construct the same.
Unit III	The learner will have understanding of counters and adders circuits.
Unit IV	The learner will have an understanding of architecture and pin diagram of 8085.
Unit V	The learner will be able to write 8085 assembly language programs by learning 8085 instructions.

Course Code: CAPOL105

PROGRAMMING IN C++

Semester: II

Course Objective: To help the learners understand the object oriented programming techniques and be able to write programs by implementing the OOP techniques using C++ language.

UNIT I

Principles of Object Oriented Programming – Software evolution – Procedure and Object Oriented paradigm – Basic Concepts of Object - Oriented Programming – Benefits of OOP –Object Oriented Languages – Applications of OOP – Beginning in C++ - Applications of C++ -C++ Statements- Structure of C++ Program – Tokens, Expression and control structures – tokens –identifiers – basic and user–defined data types – operators in C++ - Operator Over Loading –Operator precedence –Control structures.

UNIT II

Functions in C++ - The Main function – Function Prototyping – Call by value, Call by Reference – Return by reference – Inline function – Function overloading – friend and virtual functions – classes and objects – Introduction- Specifying a class – Defining member function –Nesting of member functions – private member functions – Arrays with in a class- static data Members – static member function – Array objects – objects as functions arguments – Friendly functions – Pointers to members.

UNIT III

Constructors and Destructors – constructors-copy constructor – Dynamic Constructor –Constructing Two-dimensional Arrays – destructors - Operator overloading – Type conversion

UNIT IV

Inheritance – Extending Classes – Defining derived classes – Single, Multilevel Multiple, Hierarchical and Hybrid inheritance – Virtual base classes – Abstract classes – Pointers, Virtual functions and polymorphism – Pointers to Objects – this Pointer – Pointers to Derived classes –Virtual functions.

UNIT V

Managing console I/O operations – C++ Streams – C++ Stream Classes – Unformatted I/O operations – Formatted console I/O Operators – Managing output with manipulators – working with files – Classes for file stream operations – Opening and Closing a file – File pointers and their Manipulations – Sequential I/O operations-Random files, Templates , exception handling

LIST OF EXPERIMENTS

1. Programs using branching
2. Programs using multidimensional arrays
3. Programs using function overloading, inline functions
4. Programs using classes and objects (array as data members, array objects)
5. Programs using constructors and destructors
6. Programs using String class
7. Programs using operator overloading
8. Programs for data conversion using overloading
9. Programs using inheritance
10. Programs using virtual functions, friend functions

LEARNING OUTCOMES

Unit I	The learner will have an understanding of data types, control structures, OOP concepts, operator overloading
Unit II	The learner will have understanding of function, calling mechanism, friend and virtual functions, class and object concepts
Unit III	The learner will have understanding of constructor, destructor and operator overloading
Unit IV	The learner will have an understanding of inheritance and its types, pointer, this pointer.
Unit V	The learner will have an understanding of console I/O, File concepts and exception handling mechanism.

Course Code: MATOL121

NUMERICAL METHODS FOR COMPUTER APPLICATIONS

Semester: III

Course Objective: The aim of this course is to introduce the computational methods in Mathematics which forms the basic idea in Computer Science.

UNIT I

(Algebraic and Transcendental Equations) Introduction – Synthetic division- Graphical solution – Bisection method – Method of false position – Secant method – Newton-Raphson method and its deductions – Hroner’s method – Graffe’s root squaring method.

UNIT II

(Simultaneous Algebraic Equations) Introduction – Direct methods of solution – Gauss elimination method , Gauss – Jordan method , Factorization method – Iterative methods of solution – Jacobi’s method , Gauss – Seidal method– Solution of non-linear simultaneous equations – Newton–Raphson method – Comparison of various methods.

UNIT III

(Interpolation) Finite differences – Newton’s interpolation formulae Central difference – Gauss interpolation formula – Stirling’s formula- Bessel’s formula – Interpolation with unequal intervals – Lagrange’s formula , Newton’s divided difference formula – Inverse interpolation.

UNIT IV

(Numerical Differentiation and Integration) Numerical differentiation – Maxima and Minima of Tabulated functions - Numerical integration – Trapezoidal rule; Simpson’s $1/3^{\text{rd}}$ rule ; Simpson’s $3/8^{\text{th}}$ rule – Quadrature formula – error calculation – Method of undetermined coefficients - Gaussian integration.

UNIT V

(Numerical solution of Ordinary Differential Equations) Introduction – Picard’s method – Taylor’s series method – Euler’s method – Modified Euler’s method – Runge’s method – Runge-Kutta method – Predictor-corrector method ;Milne’s method, Adam’s-Bashforth method – Error analysis – Convergence – Stability.

LEARNING OUTCOMES

On the completion of this course, the student can gain knowledge on some of the methods used for obtaining numerical results for the various forms of Mathematical problems like algebraic equations, simultaneous algebraic equations, interpolation method, numerical differentiation as well as integration, and in addition to this, finding the numerical solution for a ordinary differential equation.

Course Code: CAPOL107

COMPUTER ORGANIZATION AND ARCHITECTURE

Semester: III

Course Objective: To help the learners understand the principles of Computer Hardware Architecture

UNIT I

Register Transfer & Micro operations: Register transfer Language – Register Transfer – Bus and memory transfers – Arithmetic micro operation – Logic Micro operation –Shift Micro operations – Arithmetic

Logic shift unit. Basic computer organization and Design: Instruction codes-Computer Registers-Computer Instructions - Timing and control instructions cycle-Memory reference instructions-Input-output interrupt- Design of Accumulator logic

UNIT II

Central Processing Unit – General register organization – Stack organization – Instruction format – Reduced Instruction Set Computer. Memory Organization:Memory hierarchy – Main memory – Associative memory – Cache memory – virtual memory.

UNIT III

Computer Arithmetic: Addition & Subtraction – Multiplication Algorithm – Division Algorithm – Floating Point arithmetic operations.

UNIT IV

Input-Output Organization: Input – Output Interface – Asynchronous data transfer (Strobe control & Hand shaking) – Priority Interrupt – Direct Memory Access – Input-Output processor

UNIT V

Pipeline & Vector Processing: Parallel processing, pipelining – Arithmetic pipeline – Instruction pipeline - RISC pipeline – Vector processing – Array processors. Multiprocessors:Characteristics of Multiprocessors, Interconnection structures-Inter processor Arbitration-Inter processor communication and synchronization.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of the Fundamentals of Comp. Architecture
Unit II	The learner will have an understanding of CPU & Memory organization
Unit III	The learner will get an idea about how arithmetic operations performed in processor

Unit IV	The learner will have an idea about I/O organization
Unit V	The learner will have an idea about the pipeline concepts and MP.

Course code: APOL201 FUNDAMENTALS OF DATA STRUCTURES & ALGORITHMS

Semester: III

Course Objective: To get a clear understanding about the underlying principles of various data structures. To help the learners understand the implementation of important concepts of data structures.

UNIT I

Introduction : Definition and Criteria of an algorithm - Performance analysis - Space Complexity - Time Complexity – Examples - Analysis of Sum of N numbers [Recursive and Non Recursive algorithm], Matrix Addition and Fibonacci.

Asymptotic Notations: Big - O Notation - θ and Ω notation - The Best, Average and Worst cases – with Linear search Example.

UNIT II

Linked Lists - Singly Linked Lists - Doubly Linked Lists – Circular Lists - Self Organizing Lists- Stacks - Queues – Circular Queues - Priority Queues - Application of Stack: Expression Evaluation - Tower of Hanoi.

UNIT III

Trees - Binary Trees - Implementing Binary Trees - Tree traversal - Binary Search Trees - Searching a Binary Search Tree – Heaps

UNIT IV

Graphs - Graph Representation - Graph Traversals – Shortest paths: One to all shortest path(Dijkstra)-All to all shortest path (Floyd - Warshall) – Minimum Spanning Trees - Prim's and Kruskal's Methods

UNIT V

Searching-Linear Search-Binary Search-Sorting - Insertion Sort - Selection Sort -Bubble Sort - Quick Sort - Heap Sort - Merge Sort – Radix sort. - Hashing- Hash functions – Collision Resolution.

List Of Experiments

1. Program using Arrays.
2. Implementation of Stacks.
3. Implementation of Queues.
4. Expression Evaluation using Stacks.
5. Implementation of Circular Queue and Priority Queue.
6. Implementation of Linked list with Insertion, Deletion and Accessing Operations
7. Implementation of Tree traversals
8. Implementation of Linear and Binary Search Algorithms.
9. Implementation of Bubble sort, Insertion sort, Selection Sort.
10. Implementation of Quick sort and Merge Sort.

LEARNING OUTCOMES

Unit I	Learning the basics of algorithm and Complexity analysis. The learner will have an idea for analysis various algorithm using asymptotic notations
Unit II	Learning and understanding of various types of data structures like Linked list, Stack and different types of Queue
Unit III	The learner will have an understanding the basic concept of Tree Data Structure, Binary tree and Heap

Unit IV	Learning the basics of Graph, Understanding the concepts of Graph Traversal, Shortest path and spanning Tree
Unit V	The learner will be able to apply various Sorting and Searching techniques.

Course Code: CAPOL108

OPERATING SYSTEM CONCEPTS

Semester: III

Course Objective: To learn the various aspects of operating systems such as process management, memory management and File System

UNIT I

Introduction: Operating systems – review of computer organization – operating system structures – system calls – Types of system calls – system programs – system structure Processes: Process concept – Process scheduling – Operations on processes – Cooperating processes – Interprocess communication – Communication in client-server systems.

UNIT II

CPU Scheduling: Scheduling criteria – Scheduling algorithms – Multiple-processor scheduling Algorithm Evaluation. Process Synchronization: The critical-section problem – Peterson’s Solution - Synchronization hardware – Semaphores – Classic problems of synchronization – Bounded Buffer problem – Reader-Writers problem – Dining Philosopher’s problem.

UNIT III

Memory Management: Background – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with paging. Virtual Memory: Background – Demand paging – Process creation – Page replacement – Allocation of frames – Thrashing.

UNIT IV

Deadlock: System model – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock
Mass-Storage Structure: Disk scheduling

UNIT V

File-System Interface: File concept – Access methods – Directory structure – File system

mounting – Protection. File-System Implementation : Directory implementation –Allocation methods – Free-space management – efficiency and performance – recovery – log-structured file systems.

LIST OF EXPERIMENTS

1. UNIX Basic Operations
 - a) Directory Operations
 - b) File Operations

2. Simple programs using shell scripts
 - a) Positional Parameters (Set, Shift)
 - b) Control Instructions
 - c) Repetition and Case control Instructions

3. Write a shell script that searches for a single word pattern recursively in the current directory and then call up the VI editor with those files containing the pattern.
4. Write a program for FCFS and Priority scheduling algorithms
5. Write a program for SJF scheduling algorithm.
6. Write a program for RR scheduling algorithm.
7. Inter Process Communication using FORK
8. Implement half duplex & Full duplex communication using pipe
9. Inter Process Communication using Shared Memory System Call.
10. Inter Process Communication using Message Queues.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of OS concepts & Process Management
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Unit II	The learner will have an understanding of CPU Scheduling & Synchronization
Unit III	The learner will get an idea about Storage management
Unit IV	The learner will have an idea about Deadlock concepts
Unit V	The learner will have an idea about the File System Concepts

Course Code: CAPOL203

OBJECT ORIENTED ANALYSIS AND DESIGN

Semester: IV

Course Objective: To focus on understanding, modeling and specifying requirements which can be implemented on object oriented platforms to produce application solutions.

UNIT I

Structured approach to system construction: SSADM/SADT - An overview of object oriented systems development & Life cycle

UNIT II

Various object oriented methodologies – Introduction to UML

UNIT III

Object oriented analysis – Use cases- Object classification, relationships, attributes, methods

UNIT IV

Object oriented design – Design axioms – Designing classes – Layering the software design: - data access layer, User interface layer, Control/business logic layer

UNIT V

UML - Examples on: Behavioral models – Structural models – Architectural models from real world problems.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of OO concepts & Life Cycle
Unit II	The learner will have an understanding of OO methodologies and brief knowledge about UML
Unit III	The learner will get an idea about OO Analysis and Use Cases.
Unit IV	The learner will have an idea about various OO design layers.
Unit V	The learner will have an idea about various models in UML

Course Code: CAPOL204

COMPUTER NETWORKS

Semester: IV

Course Objective: Gets the idea of choosing the required functionality at each layer for a given application and trace the flow of information from one node to another node in the network. Then gives the understanding of division of network functionalities in to layers, the component required to build different types of networks and identify the solution for the functionalities in each layer.

UNIT I

Introduction:Uses of Computer Networks: Business Applications-Home Applications-Data communications:Components- Data representation-Dataflow-Networks-network types- Internet History-Standards and administration- Protocol Layering-TCP/IP Protocol Suit- the OSI Reference Model.

UNIT II Physical Layer and Transmission Media: Physical layer: Data and Signals-Digital Signals-transmission impairments-performance-Digital to Digital conversion-analog to digital conversion-transmission modes-multiplexing-guided media-unguided media.

UNIT III

Data link Layer: Introduction – Link layer addressing-Error detection and correction-DLC Services-data link layer protocols-Media Access Control (MAC)-Ethernet-connecting devices – virtual LANS.

UNIT IV

Network Layer and Routing algorithms:Network Layer:Network Layer services-packet switching-network layer performance-IPv4 Addresses-Forward of IP Packets-Internet Protocol (IP) - ICMPV4 Unicast Routing: Introduction-Routing algorithms-Unicast routing protocols-Multicast Routing: Introduction-Multicasting basics-Inter domain multicast protocols-intra domain multicast protocols-IPV6.

UNIT V

Transport Layer and Application Layer:Transport Layer:Introduction-Transport layer protocols-UDP-TCP-Application Layer: Client server programming-World Wide Web and HTTP-FTP-Electronic Mail-TELNET-DNS.

LEARNING OUTCOMES

Unit I	The learner should be able to understand the various applications areas of computer networks and basics of data communications.
Unit II	The learner will learn the concepts of physical layer of the OSI Model and different types of transmission media.
Unit III	The learner will be able to understand the different functionalities of data link layer.
Unit IV	The learner will gain the knowledge about network layer and different routing algorithms
Unit V	The learner will understand the various transport layer protocols and application layer protocols.

Course code: CAPOL110 FUNDAMENTALS OF RELATIONAL DATABASE MANAGEMENT SYSTEMS

Semester: IV

Course Objective: To understand the basic concepts and organization of a database and to impart basic knowledge on relational database.

UNIT I

Introduction and conceptual modeling – Basic concepts – Characteristics – Database users - Advantages – Data models – Schemas and Instances – Database system architecture – Data independence – Classification of DBMS - Data Modeling using ER Model: Entity Types, Entity Sets, Attributes and keys-Relationship Types, Relationship Sets, Roles and Structural Constraints – weak entity Types – Subclass, Supersclass, Inheritance -Generalization and Specialization – ER to relational mapping.

UNIT II

Relational data model: Definitions – Characteristics of relations – Relational model constraints – Relational schemas – Relational algebra – Unary, Set and Binary operations – Aggregate functions and grouping – Recursive closure operations – Outer Join operations – Example queries - Relational Calculus – Tuple Calculus – Domain Calculus - Definition –Formulas-Quantifiers – Examples.

UNIT III

Relational database manipulation: Introduction to SQL-SQL Data Definition and Data types-Constraints in SQL – Basic Queries in SQL- Complex SQL Queries-Nested queries – Correlated Nested Queries – Multiset comparisons – Exist and Unique functions – Joined Tables – Aggregate functions – Grouping - Insert, Delete, Update statements- Views – QBE – Basic retrievals and manipulations.

UNIT IV

Relational Database Design: – Informal Design Guidelines for relation schemes – functional dependencies- Normal forms based on primary keys: 1NF, 2NF and 3NF – Boyce code normal forms – Lossless and dependency preserving decomposition algorithm.

UNIT V

Concurrency Control and Recovery - Database System Architecture -Serializability - Locking - Non-locking schedules - Database Recovery.

PL/SQL: PL/SQL data types – Cursors – Array- Control statements – Records – Exceptions – Procedures – functions – Packages – Triggers.

LIST OF EXPERIMENTS

1. Create a database with constraints using simple queries.
2. Data retrieval and manipulations for AND, OR, NOT operations.
3. Data manipulations for Union, Intersection, Projection and Join operations.
4. Data retrieval for sorting and grouping.
5. Nested queries.
6. Built in functions using numeric, character and date functions.
7. Update operations.
8. Create synonym, index, viewing and SQL reporting.
9. Commit, Rollback with save point.

10. Write a PL/SQL block to print Fibonacci series upto N terms.

LEARNING OUTCOMES

Unit I	The learner will understand basic concepts of various data models and its characteristics and also learn ER modeling and its data mapping.
Unit II	The learner will have an understanding of relational data model.
Unit III	The learner will gain knowledge of relational database manipulation using SQL queries.
Unit IV	The learner will be able to know the functional dependencies, normal forms and decomposition algorithms.
Unit V	The learner will gain knowledge of concurrency control and data recovery and able to apply the data manipulation using PL/SQL blocks.

Course Code: CAPOL205

VISUAL PROGRAMMING

Semester: IV

Course Objective: To help the learner understand the basics of GUI and be familiar with Windows fundamentals and event driven programming.

UNIT I

Introduction to GUI – First Step in programming –Anatomy of Visual Basic application – The Code Window – Visual Basic Editing Tools – Statements in Visual Basic – Variables – Data types– Working with Variables – Constants – Input boxes. Tool Box Controls – Text box, Label Box, Command Button, Timer Control, Option Button, Check Box, Picture box, Image control.

UNIT II

Intrinsic Controls – Rich Text Box Control, Common Dialog Control, Microsoft Windows Common Control – Image List control, List view control, Progress Bar control, Status Bar Controlling Program flow - determinate loop – indeterminate loop – making decisions – select case – Nested if – go to –Built in String and Numeric functions –User defined functions and procedures –

UNIT III

Organizing information via Code: One Dimensional arrays – Fixed vs Dynamic arrays – Static Arrays – The Erase Statement – One Dimensional array with index range – Assigning arrays – the Array function – Arrays with more than one dimension –The Object Browser – Manipulating Objects into VB, General Object Variables-Run-time type information –File system Controls- File, Directory and Drive List boxes –A survey of Database Development using Visual Basic-programming DAO and ADODC control

VISUAL C++

UNIT IV

Concepts and Vocabulary for windows – Project Files – Resource files – Resource Editors –Software Development Kit (SDK) program.- Microsoft Foundation Class (MFC) design consideration – Key features of MFC Library - Building an application through AppWizard and classwizard

UNIT V

MDI –Splitter Window -Controls-: Static button, Push button, Edit box-various mouse events – COM-OLE- Active X control

LIST OF EXPERIMENTS

1. Design an application that receives student regno,name,marks in 5 subjects using appropriate controls. Write down events to calculate total, average,result and grade.
2. Move any given text from left to right or top to bottom using timer control
3. (i) Write a function to find out the largest of three given numbers
(ii) Write a function to check whether the given number is prime number or not
4. Write a procedure to remove all leading, trailing and in-between spaces in a given string.
5. Create a text editor using Rich Text Box Control and implement the following functions using menu

- i) Cut, Copy and Paste Operation
 - (ii) File Load and Store
 - (iii) Font option (Changing Font name, size and style)
 - (iv) Color option
6. Develop a simple application using Drive, Directory and File List Box.
 7. Develop a simple application using Common Dialog control
 8. Develop a sample SDK program
 - i. Program to display a message box.
 - ii. Program to display a window
 9. Create a Push button control in VC++ along with any event
 10. Program to implement mouse events

LEARNING OUTCOMES

Unit I	At the end of the first unit, students should be familiar with GUI basics and working with an IDE
Unit II	At the end of the second unit, students should be familiar with event driven style of programming
Unit III	At the end of the third unit, students should be able to program using arrays file system concepts and be familiar with connecting VB with MS-Access and Oracle.
Unit IV	At the end of the fourth unit, students should be able to understand the fundamentals of Windows programming.
Unit V	At the end of the fifth unit, students should be able to understand ActiveX control and be familiar with COM/OLE concepts

Course Code: CAPOL301

JAVA PROGRAMMING

Semester: V

Course Objective: The learner will be able to understand the Java programming language and be familiar with writing console based application and GUI application using Applets and AWT.

UNIT I

Object Oriented fundamentals and Revolution: Object oriented programming concepts –Characteristics – Reserved Words – Identifiers – Literals – Operators – Variables – Data types –Operator precedence – Control statements – Selection – Iteration – Jump – Arrays.

UNIT II

Classes: Definitions – Object reference – Instance variables – new operator – Method – this operator – Constructor – Method overloading – Recursion – Nested classes – Command line arguments - Inheritance – Dynamic method dispatch – Class, variable, method and constructor modifiers – Packages and Interfaces.

UNIT III

Exception handling fundamentals – Types – Uncaught Exceptions – nested Try statements. Multithreading: Thread – Runnable – multiple Threads – Thread synchronization. String class – StringTokenizer - Dictionary class – System class – Hash Tables. IO package: File – Directory –FileStream – Input & Output Streams.

UNIT IV

Applets – Applet tag – Lifecycle – Simple Graphics methods – Font manipulation – Image – Audio files. AWT Controls: Button – TextField – Checkbox – TextArea – Label – Choice – List –Scrollbar – Layout managers(Flow, Border & Grid) – Frame – Panels.

UNIT V

Event Handling: Events – Listeners – ActionEvent – MouseEvent – KeyEvent – TextEvent –WindowEvent – FocusEvent – ItemEvent - AdjustmentEvent - Listeners of all events.

LIST OF EXPERIMENTS

1. Program using input (DataInputStream) and Output.
2. Program using Arrays with branching and looping.
3. Program using Polymorphism.
4. Program using Inheritance and Constructor
5. Program using Packages with interfaces.
6. Exceptions in JAVA.

7. Program using Multiple Threads.
8. Program using Threads (Synchronization).
9. Program using Applet and Graphics Programming concepts.
10. Program using String Manipulation

LEARNING OUTCOMES

Unit I	At the end of the first unit, students should be familiar with the OOP techniques and array concepts in JAVA
Unit II	At the end of the second unit, students should be familiar with class and objects, inheritance, package and interface concepts
Unit III	At the end of the third unit, students should be able to write program using exception, thread and file concepts.
Unit IV	At the end of the fourth unit, students should be able to understand Applets and AWT components.
Unit V	At the end of the fifth unit, students should be able to understand various event listeners.

Course Code: CAPOL207

BASICS OF SOFTWARE ENGINEERING

Semester: V

Course Objective: The learner will be able to understand the software engineering basics, SRS, architectural design and software estimation techniques.

UNIT I

Introduction to Software Engineering: Definition, software, categories, myths; Software Process : framework, Models- Waterfall, incremental, evolutionary, Agile, specialized Practices: Software engineering, communication, planning, modeling construction

UNIT II

Definition of requirement; Functional and non-functional requirements, Requirements Elicitation; Requirements Elicitation techniques; Requirements documentation: SRS-characteristics, IEEE format- Requirements Review: continuous review, phase-end review, sign-off;

UNIT III

Requirements management: Requirements change management: Requirements traceability-Analysis Techniques: Data Modeling Flow-oriented modeling; Design Engineering: Context, Design process and quality, Design concepts, design model

UNIT IV

Architectural design concepts: architecture, data design, design, evaluating alternatives, Transform and Transaction mappings; Modular design: coupling, cohesion; Design notations-graphical, tabular, PDL; Interface design: rules, design steps

UNIT V

Size estimation: Different methodologies- Function Point analysis, Mark II FPA Model; LOC.Effort, Cost and Time Estimation: Estimation Factors, Mark II FP, COCOMO II: Application Composition, Early Design and Post-Architectural Models; Putnam Estimation Model

LEARNING OUTCOMES

Unit I	At the end of the first unit, students should be familiar with basic concepts of software engineering and software models.
Unit II	At the end of the second unit, students should be familiar with requirements and SRS
Unit III	At the end of the third unit, students should be familiar with requirement management and design engineering concepts
Unit IV	At the end of the fourth unit, students should be able to understand the architectural

	design concepts
Unit V	At the end of the fifth unit, students should be able to understand the various software estimation techniques

Course Code: CAPOL302

WEB TECHNOLOGY

Semester: V

Course Objective: To understand the concepts of web application development. Learner will be able to understand the web technologies

UNIT I

Getting Started on the Web-Publishing Web Content-Understanding HTML and XHTML-Connections-Understanding Cascading Style-Sheets-Understanding JavaScript BuildingBlocks of Practical-Web Design-Working with Fonts, Text Blocks, and Lists-Using Tables to Display Information-Using External and Internal Links-Working with Colors, Images, and Multimedia

UNIT II

Advanced Web Page Design With CSS-Working with Margins, Padding, Alignment, and Floating-Understanding the CSS Box Model-and Positioning Using CSS to Do More with Lists, Text, and Navigation-Creating Fixed or Liquid Layouts

UNIT III

Getting Started with Dynamic Web Sites-Understanding Dynamic Websites-Getting Started with JavaScript Programming-Working with the Document Object Model (DOM)-Using JavaScript Variables, Strings and Arrays-Using JavaScript Functions and Objects-Controlling Flow with Conditions and Loops - Responding to Events-Using Windows and Frames

UNIT IV

AdvancedJavaScript Programming-Using Unobtrusive JavaScript-Using Third-Party Libraries- Greasemonkey: Enhancing the Web with JavaScript-AJAX: Remote Scripting

UNIT V

Advanced Website Functionality and Management- Creating Print-Friendly Web Pages-Working with Web-Based Forms-Organizing and Managing a Website-Helping People Find Your Web

LIST OF EXPERIMENTS

1. Create simple static web page using HTML
 - a) Web page must have a title
 - b) Apply background color
2. Create multiple web pages that has navigation among them
 - a) Use internal and external links
 - b) Apply various text formatting tags
 - c) Use Lists and Table
3. Create internal and external style sheets for the above two experiments
4. Create a CSS that has fixed or liquid layouts
5. Create a web site
 - a) With multiple web pages
 - b) Use Frames and forms
6. Design a login and registration page using form elements

LEARNING OUTCOMES

Unit I	The learners will understand the concepts of static and dynamic web applications, design attributes for the form elements
Unit II	The learners will understand Margins, Padding, Alignment, and Floating and Positioning Using CSS to Do More with Lists, Text, and Navigation-Creating Fixed or Liquid layouts
Unit III	The learners will be able to create dynamic web sites and java scripting constructs

Unit IV	The learner will be able to design web applications using third party libraries
Unit V	The learner will be able to design Print-Friendly Web Pages and Working with Web-Based Forms

Course Code: CAPOL112

PROGRAMMING IN PERL

Semester: V

Course objective: This course aims to provide an in-depth knowledge of programming concepts using PERL. This course is designed to understand the concepts of regular expressions and CGI programs.

UNIT I

Introduction to PERL: The History-the platform support– Scalar data: data types-variable assignments-- operators-type conversions – Control structures: conditional statements-control statements-Nested loops

UNIT II

Lists Arrays and Hashes:lists-arrays-array slices-hashes- Program flow and subroutines: organization basics-subroutines-declaring-arguments-predefined subroutines-returning data-advanced topics-working with Files and Directories:Basic file manipulation-directory access

UNIT III

Regular expressions:what are regular expression-pattern matching syntax- packages and modules-definitions-constructor and destructor-loading libraries-the Package statement-The Exporter module-import()-building a library-Interacting with databases using PerlDBI:understanding databases-introduction to the DBI-Using the DBI

UNIT IV

Writing CGI Programs: what is CGI-understanding forms-sending and receiving forms-returning data– Cross platform functions and issues: System()-operating system specific issues

UNIT V

Error Message and Debugging :understanding Error messages-debugging-Advanced features and concepts: object oriented programming- PerlScript- gui Components with Perl/Tk-

LEARNING OUTCOMES:

Unit I	The learner will be able to know and apply the operators and control structures.
Unit II	The learner will be able to apply the concepts of lists, arrays and hash structures.
Unit III	The learner will be able to know the regular expressions.
Unit IV	The learner will be able to write CGI programs.
Unit V	The learner will be able to know the error messages and its debugging.

Course Code: CAPOL113

PYTHON PROGRAMMING

Semester: V

Course Objective: To learn Python programming and fundamentals in OOP

UNIT I

Introductory Concepts Introduction to Python Programming: memory concepts-arithmetic, string formatting. Decision making: equality and relational operators-control structures-functions-tuples-lists and dictionaries.

UNIT II

Object Based and Object Oriented Programming Object-Based Programming: Introduction- implementing a time abstract data type with a class - special attributes - controlling access to attributes - using default arguments with constructors destructors-class attributes. Composition: object references as members of classes, data abstraction and information hiding - software reusability - operator overloading.

Object-Oriented Programming: Inheritance-base classes and derived classes-creating base classes and derived classes-overriding base class methods in derived class-software engineering with inheritance-composition vs. inheritance-abstract base classes and concrete classes, polymorphism.

UNIT III

Exception Handling and String manipulation Exception Handling: Overview-python exception hierarchy-finally clause-exception objects and trace backs-programmer-defined exception classes. String manipulation and regular expressions: fundamentals of characters and strings-string presentation-searching strings-joining and splitting strings-regular expressions-compiling regular expressions and manipulating regular expression objects, regular expression repetition and placement characters, classes and special sequences, regular expression-string manipulation functions-grouping.

UNIT IV

File Handling in Python File processing and serialization: Introduction, data hierarchy, files and streams, creating a sequential access file-reading data from a sequential access file, updating sequential access files. Database Application Programming Interface (DB-API): Python DB-API specification-database query example-querying the database-reading, inserting and updating a database.

UNIT V

BioPython Introduction-sequence object-sequence record-multiple sequence alignment objects-BLASTaccessing NCBI's Entrez databases-Swiss-Prot and ExPASy-the PDB module-Bio.PopGen: population genetics, genome diagram, framework. Python CGI: simple python CGI for images, random image script: python's graphical libraries, PIL. Dynamic image script, CGI modules.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of fundamentals of Python programming.
Unit II	The learner will have an understanding of object based programming.
Unit III	The learner will be able to learn about exception handling and string manipulation functions.
Unit IV	The learner will be able to understand the file handling functions.
Unit V	The learner will be able to know BioPython functions.

Course code: CAPOL210
Semester: V

XML & APPLICATIONS

Course objective: This course is designed to understand the basic features of extended markup language and its applications.

UNIT I

Introduction to XML – XML Basics – Extensions to XML – XML Based solutions – XML Document structure – Naming Rules – Root, Parent and Child elements – Elements and Tags – Attributes, Attributes to Elements – Entity References, Character data, Comments and Processing Instructions.

UNIT II

Document Type Definition – Creating DTDs – Declaring Internal DTDs – working with Internal DTDs – External DTDs – XML elements in DTDs – Defining elements in DTD – structuring elements – defining attributes in DTD – entities and Notations – Namespaces – sample DTD specifications .

UNIT III

Schema and CSS – simple and complex types – local and global declarations – working with basic schemas – defining simple types – specifying data types and restrictions – defining complex types – sample XML schemas- purchase order, book details etc., - CSS – layout – formatting text with CSS – links and images.

UNIT IV

XSLT and XPath – Introducing XSLT – matching document structures to template rules – structuring XSLT Style sheets – Xpath operators and expressions – branching and control functions – Variables and parameters – strings, booleans and numbers.

UNIT V

XQL and XML Applications – Requirements of a query language – XML Query Language – syntax of XQL – types of XML applications – web and internet applications – meta data and archival applications – multimedia applications – scientific, finance and business oriented applications – language oriented applications.

LEARNING OUTCOMES

Unit I	The learner will be able to understand the document structure of XML.
Unit II	The learner will be able to know the document type definitions.
Unit III	The learner will be able to design cascading style sheets and schemas.
Unit IV	The learner will be able to transform information in stylesheets.
Unit V	The learner will be able to understand the XML query language and XML applications in various disciplines.

Course Code: CAPOL211

BASICS OF LINUX PROGRAMMING

Semester: V

Course Objective: To help the learner to understand the various LINUX utilities, Shell programming, File related concept, process control, relationship, Inter process communication and advanced I/O techniques.

UNIT I

Linux Utilities-File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text processing utilities and Backup utilities, sed scripts, operation, addresses, commands, applications, awk – execution, fields and records, scripts, operation, patterns, actions, functions, using system commands.

UNIT II

Working with the Bourne again shell(bash): Introduction, shell responsibilities, pipes and input Redirection, output redirection, here documents, running a shell script, the shell as a programming language, shell meta characters, file name substitution, shell variables, command substitution, shell commands, the environment, quoting, test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

UNIT III

File I/O – File descriptor – Open, Create, Close, lseek, Read, Write function - I/O Efficiency - File Sharing - Atomic Operations - dup and dup2 functions, sync, fsync, and fdatasync functions, fcntl function, ioctl – Files and Directories – File types – File Access permission – Access and umask function – chmod and fchmod functions – sticky bit – chown, fchown and lchown functions. File systems – link, unlink, remove and rename functions - Symbolic Links and functions – File Times - Streams and File object – Buffering – Line at a time I/O, Binary I/O - Formatted I/O.

UNIT IV

Process , Process concept, Kernel support for process, process attributes, process control - process creation, waiting for a process, process termination, zombie process, orphan process, Process APIs. Signals– Introduction to signals, Signal generation and handling, Kernel support for signals,Signal function, unreliable signals, reliable signals, kill, raise, alarm, pause, abort, sleep functions - Job control signals.

UNIT V

Advanced I/O – Non blocking –Record locking –STREAMS – I/O multiplexing – Asynchronous I/O Interprocess Communication: Introduction to IPC, Pipes, FIFOs, Introduction to three types of IPC-message queues, semaphores and shared memory. Message Queues- Kernel support for messages. Terminal I/O – terminal option flags- stty command-baud rate functions-line control functions-terminal identification-canonical mode-noncanonical mode-terminal window size, termcap,

LEARNING OUTCOMES

Unit I	The learner will have an understanding of various Linux utilities and networking commands.
Unit II	The learner will be able to understand various Shell programming.
Unit III	The learner will be able to know the file system, file types and stream related concept.
Unit IV	The learner will have an understanding the concept of process control, relationship and signals.
Unit V	The learner will be able to understand various advanced I/O techniques, Interprocess communication and Terminal related concepts.

Course Code: CAPOL305

E-COMMERCE

Semester: VI

Course Objective: To help the learners to understand fundamental concepts of E-Commerce and technologies related to it.

UNIT I

Introduction, Electronic Commerce Framework, the Anatomy of E-Commerce Applications. E-Commerce Consumer applications, E-Commerce organization applications.

UNIT II

Consumer Oriented Applications, mercantile process models, mercantile models from the consumer's perspective, Mercantile from the merchant's perspective.

UNIT III

EDI-Electronic Data Interchange, EDI Applications in Business, EDI implementation, MIME, and value added networks.

UNIT IV

E-Payment Systems: Digital Token-Based Electronic Payment Systems, Smart Cards & Electronic Payment Systems, Credit Card- Based Electronic Payment Systems, Risk & Electronic Payment Systems, Designing Electronic Payment Systems.

Case Studies: Online Banking Transactions, Online Shopping Malls, Online Ticket Reservation Systems.

UNIT V

Network Security: Client Server Network Security – Security Threats-Firewall-Encryption for Data and Message Security. Mobile Computing Fundamentals: Mobile computing Framework, Mobile Information Access Devices, Mobile Computing Applications.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of E-Commerce Framework and Applications.
Unit II	The learner will have an understanding of various mercantile models.
Unit III	The learner will have an understanding of how data can be interchanged electronically.

Unit IV	The learner will have an understanding of E-Payment system with various case studies.
Unit V	The learner will have an understanding of Security issues and brief knowledge about M-Commerce.

Course Code: CAPOL208

COMPUTER GRAPHICS & MULTIMEDIA

Semester: VI

Course Objective: To familiar with all graphical need and its requirement together with various two dimensional and three dimensional graphical pattern generation.

UNIT I

Graphics Basis Introduction to Computer Graphics - Video Display devices – CRT- Raster Scan Displays – Random Scan Displays – Direct View Storage Tubes – Shadow Mask CRTs – Flat Panel Displays- Display Processors – Raster scan and Random scan Display processors.

UNIT II

Graphical Pattern Generation Input and Output Devices: Keyboards – Mouse – Track Ball – Digitizer - Touch Panels – – Hard Copy Devices – Printers – Plotters - Image Scanners- Graphics Software – Graphics Functions – Software Standards – Output primitives – Line drawing algorithms – Circle drawing algorithms.

UNIT III

Two dimensional Transformation 2-D Transformations: Translation – Rotation – Scaling – Composite transformations – Reflection- Shear – 2-D Viewing – Viewing pipeline – Window to Viewport Transformations – Clipping – Point Clipping – Line Clipping (Cohen Sutherland).

UNIT IV

Three dimensional Transformation 3-D Concepts: 3D Display Methods – 3D Transformations – 3D Viewing – Projections –View Volumes – 3D Clipping – Visible Surface Detection Methods – Back Face Detection - Depth Buffer- A-Buffer – Color Models – RGB Color Model.

UNIT V

Multimedia Concepts Introduction to Multimedia: Multimedia Basics and Applications - Multimedia Team- Authoring Tools – Audio: MIDI – Digital Audio - Audio File Formats – Image: Bitmaps – File Formats – Video: Principles of Animation – Video Compression – Broadcast Video Standards.

LIST OF EXPERIMENTS

1. Generation of various geometric shapes through built in function.
2. Various line styles and filling styles in graphics.
3. Point clipping operation.
4. Perform line clipping with in one suitable region.
5. Perform 2D translation with one square and one circle.
6. Perform 2D scaling with one rectangle and one ellipse.
7. Perform 2D rotation both in clockwise and in anticlockwise.
8. Perform 2D shearing with respect to a triangle.
9. Perform 2D Reflection with respect to a rectangle.
10. Perform 3D Translation.

LEARNING OUTCOMES

UNIT I	The learner should familiar with all graphical Raster and Randomization principles.
UNIT II	The learner should familiar with all graphical pattern generation through various graphical devices
UNIT III	The learner should familiar with all two dimensional concepts.
UNIT IV	The learner should familiar with all three dimensional concepts.
UNIT V	The learner should familiar with all multimedia basic principles.

Course Code: CAPOL306

C# & . NET TECHNOLOGIES

Semester: VI

Course Objective:To understand the concepts of Dot Net Framework, Visual C# Dot Net.Learner will be able to understand the concept of ADO .Net and Web application

UNIT I

Understanding .NET - .NET strategy, origins of .NET tech, .NET framework, CLR, Framework base classes, Users and program interfaces, Visual studio .NET, .NET languages, benefits, C# and the .NET

Introducing C# and Overview - what is c#, characteristics, difference between C#, C++ and Java, simple C# program, namespaces, Program structure. Decisionmaking and branching, looping, manipulating strings.

UNIT II

Classes and Objects, Inheritance and Polymorphism, Interfaces – defining, extending, implementing, interfaces and inheritance, explicit implementation, casestudy.

UNIT III

Operator Overloading – overloadable operators, need, defining operator overloading, overloading unary ,binary and comparison operators, case study. Delegatesand Events – delegates, declaration, methods, instantiation, invocation, using delegates, Events, case study

UNIT IV

Managing Console I/O operations, Managing Errors and Exceptions – types of errors, exceptions, syntax, multiple catch, finally statement, nested try, throwing our own exception, checked and unchecked operators , case study.

UNIT V

Building Components - What Is a C# Component, IComponent, Component, A Simple Component, Overriding Dispose(bool), Employing the using Statement, Containers. Creating Form-Based Windows Applications - A Brief History of Windows Programming, Two Ways to Write a Form-Based Windows Application, How Windows Interacts with the User, Windows Forms, A Skeletal Form-Based Windows Program, Adding a Button, Handling Messages, Using a Message Box, Adding a Menu. Working With ADO.Net –Introduction to ADO. Net Architecture, Using ADO.NET Classes in Your Application Web Based Applications on.NET

LIST OF EXPERIMENTS

1. String manipulations.
 - i) Program using string functions.
 - ii) Program to find abbreviation of a given string.
 - iii) Program to count the number of occurrences of a character in a string.
2. Write a program to generate pay bill for n number of employees.
3. Write a program to perform the following operations in the bank.
 - i) Creating a new account.
 - ii) Deposit amount.
 - iii) Withdraw amount.
 - iv) Checking minimum balance.
 - v) List customer details.
4. Design the following classes to illustrate the usage of inheritance and all c# modifiers.
 - i) Create a class for generating student's personal details.
 - ii) Create a class for calculating CGPA and grades for n number of students.
 - iii) Create a class to decide whether the students are eligible for campus interview.
5. Write a program to illustrate the usage of 'ref', 'out' and 'params' method parameters.
6. Write a program for explicit interface.
7. Write a program to implement multicasting in delegate.
8. Write a program to overload arithmetic, relational, increment and decrement operators.
9. Write a program to implement the following
 - i) try-catch

- ii) multiple catch
 - iii) throwing your own exceptions.
10. Write a class Library(DLL) program to encrypt and decrypt the given string and use it in your application.

LEARNING OUTCOMES:

Unit I	The learners will understand the concepts of Dot net framework and basic C# programming constructs
Unit II	The learners will understand the C# Classes and Objects, Inheritance and Polymorphism, Interfaces
Unit III	The learners will be able understand the operator overloading, delegates and events
Unit IV	The learner will be able to manage the Console I/O operations, Errors and Exceptions
Unit V	The learner will be able to design C# components, concepts of windows applications and ADO. Net

Course Code: CAPOL308
Semester: VI

CLIENT SERVER COMPUTING

Course objective: The learner will be able to understand the techniques and the features of client server computing.

UNIT I

Overview of Client/Server Computing: What is Client/Server Computing? – characteristics of Client/Server computing -Application Tasks- Rightsizing, de-noising and Upsizing- Benefits of Client/Server Computing-Building blocks of client/server computing -Evolution of Client/Server Computing: Hardware Trends- Software Trends-Evolution of Operating Systems- Networking Trends-Business Considerations

UNIT II

Client/Server Applications :Components of Client/Server Applications- The Client-The Server-RPC- The Network- Classes of Client/Server Applications- Categories of Client/Server Applications-Understanding Client/Server Computing:Obstacles- Open Systems and Standards-Standards-setting Organisations- Factors for Success

UNIT III

Client Hardware and Software: Client Components-Client Operating Systems- Graphical User Interface (GUI)-Database Access- Application Logic

UNIT IV

Server Hardware and Environment :Categories of Servers- Features of Server Machines- Classes of Servers- Network Management Environment- Network Computing Environment- Network Operating Systems.

UNIT V

Client and Server Requirements: GUI Design Standards- Interface Independence-Platform Independence- Transaction Processing-Connectivity- Reliability- Backup and Recovery Mechanisms- Future Trends:- ATM Switching- Object Technology- CASE Tools- Repositories- Multimedia- Workgroup Computing

LEARNING OUTCOMES

UNIT I	The learner will be able to understand about the characteristics, advantages and evolution of client server computing.
UNIT II	The learner will be able to understand the various client server applications.
UNIT III	The learner will be able to understand the client components, operating systems and application logic.
UNIT IV	The learner will be able to understand the categories of server, operating systems and its environment
UNIT V	The learner will be able to understand the requirements of client server computing.

Course Code: CAPOL309

MOBILE COMPUTING

Semester: VI

Course Objective: It provides a comprehensive coverage of both the communication and computing aspects.

UNIT I

Introduction – Applications of mobile communications – Reference model - Medium access control (MAC) – Hidden and exposed terminals , Near and far terminals, SDMA, FDMA, TDMA, CDMA.

UNIT II

Telecommunication systems – GSM - Satellite systems – Basics, GEO, LEO, MEO, Routing, Localization and Handover - Broadcast systems – Cyclical repetition of data, DAB.

UNIT III

STANDARDS AND PROTOCOLS Wireless LAN – IEEE 802.11- system and Protocol Architecture, Physical and MAC layer, MAC management - Blue tooth – Physical and MAC layer, Networking and security and Link Management.

UNIT IV

ADHOC NETWORKS Routing – Destination Sequence Distance Vector – Dynamic source Routing – Hierarchical Algorithms – Alternative metrics

UNIT V

NETWORK ISSUES Mobile IP – DHCP – Mobile transport layer – Indirect TCP – Snooping TCP – Mobile TCP – Transmission/time – out freezing – Selective retransmission – Transaction oriented TCP- Wireless Application Protocol.

LEARNING OUTCOMES

Unit I	The learner will understand the concepts and implementation of mobile communications
Unit II	The learner will understand the basic concepts and implementation of tele communications, Satellite communications.
Unit III	The learner will be able to apply the principles of protocols and their characteristics
Unit IV	The learner will be able to analyze various routing techniques and algorithms
Unit V	The learner will have an understanding of various implementation issues and solutions related to networks

Course Code: CAPOL310
Semester: VI

PRINCIPLES OF ARTIFICIAL INTELLIGENCE

Course objective: This course aims at teaching different techniques of artificial intelligence and expert systems, Turing test, knowledge representation. Also, focuses on building an expert system, agent properties and classification.

UNIT I

Problem Solving What is AI? - Scope of AI – Problem as State Space Search – BFS – DFS – Search – Uninformed Search – Heuristic Search – Hill Climbing – Best First Search – Constraint Satisfaction.

UNIT II

Knowledge Representation Approaches to Knowledge Representation – Issues in Knowledge Representation – Using Predicate Logic – Modus Ponens – Resolution – Unification – Rules – Forward and Backward reasoning – Conflict Resolution – Structured Knowledge Representation – Semantic nets – Frames.

UNIT III

Game Playing & Planning Minimax Search Procedure – Alpha-Beta Cutoffs – Iterative Deepening – Planning – Blocks-World Problem – Components of Planning System – Goal Stack Planning.

UNIT IV

Understanding & NLP What is Understanding? – Understanding as Constraint Satisfaction – Natural Language Processing – Syntactic Processing – Semantic Analysis – Discourse & Pragmatic Processing.

UNIT V

Learning & Expert Systems What is Learning? – Rote Learning – Learning by taking Advice – Problem Solving – Examples – Explanation-based Learning – Discovery – Analogy – Neural nets & Genetic Learning – Fuzzy Logic – Statistical Reasoning – Bayes' Theorem – Rule-based Systems - Introduction to Expert Systems.

LEARNING OUTCOMES

Unit I	The learner will understand the basic concepts and problem solving techniques in artificial intelligence.
Unit II	The learner familiarizes with propositional and predicate logic. They will learn various knowledge representation methods and reasoning techniques in rule based systems.
Unit III	The learner will acquire knowledge in machine learning techniques such as decision tree induction, artificial neural networks, and genetic algorithm.
Unit IV	The learner will get exposure of natural language processing structures.

Unit V	The learner will understand the basics of expert systems with relevant case studies.
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Course Code: CAPOL311 FUNDAMENTALS OF ENTERPRISE RESOURCE PLANNING
Semester: VI

Course Objective: To motivate and introduce the basics and implementation of ERP, that results in making their career as an ERP consultants.

UNIT I

(ERP AND TECHNOLOGY): Introduction–Related Technologies–Business Intelligence–E-Commerce and E-Business–Business Process Re-engineering–Data Warehousing–Data Mining–OLAP– OLTP- 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 & BUSINESS MODULES):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):Marketplace – Dynamics – SAP AG – SAP BW-Oracle – PeopleSoft – JD Edwards – SSA Global: Baan, ERP LN, ERP LX.

UNIT V

(SYSTEM INTEGRATION):Enterprise Application Integration – ERP and E-Business – ERP II – TQM: Total quality management – Trends in ERP.

LEARNING OUTCOMES

UNIT I	Understand the basic tools and technology involved in ERP.
UNIT II	Modeling and implementation procedure is elaborated.

UNIT III	Importance and modules of ERP are explained in detail
UNIT IV	To make aware of various products in the market.
UNIT V	ERP integration into the real time environment and its quality control.

Course Code: CAPOL212

Semester: VI

Information Technology & Infrastructure Management

Course Objectives:

The purpose of IT infrastructure management is to provide structure and control of the functions responsible for diverse technical operations which generally involve hardware, software, and networking in both physical and virtual environments and more over make the students to understand the basic ideology of flexible, scalable and cost-effective computing environment.

Unit-I

Introduction:Basics of OS concepts- Overview on Virtualization- Overview of Command center- Network Fundamentals- Network and internet- computing resources- information technology- IT infrastructure management- infrastructure- IT Infrastructure management-challenges in IT infrastructure management- design issues of IT organizations and IT infrastructure, determining customers' requirements- IT systems management process,. Hands on Training: Widows operating system and file transfer operations.

(12 hours)

Unit-II

Service Strategy : Goals - Objectives -Scopes and values – Key principle – Process and Activities -
Service Delivery Process: Service level management- financial management- IT service continuity management. Hands on Training: Linux operating system and file transfer operations
(12 hours)

Unit-III

Service Support Process: Configuration management- incident management- problem management- change management- release management. **Storage Management:** Introduction to storage- **Storage Basics** - backup and storage- archive and retrieve- disaster recovery- Hands on Training:. Hands of Training: Database hacking and its prevention.

(12 hours)

Unit-IV

Security Management: Introduction- **Fundamentals of Security**-computer security- internet security- physical security- identity management- access control- intrusion detection. **IT Ethics:** Introduction- intellectual property.

(12 hours)

Unit-V

Emerging trends in IT: Introduction – Ecommerce – Electronic Data Interchange –Global System for mobile communication – Bluetooth. **Service operation:** Purpose-key processes and activities-Key role- Key functions.

(12 hours)

Text Books:

1. Phalguni Gupta, Surya Prakash, Umarani Jayaraman, IT Infrastructure and its Management, Tata McGraw Hill Education Private Limited, ISBN-13: 978- 0070699793, 2009. (T1)
2. An Introductory Overview of ITIL® 2011 Aligned to the 2011 editions BEST MANAGEMENT PRACTICE PRODUCT Published in association with Reference Books: (T2)

Reference Books

1. Ivanka Menken, ITIL V3 Foundation Certification Exam Preparation Course in a Book for Passing the ITIL V3 Foundation Exam, Second Edition (The Art of Service), 2009.

2. Van Haren, Passing the ITIL Foundation, Van Haren Publishing, 2011.

Online Materials

1. https://onlinecourses.nptel.ac.in/noc20_mg28/preview

2. <https://www.btechguru.com/courses--nptel--civil-engineering--infrastructure-planning-and-management-video-lecture--CE--CE10016W.html>

3. <https://www.coursera.org/learn/system-administration-it-infrastructure-services>

LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	<ul style="list-style-type: none">• Infer the basics on Network and internet• Perceive the knowledge of challenges in IT infrastructure management
Unit II	<ul style="list-style-type: none">• Develop the idea behind Service Strategy• Explain the concepts of Service Delivery Process
Unit III	<ul style="list-style-type: none">• Understanding the concepts of Service Support Process.• Elaborate the Storage Management
Unit IV	<ul style="list-style-type: none">• Summarize the Security Management• Outline the IT Ethics
Unit V	<ul style="list-style-type: none">• Point out the Emerging trends in IT• Understanding service operation and its key activities

COURSE LEARNING OUTCOMES

Upon successful completion of this course, the learner will be able to:

CO No.	Course Outcomes	HCL
CO1	Infer the basics on Network and internet	K2
CO2	Explain the concepts of Service Delivery Process	K3
CO3	Understanding the concepts of Service Support Process	K2
CO4	Summarize the Security Management	K3
CO5	Point out the Emerging trends in IT	K2
CO6	Interpret the concepts of Continual service improvement	K2

Course Code: CAPOL307 PROJECT
Semester: VI

NAME OF THE PROGRAMME: Master of Computer Applications

DURATION : 2 Years

ELIGIBILITY FOR ENROLMENT: Any recognized bachelor's degree of minimum three years duration with Mathematics as subject of study in +2 or qualifying degree course.

PROGRAMME FEE : Tuition fee of Rs.35000/- per semester.



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Course Directory for

Master of Computer Applications (Online Mode)

(Students admitted from the Calendar year Jan-2024 Batch)

Programme Objective

Online MCA programme will equip the students with the necessary theoretical knowledge and practical skills in the world of computing that will enable them to understand the design of complex computer applications.

On the successful completion of this programme, the student will be expected to possess the following:

1. Strong foundation of computer applications and information technology.
2. Skills to develop and work with real-time applications.
3. Communication skills, managerial ability to analyze, design, develop, deploy and maintain software projects.

I Semester (21 Credits)

Course Code	Course Name	Credits
CAPOL401R02	Data Structures & Algorithms	3
MATOL427R01	Numerical & Statistical Analysis	3
CAPOL403R02	Computer Organization & Architecture	3
CAPOL408R01	Operating Systems	3
XXXX	Elective I	3
CAPOL405R01	Data Structures & Algorithms Laboratory	2
CAPOL440R01	Numerical & Statistical Methods Laboratory	2
CAPOL412R01	Operating Systems Laboratory	2
TNPOL101R01	Soft Skills – 1	0
	Total	21

II Semester (21 Credits)

Course Code	Course Name	Credits
CAPOL410R01	Database Management Systems	3
CAPOL524R01	Software Design & Testing	3
XXXX	Elective II	3
MATOL444R01	Mathematical Foundation for Computer Science	3
CAPOLXXX	Elective III	3
CAPOL502R02	Advanced Java Programming (Semi Theory & Semi Practical)	2
CAPOL411R01	Database Management Systems Laboratory	2
CAPOL525R01	Software Design & Testing Laboratory	2
TNPOL102R01	Soft Skills – 2	0
	Total	21

III Semester (21 Credits)

Course Code	Course Name	Credits
CAPOL527R01	Algorithm Design & Analysis	3
CAPOL442R01	Web Technology (Semi Theory & Semi Practical)	3
CAPOL512R02	Big Data Analytics	3
CAPOLXXX	Elective IV	3

CAPOLXXX	Elective V	3
CAPOL528R01	Algorithm Design Laboratory	2
CAPOL510R01	Information System Development Laboratory	2
CAPOL523R02	Big Data Analytics Laboratory	2
	Total	21

IV Semester (17 Credits)

Course Code	Course Name	Credits
CAPOL533R01	Theory & Practices of Artificial Intelligence (Semi Theory & Semi Practical)	3
CAPOL534R01	Network Principles & Protocols	3
CAPOLXXX	Elective VI (Students will be allowed to complete this course through SWAYAM)	3
CAPOL535R01	Machine Learning Techniques & Applications	3
CAPOL601R01	Project Work & Viva Voce	5
	Total	17

CREDIT DISTRIBUTION

Total Credits: 80

List of Electives	
<u>Elective I</u>	<u>Elective II</u>
1. ENGOL213R01 Professional Communication	3. CAPOL441R01 Object Oriented Analysis & Design
2. Introduction to game development and	4. Java Core Programming

unity game engine	5. 3D &2D Game development using unity
<p style="text-align: center;"><u>Elective III</u></p> <ol style="list-style-type: none"> 1. CAPOL504R01 Compiler Design 2. CAPOL526R01 Information Security 3. CAPOL508R01 Computer Simulation & Modeling 4. MATOL433R01 Optimization Techniques 5. MATOL443R01 Combinatorics & Graph Theory 6. Core Programming Python 7. Mathematics for game development and game programming pattern 	<p style="text-align: center;"><u>Elective IV</u></p> <ol style="list-style-type: none"> 8. CAPOL513R01 XML Applications 9. CAPOL414R02 Mobile Computing 10. CAPOL509R02 Cloud Computing 11. CAPOL431R01 Graphics & Multimedia 12. CAPOL529R01 Assembly Language Programming 13. Multiplayer Game Development using Unity 14. Software Engineering Agile Devops
<p style="text-align: center;"><u>Elective V</u></p> <ol style="list-style-type: none"> 15. CAPOL432R01 Digital Image Processing 16. CAPOL530R01 Natural Language Processing 17. CAPOL531R01 Digital Signal Processing 18. CAPOL438R01 Internet of Things 19. CAPOL532R01 Soft Computing Techniques 20. AI & ML in game Development using Unity 	<p style="text-align: center;"><u>Elective VI</u></p> <ol style="list-style-type: none"> 21. CAPOL423R01 Enterprise Resource Planning 22. CAPOL425R01 Customer Relationship Management 23. CAPOL426R01 Supply Chain Management 24. CAPOL518R01 E-Commerce 25. CAPOL536R01 Design Thinking 26. CAPOL537R01 Information Technology & Infrastructure Management 27. AR & VR development using Unity <p>Note: Students will also be allowed to complete Elective IV through SWAYAM</p>

Course Code: CAPOL401R02

Semester: I

COURSE NAME: Data Structures & Algorithms

Course Objective: To make the learners to understand the various types of data structures with its associated operations, Abstract Data Types (ADT) and their applications. To study the fundamentals in algorithms using SPARKS and writing algorithms for solving problems. To learn the fundamentals in searching and sorting algorithms

UNIT - I: Stacks and Queues

Data structures: fundamentals – types of data structures. Stacks: stack operations – insertion of an element – deletion of an element. Queues: queue operations – insertion of an element – deletion of an element.

UNIT - II: Linked List and Trees

Linked list: structure of a linked list - linked list operations – insertion of an element – deletion of an element – searching an element. Trees: fundamentals – list representation for the tree. Binary Trees: properties – complete binary trees and full binary trees – sequential and linked list representation of binary trees.

UNIT - III: Graphs and Traversal Techniques

Graphs: representation of graphs – sequential and linked list representation - applications of graphs – spanning trees. Traversal techniques for graphs and trees: depth-first search and traversal – breadth-first search and traversal – recursive formulation of pre-order, post order and in order traversals.

UNIT - IV: Fundamentals in Algorithms

Algorithm: criteria – characteristics. SPARKS representation - primitive data types – conditional and unconditional statements – if statement – if-then-else statement – case statement – while statement – loop-until- repeat statement – for-repeat statement - loop-repeat statement – go to,

return, stop and exit statements – general form of SPARKS algorithm. Design of algorithms: iteration and recursion - factorial – greatest common divisor – Fibonacci numbers - the towers of Hanoi

UNIT - V: Searching and Sorting Algorithms

Searching: linear search algorithm – binary search algorithm – iterative and recursive formulation of the binary search algorithm - finding the maximum and minimum of n numbers.

Sorting: conventional sorting algorithm - insertion sort algorithm - bubble sort algorithm - quick sort algorithm.

LEARNING OUTCOMES

Unit I	The learner will be able to apply the concepts of stack and queue in real-time applications and implementing in C.
Unit II	The learner will have an understanding of the linked lists and trees. They will gain knowledge to implement the corresponding operations in C.
Unit III	The learner will be able to apply the concepts of graphs and traversals in real time applications.
Unit IV	The learner will have an understanding of fundamentals in algorithms using SPARKS. Exposure to iteration and recursion in writing algorithms
Unit V	The learner will be able to understand the importance of searching and sorting algorithms in solving real world problems

Course Code: MATOL427R01

Semester: I

COURSE NAME: Numerical & Statistical Analysis

Course Objective: To make the learners to understand and solve higher degree polynomials, ordinary and partial differential equations.

UNIT- I: Transcendental polynomial & Simultaneous equations and Interpolations

Muller method – Birge-Vieta method – Graeffe's root squaring method for complex roots – Gauss Jacobi iteration Method – Gauss-Seidel iteration method. Finite difference operator – Newton's forward Interpolation – Backward Interpolation – Stirling's- Lagrange's interpolation.

UNIT - II: Differentiation & Integration

Introduction – Numerical Differentiation – First & Second order differentiation – Methods based on Finite differences – Numerical Integration- Trapezoidal rule-Simpson's integration-Romberg's method.

UNIT - III: Numerical Solution of ODE

Solution by Taylor series-Picard's method –Euler's method – Improved and modified Euler method - Runge-Kutta methods-Predictor- corrector methods

UNIT- IV: Statistics

Definition-Binomial, Poisson, Normal distribution-Fitting the distributions to the data-simple correlation & regression-multiple correlation & regression-Test of significance based on T,F&chi square distribution-Small samples & Large sample test - Types of Errors

UNIT- V: Non-parametric statistical methods & Time series analysis

Non-parametric-methods-advantages, disadvantages; Sequential Analysis-Sequential Probability ratio test – simple problem -Time series Analysis-Estimating long term trend- short term trend and other components of Time series-basic methods on Principle component Analysis and canonical variables

LEARNING OUTCOMES

Unit I	The learner will understand the methods of solving transcendental equations, polynomials and simultaneous equations
Unit II	The learner will be able to understand the applications of numerical differentiation and integrations
Unit III	The learner will have the knowledge of solving ODE using numerical methods
Unit IV	The learner will have an understanding of fundamentals in statistics and testing methods
Unit V	The learner will be able to understand the non-parametric statistical methods and time series analysis

Course Code: CAPOL403R02

Semester: I

COURSE NAME: COMPUTER ORGANIZATION & ARCHITECTURE

Course Objective: To learn structure and components of the digital computer and the basics of number systems; To learn different types of CPU organization, the concept of pipelining, study the hierarchy and characteristics of the memory system; To study different methods of communication with I/O devices, standard I/O interfaces and DMA controller.

UNIT- I: Introduction to Computer Organization

Basic concepts and evolution - Computer components and functions - Data Representation – Number systems - Arithmetic for Computers: Addition and Subtraction - Multiplication - Division - Floating Point - Memory system and hierarchy – ALU.

Unit-II: Principles of Computer Design

CPU organization- Instruction sets: characteristics and functions, addressing modes and formats – Processor structure and functions – RISC – CISC – Parallel Processing: Multiple Processor organization– increase in parallelism – GPU vs. CPU.

Unit-III: Storage& Memory Functions

Memory systems – Cache Memory – elements of cache design – internal memory - RAM, ROM, Flash memory – external memory system – magnetic disk – optical memory – memory technologies - Virtual Memory system –

Unit-IV: I/O processing functions

Input and Output devices – Computer display – CRT – LCD – LED – Scanning procedures – Raster and Random scanning – Different types of printers

Unit-V: Hardware interfacing issues

I/O modules – Programmed IO – Interrupt driven IO- Direct Memory Access – Direct Cache Access – IO channels and Processors – External interconnection standards – IO interrupts.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of components, data representation and number systems
Unit II	The learner will be able to analyse the types of CPU organization and processing of data within the system
Unit III	The learner will be able to understand the organization of various storage technologies to analyze the flow of data between memory systems
Unit IV	The learner will have an understanding of the input/output processing functions of various peripheral devices
Unit V	The learner will be able to understand the mode of data transfer between various hardware components

Course Code: CAPOL408R01

Semester: I

COURSE NAME: OPERATING SYSTEMS

Course Objective: To understand the basic concepts of operating system processes and services.

UNIT- I: Introduction

Evolution of operating systems, Types of operating systems, Different Views of operating systems, operating systems concepts and structure. The process concept, systems programmer's view of processes, the operating System view of processes, Operating system services for process management, Scheduling algorithms, performance evaluation

UNIT- II: Memory Management

Memory management without swapping or paging, swapping, virtual memory, page replacement algorithms, modeling paging algorithms, design issues for paging systems, segmentation.

UNIT - III: Process management & Deadlocks

process communication and synchronization, the need for interprocess synchronization, mutual exclusion, semaphores, hardware support for mutual exclusion, queuing, implementation of semaphores, classical problems in concurrent programming, critical region and conditional critical region, monitors, messages, deadlocks.

Unit- IV: File & I/O Management

File systems, directories, file system implementation, security protection mechanisms. Principles of I/O Hardware: I/O device, device controllers, direct memory access Principles of I/O software: goals, interrupt handlers, device drivers, device-independent I/O software, User space I/O software. Disks: Disk hardware, scheduling algorithms

UNIT- V: Error handling & Performance Issues

Error handling, track-at-a-time caching, RAM Disks Clocks: Clock hardware, clock software. Terminals: Terminal hardware, memory-mapped terminals, I/O software. Processes and Processors in distributed systems: Threads, system models, processor allocation, scheduling. Distributed File Systems: Design, implementation, trends - Important trends affecting performance issues, why performance monitoring and evaluation are needed, performance measures, evaluation techniques bottlenecks and saturation, feedback loops

Case studies: MS DOS, MS WINDOWS, LINUX (UNIX) Operating system.

LEARNING OUTCOMES

Unit I	The learner will understand the basic concepts of operating system structure, process management concepts and scheduling algorithms
Unit II	The learner will know the basics of memory management concepts including virtual memory management Paging and segmentation
Unit III	The learner will understand basics of Inter Process Communication Techniques, Semaphores, Mutual Exclusion problems and Deadlocks
Unit IV	The learner will understand the basic concepts of File Management and I/O Management
Unit V	The learner will be able to understand distributed processing concepts, distributed file management concepts and case study about Unix and windows OS

Course Code: ENGOL213R01

Semester: I

COURSE NAME: PROFESSIONAL COMMUNICATION

Course Objective: At the end of the course learners will be able to use English for all their communication needs as computer professionals – make effective interpersonal interactions, presentations and write various types of letters, reports and other technical documents.

Unit I: Nature of Business Communication

Importance of Communication; General vs. Business Communication; Process of Communication - Types of Communication: Verbal – Oral, written; Non-verbal/body language – eye contact, facial expression, gesture, posture, para-language. Levels of communication: Interpersonal, organizational, mass. Organizational communication; Flow of communication in an organizations – downward, upward, horizontal (lateral); Profile of an effective communicator; Barriers of communication; Ethical and legal issues.

Unit II: Communication Basics

Listening – process; Types of Listening; Characteristics of a good listener; Listening and note taking - Reading - Introduction, Definition and Meaning of Reading, Purpose of Reading, Types of Reading, SQ3R Technique of Reading, Comprehension test. Functional Grammar: Verbs, Tense, Voices, Negation and interrogation, conditionals, concord, phrasal verbs, Elimination of common errors.

Unit III: Oral Communication

Interpersonal Skills – various language functions like Greeting people; Conversational Skills; Delivering a speech; Audience analysis; Organizing a speech; Presentation strategies; business presentation with multimedia, prepared speech, extempore speech.

Unit IV: Written Business Communication

Preparing an agenda; minutes of a meeting; Business reports Types – Proposals/Feasibility/Progress/Project Completion; Structure and format of a report: Title page, abstract, contents, including Bibliography, Glossary, index, appendix; Types of business letters; E-mail, interoffice memos. Organization of writing material.

Unit V: Applications of Business Communication

Negotiation Skills; Business Etiquette; Resume and Cover letter writing; Personal Interviews, and Group Discussions; Poster presentation, writing technical document, preparing software user manual, preparing project documentation.

LEARNING OUTCOMES

By the end of the course, the learner will be able to

Unit I	develop an understanding of the process of communication, familiarize with the communication that takes place in an organization, Flow of Communication and Levels of Communication etc.
Unit II	equip themselves with listening, reading and basic grammar skills.
Unit III	make better interpersonal communication, and presentation skills
Unit IV	write business letters and reports of various types with appropriate format
Unit V	apply the knowledge of writing especially in preparing software user manual, project documentation etc.

Course Code: IE001

Semester: I

INTRODUCTION TO GAME DEVELOPMENT AND UNITY GAME ENGINE

Course Objectives:

This course will help the learner to establish a solid foundation in game development by providing insights into key elements, the development process, and various roles within the industry. Participants will explore emerging trends and technologies such as VR, AR, and AI, and gain a comprehensive understanding of game genres and gameplay mechanics. Additionally, the course introduces game design principles and tools, covering narrative, aesthetics, user experience, and interface design. In the final unit, learners will acquire practical skills in Unity and C# scripting, including physics and collision detection, enabling them to initiate their journey into the dynamic field of game development.

UNIT - I

Foundations of Game Development - game and its key elements - game development process - Introduction to game design, programming, and art - Evolution of games.

Exploring the Gaming Industry - Emerging trends and technologies in the gaming industry - impact of virtual reality (VR), augmented reality (AR), and artificial intelligence (AI) on games - Game development pipeline.

Roles in Game Development - Game designer - Game programmer - Game artist - Game tester.

UNIT - II

Genres and Gameplay – analysing game genre - Understanding gameplay mechanics.

Introduction to Game Design - game design principles and process - Key elements of game design - game design tools and software

Game Mechanics and Systems – Analysis of game mechanics and systems - Designing game mechanics

Game Prototyping - Tools and techniques for game prototyping - Rapid prototyping and iteration

UNIT – III

Game Narrative and Storytelling – Story structures and techniques - Writing for games: creating characters, dialogue, and story arcs.

Game Aesthetics and Art Direction – Designing game visuals: art styles, color theory, and composition - Audio design in games: sound effects, music, and voice acting

User Experience and Interface Design – Designing effective user interfaces (UI) for games

Game Monetization and Business - Game marketing and user acquisition strategies - Intellectual property and legal considerations in game design

UNIT - IV

Introduction to Unity and Game Development - History and background of Unity - Installation and setup of Unity - Creating a new project - Understanding the Unity interface - GameObjects and Components - Scenes and Prefabs - Assets and the Asset Store

UNIT - V

Unity Scripting Basics – Understanding the Unity scripting environment - C# programming language in Unity - Built-in Unity functions - Debugging techniques in Unity

Physics and Collision Detection - rigidbodies and colliders - Trigger colliders -Applying forces and constraints to rigidbodies - raycasting for collision detection - Unity Events for collision handling

LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	<ul style="list-style-type: none"> Define and describe the key elements of a game, understand the game development process, and identify the roles in game development. Analyze the impact of emerging trends and technologies in the gaming industry, including virtual reality (VR), augmented reality (AR), and artificial intelligence (AI).
Unit II	<ul style="list-style-type: none"> Analyze different game genres and deconstruct gameplay mechanics to gain an understanding of how they contribute to the player experience. Apply game design principles and processes, identify key elements of game design, and utilize game design tools and software.
Unit III	<ul style="list-style-type: none"> Demonstrate proficiency in crafting game narratives, including understanding story structures, techniques, and the creation of characters, dialogue, and story arcs. Apply principles of game aesthetics and art direction, including designing game visuals, understanding art styles, color theory, composition, and incorporating audio design in games.
Unit IV	<ul style="list-style-type: none"> Develop a foundational understanding of Unity and game development, including the history and background of Unity, project setup, and familiarity with essential Unity components and assets.
Unit V	<ul style="list-style-type: none"> Acquire fundamental scripting skills in Unity, including an understanding of the scripting environment, the C# programming language, built-in Unity functions, and debugging techniques.

List of Laboratory Experiments

1. Move a cube using `getAxis()` in left, right, forward and backward direction. Rotate a cube in clock wise and anti clockwise direction. Scale up/down a cube using `getKey()`.

2. Create a project and do the following:

*** create a cube gameobject**

*** create a light gameobject. Name it "myFavLight".**

*** create two scripts only: cubeScript and extraScript. Attach both of them to the cube.**

*** The extrascript should be enabled and disabled at run-time using the space key.**

*** the light gameobject should be enabled and disabled at run-time using the space key as well.**

3. Create a project and do the following:

*** create a cube gameobject**

*** create two scripts only: cubeScript and myExScript. Attach only the cubeScript to the cube.**

- * create a variable "age" with value 12 in myExScript.
- * create a myExScript method "printBla" printing "foo" in the method.
- * in cubeScript, access the properties of myExScript, both age and the method "foo".

4. Create 3 spheres depicting the sun, earth and moon. Simulate the rotation of the earth and it's revolution around the sun. Do the same for the moon.

5. Implement wall breaker game using prefabs.

Course Code: CAPOL405R01

Semester: I

COURSE NAME: DATA STRUCTURES & ALGORITHMS Laboratory

Course Objective: To provide hands-on exposure in applying various data structure concepts for solving applications using C language.

1. Write a program to add and delete a node in a singly linked list.
2. Write a program to add and delete a node in a doubly-linked list.
3. Write a program to implement stack operations using the array.
4. Design a program to implement queue operations using the array.
5. Implement stack operations using a linked list.
6. Implement queue operations using a linked list.
7. Design a program to sort n numbers in ascending order using conventional sorting.
8. Write a program to implement the selection sort.
9. Write a program to implement insertion sort.
10. Write a program to implement quicksort.
11. Write a program to search for a key using the binary search method.
12. Write a program to implement a linear search.
13. Write a program to add and delete a node in a binary tree.
14. Write a program to implement BFS and DFS.
15. Write a program to implement infix, prefix and postfix conversions.

LEARNING OUTCOMES

Ex 1,2	The learner will have an understanding of the implementation of linked lists
Ex 3, 4	The learner will have an understanding of the implementation of stack and queue using array
Ex 5, 6	The learner will have an understanding of the implementation of stack and queue

	using lists
Ex 7-10	The learner will have an understanding of the implementation of sorting algorithms
Ex 8	The learner will have an understanding of the implementation of binary search
Ex 9	The learner will have an understanding of the implementation of binary tree
Ex 10	The learner will have an understanding of the implementation of BFS and DFS
Ex 11, 12	The learner will have an understanding of the searching techniques
Ex 13	The learner will have an understanding of binary tree operations
Ex 14	The learner will have an understanding of graph traversals
Ex 15	The learner will have an understanding of the conversions of expressions

Course Code: CAPOL440R01

Semester: I

COURSE NAME: Numerical & Statistical Methods Laboratory

Course Objective: To provide hands-on exposure in solving real-world problems and implementing numerical methods using C.

1. Develop a program to implement Numerical Integration.
2. Design a program to implement Runge - Kutta Methods.
3. Develop a program for fitting Poisson distribution.
4. Design a program to find the correlation coefficient of X and Y.
5. Design a program to find the regression equations for individual observations.
6. Write a C program to find the test of significance based on t test.
7. Write a C program to find the test of significance based on F test.
8. Write a C program to find the test of significance based on the Chi-square test.
9. Design a program to solve the simultaneous system of linear equations.
10. Design a program to implement Lagrange interpolation.

LEARNING OUTCOMES

Ex. 1	The learner will be able to implement numerical integration.
Ex. 2	The learner will be able to write a program for Runge- Kutta Methods
Ex.3	The learner will be able to implement fitting of Poisson distribution
Ex. 4	The learner will be able to write a program for the correlation coefficient
Ex.5	The learner will be able to implement programs for regression equations

Ex.6	The learner will be able to implement programs for t test
Ex.7	The learner will be able to implement programs for F test
Ex.8	The learner will be able to implement programs for Chi-square test
Ex.9	The learner will be able to solve the simultaneous system of linear equations
Ex.10	The learner will be able to implement Lagrange interpolation

Course Code: CAPOL412R01

Semester: I

COURSE NAME: Operating Systems Laboratory

Course Objective: Students acquire knowledge in shell programming, systems calls of the Linux operating system. They do programs to simulate Linux commands. Students will also be able to write programs for processor scheduling, deadlock detection and avoidance, file allocation and organization and memory management schemes.

LINUX shell scripts

1. Write a shell script to know the information about a file.
2. Write a shell script to locate lines with only two words and replace all the lines with two words with the given input
3. Write a shell script to replace a file with its sorted version.
4. Write a shell script that accepts the name of a text file and finds the number of sentences, number of words, and number of words that start with a vowel.
5. Write a program to implement the following process scheduling algorithms

- a) FCFS
 - b) SJF
6. Write a program to implement the following process scheduling algorithms
- (a) Priority
 - (b) Round Robin
7. Write a program to implement the following file allocation strategies
- a) Sequential
 - b) Indexed
 - c) Linked
8. Implement the page replacement algorithms
- a) FIFO
 - b) LRU
9. Write a program to implement the concept of semaphores.
10. Write a program to Implement File Organization Techniques
- a) Single level directory
 - b) Two level directory
11. Write a program to implement Paging Technique of memory management.
12. Write a program to implement the following disk scheduling algorithms
- a) FIFO
 - b) SCAN
 - c) C-SCAN
 - d) LOOKUP

LEARNING OUTCOMES

Ex.1	The learner will be able to understand and implement file operations
Ex. 2	The learner will be able to understand and implement shell script to find and replace words in a file

Ex. 3	The learner will be able to sort the contents of a file
Ex. 4	The learner will be able to implement shell script to find number of characters, words, sentences and number of words that start with vowel in a file
Ex. 5	The learner will be able to understand the process scheduling Concepts of FCFS and SJF and implement it.
Ex.6	The learner will be able to understand the process scheduling Concepts of Priority and Round-robin and implement it.
Ex.7	The learner will be able to understand and implement file allocation strategies.
Ex.8	The learner will be able to understand and implement file page replacement algorithms
Ex.9	The learner will be able to understand and implement semaphores
Ex.10	The learner will be able to understand and implement file organization techniques
Ex.11	The learner will be able to understand and implement paging techniques
Ex.12	The learner will be able to understand and implement disk scheduling techniques

Course Code: TNPOL101R01

Semester: I

COURSE NAME: SOFT SKILLS – 1

Course Objective:

To emphasize, impart and improve soft skills of the learner

S.NO	TOPICS	NO. CLASSES
1	Self Introduction	2
2	Impromptu	4
3	SWOT Analysis	4
4	Body Language	2
5	Product Launch	2
6	Person I admire / Book I Like / If I were	4
7	Mock Press	2
8	Out of Box Thinking (Creativity & Innovative Thinking)	1
9	Debate on Current Affairs	4
10	General Quiz	1
11	Semester Practical	3
12	Semester Theory Exam	1
TOTAL		30

Self Introduction	The learner will be able to successfully introduce himself before others.
Impromptu	The learner realizes the importance of presence of mind and react sharply and swiftly.
SWOT Analysis	Students are encouraged to do a self introspection of their strengths, weaknesses, opportunities and threats

Body Language	The learner realizes the importance of body language in the day to day communication
Product Launch	The learner understands the importance of marketing skills and the need for sharpening the skill.
Person I admire/Book I like/If I were	This inculcates the habit of reading and know about the greatness of great people.
Mock Press	The learner will enhance the answering skills and the ability to articulate his thoughts.
Out of Box thinking	The learner will develop lateral thinking and encouraged to think differently.
Debate on Current Affairs	The learner will be exposed to the happenings around the globe through a debate.
General Quiz	The learner will be exposed to the happenings around the globe through a Quiz.

Course Code: CAPOL410R01

Semester: II

COURSE NAME: DATABASE MANAGEMENT SYSTEMS

Course Objective: This course focuses on the introduction of relational database management systems, ER model and structure of relational database, indexing and advanced data base concepts. It also exposes the basic principles and concepts of distributed, object-oriented and object-relational databases.

UNIT- I: Introduction

Introduction – purpose of database system- data models – database languages-Transaction management – Storage management - DBA – database users-system structure - E-R model

UNIT- II: Relational Database Design

Anomalies in a Database – Functional Dependency – Lossless Join and Dependency-Preserving Decomposition – Third Normal Form – Boyce Codd Normal Form – Multi-valued Dependency – Fourth Normal Form – Join Dependency – Project Join Normal Form – Domain Key Normal Form. SQL: Data Definition – Data Manipulation – Integrity Constraints – Views – PL/SQL.

UNIT-III: Indexing and Hashing

Indexing and Hashing - Query Processing – Transaction Processing - Concurrency Control and Recovery

UNIT-IV: Advanced Database Concepts and Emerging Applications

Distributed Databases-Object Oriented Databases-Object Relational Databases- Data mining and Data Warehousing. Non-relational Databases and NOSQL

UNIT- V: DBMS Case Studies

Application of DB concepts in Hospitals or any small and medium scale Industry – Application of DBMS in Marketing

LEARNING OUTCOMES

Unit I	The learner will have an understanding on the basic concepts of various data models. Transaction and storage management concepts have also been exposed
Unit II	The learner will learn concepts of normalization and various normal forms besides SQL and PL/SQL queries
Unit III	The learner will be able to analyse the performance of query processing using indexing, hashing and also learn recovery mechanisms
Unit IV	The learner will have an understanding of emerging concepts in databases like object-oriented, object-relational and distributed databases. Learners are also

	exposed to learn data mining and data warehousing techniques
Unit V	The learner will be able to apply different concepts and techniques of DBMS in developing software for some business applications

Course Code: CAPOL524R01

Semester: II

COURSE NAME: Software Design & Testing

Course Objectives:

- To understand the concepts of software processes, process models and fundamental process activities.
- To understand the fundamental concepts of requirements engineering and requirements specification and documents.
- To know about the idea of design patterns and how these are away of reusing design knowledge and experience.
- To be aware of testing processes, techniques and debugging to solve program defects.
- To learn how to use software metrics, manage risk, apply basic software quality assurance practices to ensure that software designs, development, and maintenance meet or exceed applicable standards.

Unit-I: Introduction

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II: Software Requirement Engineering

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit-III: Software Design

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs

Unit-IV: Software Testing

Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit-V: Software Maintenance and Software Project Management

Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control- An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

LEARNING OUTCOMES

Unit I	The learner will get an understanding of various software process models.
Unit II	The learner will have an understanding on various concepts of requirements engineering.
Unit III	The learner will get an understanding of software design concepts and software design models
Unit IV	The learner will be able to test the software by applying various testing techniques..
Unit V	The learner will have an understanding of developing a project management plans (PMP) and to track project execution through collecting artifacts and metrics

Course Code: CAPOL441R01

Semester: II

COURSE NAME: OBJECT ORIENTED ANALYSIS & DESIGN

Course Objective: To impart knowledge on model and design of object oriented concepts for developing programs catering to different applications.

UNIT- I: Basics of Modeling and Class Modeling

Introduction: Object Orientation, OO Development, OO Themes; Class Modeling: Objects and classes, links and associations, advanced link and association concepts, generalization and inheritance, grouping constructs, sample class Model - Advanced Class Modeling: Aggregation, Abstract Classes, Generalization as extension and restriction, multiple inheritance, metadata, candidate keys, constraints.

UNIT- II: Behavioral Modeling

State Modeling: Events, States, Transitions and Conditions, State Diagrams; Advanced State Modeling: Nested State diagrams, Nested States, Sample State Model, Relation of Class and State Models. Interaction Modeling: Use case Models, Sequence Models, and Activity Models. Advanced Interaction Modeling: Use case Relationship, Procedural Sequence Models, Special Constructs for activity Models. Use cases and collaborations, Collaboration diagrams, Modeling Object flow, Workflow, Operation

UNIT- III: Analysis and Design

Process Overview: Development Stages, Lifecycle, Preparing a Problem Statement. Domain Analysis: Overview of Analysis, Domain Class Model, Domain State Model, Domain Interaction Model, Iterating the Analysis; System Design: Overview of System Design, Estimating Performance, Making a Reuse Plan, Breaking a System into Subsystems, Identifying Concurrency, Allocation Subsystems, Management of Data storage, Handling Global Resources, Choosing Software Control Strategy, Handling Boundary Conditions, Setting Trade-Off Priorities, Common Architectural Styles, Architecture of the ATM System;

UNIT- IV: Implementation

Implementation Modeling: Overview of Implementation, Fine-Tuning Classes and Generalizations, Realizing Associations, Testing - OO Languages: Introduction, Abbreviated

ATM Model, Implementing Structure and Functionality - Databases: Introduction, Abbreviated ATM Model, Implementing Structure – Basic, Implementing Structure – Advanced, Implementing Structure for the ATM Example, Implementing Functionality, Object –Oriented Databases, tips; Programming styles: Object Oriented Style, Reusability, Expendability, Robustness, Programming-in-the-Large.

UNIT- V: Architectural Modeling

Interfaces, Types, and Roles: Terms and Concepts. Packages, Instances, Processes and Threads, Time and Space: Terms and Concepts. State chart Diagrams: Terms and Concepts, Modeling Reactive Objects, Forward and Reverse Engineering. Components: Terms and Concepts, Modeling Executables and Libraries, Modeling Tables, Files, and Documents, Modeling an API, Modeling Source Code. Patterns and Frameworks: Terms and Concepts, Modeling Design Patterns, Modeling Architectural Patterns. Component Diagrams: Terms and Concepts, Modeling Source Code, Modeling an Executable Release, Modeling a Physical Database, Modeling Adaptable Systems, Forward and Reverse Engineering.

LEARNING OUTCOMES

Unit I	The learner will be exposed to generic notations for representing analysis and design elements
Unit II	The learner will be able to understand the state models, sequence models and scenario models
Unit III	The learner will have an understanding of class notation, various analysis and design models
Unit IV	The learner will be able to understand implementation models, functional models and object oriented database modeling
Unit V	The learner will be able to understand the modeling of architecture, source code, patterns and frameworks

Course Code: IE002

Semester: II

COURSE NAME: JAVA Core Programming

Course Objective: Learn fundamentals of OOP and Java; Learn building blocks of a java program; learn to solve problems using java.

Unit I: Introduction & Java Fundamentals

Java introduction and history- data types, constants, variables, operators - control structures, loops, arrays, Classes, and Objects

Unit II: Collections & String Manipulation

Generics, Array List, HashMap, Linked Hash Set, LinkedList, string builder, string tokenizer, map, filter etc.

Unit III: OOPS

Basic OOP features – Encapsulation, Inheritance, Polymorphism, constructor, Constructor overloading and method overloading.

Unit IV: Java Features and Threading

Abstract classes and interfaces, packages, Multi-Threading, Synchronization, Exception handling, IO Streaming, and MVN overview.

UNIT V: Spring Boot

Introduction to Spring Boot: Introduction to Spring Boot – Setting up a Spring Boot Development Environment – Creating a Simple Spring Boot Application - Dependency Injection and Configuration in Spring Boot. Building RESTful APIs: Designing RESTful APIs – Building RESTful Endpoints with Spring Boot – Handling Request and Response Data – Error Handling and Exception Management – CORS.

LEARNING OUTCOMES

By the end of the course, the learner will be able to

Unit I	The learner will have an understanding of fundamentals in OOP and Java language.
Unit II	The learner will be able to understand the features of Java and solve problems using Java features. The learner will be able to understand the importance of input output, AWT and swing packages.
Unit III	The learner will be able to understand JDBC concepts and will be able to write simple Java applications using database connectivity. The learner will be able to solve problems using graphics programming with Java

Unit IV	Students will learn to build scalable n-tiered web applications using Java/J2EE Students will be able to create applications using Servlets and JSP
Unit V	Students will learn how to build user interface using JSF. Learners will gain knowledge on Enterprise Java Beans (EJB) technology

Course Code:IE003

Semester: II

3D AND 2D GAME DEVELOPMENT USING UNITY

Course Objectives:

This course will help the learner to master key aspects of game development in Unity, covering particle systems, UI design, character control, animations, lighting, sprites, and mobile development. By the end, participants will possess a comprehensive skill set ready for game creation

UNIT - I

Particle System - Audio - Unity UI - Canvas and UI Elements - UI Navigation and Interaction - UI Design Principles

UNIT - II

UI Scripting and Dynamic UI - Animation Basics in Unity - Animation Controllers - Animation Events and Triggers.

UNIT - III

Character Controller Basics - NavMesh Navigation System - Pathfinding and AI Movement - Unity Lighting Basics - Lighting Modes -Lighting Effects and Post-Processing

UNIT – IV

Introduction to Sprites - Sprite Rendering and Sorting Layers - Sprite Animation - Sprite Physics and Colliders - Optimizing Sprite Performance

UNIT - V

Setting Up Unity for Mobile Development - Mobile Input Handling - Optimizing Graphics for Mobile - Mobile UI Design - Performance Optimization for Mobile Devices

LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	<ul style="list-style-type: none">• Design and execute Unity animations and particle systems.• Create and implement an interactive user interface (UI) in Unity.
Unit II	<ul style="list-style-type: none">• Implement a character controller with navigation and artificial intelligence (AI) movement in Unity.• Evaluate and optimize Unity lighting for different scenarios.
Unit III	<ul style="list-style-type: none">• Design and create 2D game graphics and animations using sprites in Unity.• Evaluate and optimize sprite performance in Unity games.
Unit IV	<ul style="list-style-type: none">• Set up a Unity project for mobile development, incorporating the necessary configurations, tools, and SDKs.
Unit V	<ul style="list-style-type: none">• Evaluate and implement performance optimization strategies for mobile games in Unity.

List of Laboratory Experiments

1. With the help of a cylinder and particle system simulate candle and smoke effect.
2. Create a UI menu with buttons to trigger animations of a 3d model.
3. Recreate flappy bird game using 2d assets, build it for android platform.
4. Create a simple FPS game using the assets provided. Build for Windows PC platform.

Course Code: MATOL444R01

Semester: II

COURSE NAME: Mathematical Foundation for Computer Science

Course Objective: To help the learner to focus and develop logical thinking and to study the mathematical concepts of Relational algebra, Lattices & Boolean algebra, Group theory and Graph theory; and to apply them in Computer Science problems.

UNIT- I: Predicate Calculus

Statements and Notations – connectives –Algebra of propositions –Tautological implications-normal form – PDNF and PCNF -theory of inferences-Inconsistent premises-Predicate logic-Quantifiers – Valid formulas and equivalences – inference theory of the predicate calculus.

UNIT- II: Relational Algebra

Basic set theory-Relations and its types – equivalence relation –Representation of relations using matrices and graphs- partial order relation – functions – types of functions-composition of functions –.special types like hashing function etc-recursive relations and sets- solving recurrence equations – generating functions – mathematical induction.

UNIT- III: Lattices and Boolean algebra

Combinatorics – permutations and combinations –pigeon-hole principle and its generalisation – binomial coefficients – Inclusion Exclusion principle -. Lattice as partially ordered set – properties of lattices-special lattices and principle of duality- Boolean algebra and switching circuits – Boolean functions–Representation in canonical form –Applications of Lattices -Logic gates-combination of gates-adders-Karnaugh maps–QuineMcCluskey's tabulation method for minimal expressions

UNIT- IV: Algebraic systems

Binary operations – Algebraic systems – Group and its general properties – Group of integers modulo n – Permutation groups – subgroups and coset decompositions – Lagranges theorem – cyclic groups and properties – Normal subgroups and Group homomorphisms – Direct products and isomorphisms – Algebraic systems with two binary operations – Rings and fields with their important properties –coding theory – Encoders and decoders - Group codes – Hamming codes – Error correction in Group codes –Step by step procedure for decoding group codes - .

UNIT- V: Graph theory

Konigsberg bridge problem- Basic definitions of a graph – Matrix representation – Degree of a vertex and handshaking theorem –complete graphs- regular graphs – bipartite graphs - subgraphs – isomorphism and adjacency matrices – paths, cycles and connectivity –Eulerian and Hamiltonian graphs – Tree and its properties –Minimum spanning tree –Kruskal andPrim’s algorithms – Rooted and binary trees – Properties of binary trees –colouring of graphs and chromatic number – cut vertices and cut edges.

LEARNING OUTCOMES

Unit I	The learner will understand the fundamentals in predicate calculus and its application in arguments and inference theory
Unit II	The learner will understand the fundamentals in Relational algebra with applications
Unit III	The learner will know the fundamentals of lattices and Boolean algebra with their applications in switching circuits
Unit IV	The learner will understand the fundamentals of Algebraic systems, Group theory in particular with its applications in Coding theory.
Unit V	The learner will know the fundamentals of graph theory and its applications in networks and colouring

Course Code: CAPOL504R01

Semester: II

COURSE NAME: COMPILER DESIGN

Course objective:To learn the process of translating a high-level language to executable code. Learners should understand the terminologies related to grammar. They are also made familiar with elementary language theory, formal grammars, and finite state automata.

UNIT- I: Introduction and Grammars

Different phases of a compiler - Context-Free Grammars: importance and notations-ambiguous grammars-derivations and parse trees- basic parsing techniques: parsers-shift reduce parsing-operator precedence parser-simple precedence parser-top down parsing-predictive parsers.

UNIT- II: Parsers

Automatic construction of efficient parsers: LR parsers-canonical collection of LR(0) items-constructing SLR parsing tables-constructing canonical LR parsing tables -constructing LALR parsing tables-using ambiguous grammars-automatic parser generator-implementation of LR parsing tables-constructing LALR sets of items.

UNIT- III: Syntax Directed Translation

Syntax directed translation: syntax-directed translation schemes-implementation of syntax-directed translators-intermediate code-postfix notation-parse trees and syntax trees-three address code, quadruples and triples-translation of assignment statements-boolean expressions-statements that alter flow of control-postfix translation-case statements, Symbol tables: contents-data structures for symbol tables-representing scope information, Run time storage administration, Error detection and recovery.

UNIT- IV: Code Optimization

Introduction to code optimization: principle sources of optimization-loop optimization-DAG representation of basic blocks-global data flow analysis, More about loop optimization: dominators-reducible flow graphs-depth first search-loop invariant computation-induction variable elimination, code generation.

UNIT- V: Code Generation

Object code forms, machine-dependent code optimization, register allocation and assignment generic code generation algorithms, DAG for register allocation.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of fundamentals in phases of compilers, grammars
Unit II	The learner will study different parsing algorithms
Unit III	The learner will have an understanding of syntax directed translation and symbol table concepts with illustrations
Unit IV	The learner will be able to optimize code using different techniques
Unit V	The learner will have an understanding of code generation algorithms and its applications

Course Code: CAPOL526R01

Semester: II

COURSE NAME: INFORMATION SECURITY

Course Objective: This course aims at giving an insight into cryptography, authentication and emerging security standards. It also imparts knowledge on information security and concepts of public-key encryption.

Unit –I:Information Security concepts

Introduction to security and services, What is Information Security?, Critical Characteristics of Information, Components of an Information System, Securing the Components, vulnerabilities and countermeasures, malicious code, goals of security-prevention, detection, and recovery.

Unit –II: Cryptography

Classical Encryption Techniques; Block ciphers and Data Encryption Standard, Advanced Encryption Standard, Contemporary symmetric ciphers, Triple DES, Blowfish, RC5, Public-Key Cryptography and RSA, Key management, Diffie-Hellman, Elliptic curve cryptography, certificate authority, identification and authentication protocols.

Unit –III: Securing the Systems

Authentication Applications: Kerberos, X.509 Authentication Service. System security: Intruders, Malicious Software, Firewalls, Packet filters, Application Level gateway, Encrypted Tunnel, Comparisons, Why firewalls don't work, Denial of service attacks. E-mail security, Pretty Good Privacy, S/MIME.

Unit –IV: Network perimeter and web security

Understanding Network Security Perimeter, Secured router configuration, firewall, design principles, trusted systems, virtual private network, intrusion detection system, vulnerability assessment penetration testing, intrusion prevention system, network address translation.

Web security: Web security requirements, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction.

Unit –V: Computer Forensics and Cyber Laws

Computer Forensics, data recovery, security policies and procedures, security lifestyle management, security awareness, enforcement, information classification, documentation, security audit, managed security services, cyber laws, legal issues-the law affecting information.

LEARNING OUTCOMES

Unit I	The learner will gain an understanding of information security concepts.
Unit II	The learner will understand the principles involved in public key cryptosystems.
Unit III	The learner will have an understanding of securing the systems.
Unit IV	The learner will have an understanding of the principles involved in network perimeter and web security.
Unit V	The learner will understand Cyber laws to recover and secure the data.

Course Code: CAPOL508R01

Semester: II

COURSE NAME: COMPUTER SIMULATION & MODELING

Course Objectives: To understand the concepts in discrete-event system simulation such as random number generation and testing, random variate generation for discrete and continuous distributions; the use of analytic techniques, verification and validation of models; designing simulation experiments, simulation languages, and recent simulation applications.

UNIT- I: Simulation Fundamentals and Random Numbers

Introduction: Definition - Areas of application – Systems and system environment – components of a system – discrete and continuous systems – models – Types of models – Discrete-event system simulation - Phases in a simulation – concepts in discrete-event simulation - Random numbers: Techniques for generating random numbers – tests for random numbers.

UNIT- II: Random-variate Generation

Inverse transform technique: Exponential – Uniform – Weibull distribution – Special properties: direct transformation – convolution method – Table-lookup procedure: discrete uniform distribution – geometric distribution – Acceptance – Rejection technique: Poisson distribution.

UNIT- III: Model Validation and Experimental Design

Model validation: Steps in model building - verification of simulation models - Calibration and validation of models - Design and evaluation of simulation experiments - Simulation run length - Variance reduction techniques - Types of simulations with respect to output analysis.

UNIT- IV: Simulation Software

History of simulation software – classification of simulation languages – features - selection of simulation software – simulation in Java - simulation in GPSS – simulation in SSF – simulation environments – experimentation and statistical analysis tools.

UNIT- V: Simulation Applications with Case Studies

Some recent applications of simulation - Simulation examples - Queuing simulation –Waiting line models – simulating a single-server queue – simulating a queue with two servers- Inventory simulation – simulating the news dealer’s problem – simulating an activity network - simulation of manufacturing and material handling systems.

LEARNING OUTCOMES

Unit I	<p>The learner will be able to understand</p> <ul style="list-style-type: none"> - the fundamentals in the system, model and simulation - the various types of models and steps in a simulation study - the importance of random numbers in simulation and the different techniques for generating random numbers - the different tests conducted for testing uniformity and independence properties of random numbers
Unit II	<p>The learner will be able to understand</p> <ul style="list-style-type: none"> - the uses of discrete and continuous distributions in simulation modeling - the different techniques of generating random numbers for the continuous and discrete probability distributions
Unit III	<p>The learner will have knowledge on</p> <ul style="list-style-type: none"> - the different methods of verifying and validating the simulation model - the different variance reduction techniques used in simulation performance

	evaluation - the different types of simulations concerning output analysis
Unit IV	The learner will be able to understand - the classification of simulation programming languages - simulating real-world problems in Java, GPSS, and SSF languages - simulation tools and its features
Unit V	The learner will be able to understand - the recent applications of simulation with case studies - the application areas of simulation in queuing theory, inventory systems, networks and manufacturing and material handling systems

Course Code: MATOL433R01

Semester: II

COURSE NAME: OPTIMIZATION TECHNIQUES

Course Objective: The objective of introducing optimization techniques is to expose learners with various mathematical techniques that are essentials for managing the resources.

UNIT- I: Linear Programming

Problem formulations, Graphical solution of linear programming models, Solution by Simplex methods and Transportation and assignment problems

UNIT- II: Networks Models

Minimal spanning tree problem, shortest route problem, maximal flow problem and PERT /CPM problems with the application

UNIT- III: Integer Programming

Applications of integer programming – Solution methods: Branch and Bound algorithm – Cutting Plane algorithms - ZERO/ONE Programming

UNIT- IV: Inventory Model

Basic definition of inventory – Production and purchase models with and without shortages - Probabilistic inventory model

UNIT- V: Queuing Models

Basic elements of the queuing model – Generalized Poisson model, steady state – measures of performance - Specialized Poisson queues – Non-Poisson queues

LEARNING OUTCOMES

Unit I	The learner will have an understanding of problem formulation of optimization problems and solving LPP using different methods
Unit II	The learner will be able to solve deterministic and probabilistic network problems
Unit III	The learner will be able to solve the methods of integer programming
Unit IV	The learner will be able to understand the various inventory models and the solutions
Unit V	The learner will have an understanding of different queuing models

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Course Code: MATOL443R01

Semester: II

COURSE NAME: Combinatorics & Graph Theory

Course Objectives: This course will help the learner to understand basic combinatorics and advanced graph theoretical concepts which aid in designing algorithms for optimization problems.

Unit I:

Combinatorics: Introduction-counting principles-permutation and combination-binomial theorem-multinomial coefficients-Stirlingsnumber-Stirling number of second kind-Bell number-Principle of inclusion-Generating functions-Generating subsets-Congruences-Complete system of residues-Linear Congruences-Chinese remainder theorem.

Unit II:

Independent set, Matchings and Dominating sets: Introduction-vertex independent set-vertex coverings-edge independent sets-Matching and factors-Matching in bipartite graphs-perfect matchings and the Tutte matrix-Edmond algorithm-weighted matching-Hungarian algorithm-Dominating set-Minimal dominating set-Domination number-enumeration of all minimal dominating set of a graph.

Unit III:

Vertex and Edge Colouring: Chromatic number-Brook's theorem-chromatic polynomial-Edge chromatic number-Vizing's theorem-The timetabling problem-Storage problem.

Unit IV:

Directed Graphs: Directed graph - some types of digraphs - Digraphs and binary relations - Directed paths and connectedness - Euler Digraphs - Trees with directed edges - Fundamental circuits in digraphs.

Unit V:

Networks: Flows-Cuts-Max flow Min cut theorem-Ford and Fulkerson algorithm-Menger's theorem-Feasible flows.

LEARNING OUTCOMES

By the end of the course, the learner will be able to

Unit I	Solve matching problems for weighted and nonweighted graphs
Unit II	Apply the notion of independence and covering in optimization problems
Unit III	Identify maximum flow in a network
Unit IV	Apply vertex colouring and edge colouring concepts in real life problems
Unit V	Enumerate all minimal dominating sets and maximal independent sets

Course Code: IE004

Semester: III

COURSE NAME: Core Programming Python

Course Objective: Understand data types and write simple programs in python, use OOP concepts to write python codes.

Unit I: Introduction

Installation of Python, Compiler and Interpreter Languages, Variables, Operators.

Unit II: Data Types

Strings, Lists, Sets, Dictionary, Tuples

Unit III: Control Flow

Conditions and Loops, Functions

Unit IV: Functional Programming

Lambda, Map, Filter, Reduce

Unit V: OOPs & File Handling

Classes, Inheritance, Polymorphism, Abstraction, Encapsulation. Files and Exception handling, Regular Expressions

LEARNING OUTCOMES

By the end of the course, the learner will be able to

Unit I	The learner will have an understanding of fundamentals of Python Language.
Unit II	The learner will be able to write simple code to manipulate various data types
Unit III	The learner will be able to write efficient reusable code using various control flow statements and functions
Unit IV	The learner will be able to write simple elegant code that enables higher performance
Unit V	The learner will understand OOPs and File Handling concepts

Course Code: IE005

Semester:II

MATHEMATICS FOR GAME DEVELOPMENT AND GAME PROGRAMMING PATTERNS

Course Objectives:

This course will help the learner to develop a strong foundation in mathematical concepts essential for game development, covering number systems, algebraic expressions, geometry, trigonometry, and vectors. Additionally, it provides a comprehensive understanding of game programming patterns, from creational and structural to behavioral and architectural patterns

UNIT - I

Intro to Mathematical Concepts in Game Development - Number Systems - Algebraic Expressions - Coordinate Systems - Vector and Matrix Operations.

Geometry - Points, Lines, and Planes - Transformations - 2D and 3D Geometry - Projections and Viewing.

UNIT - II

Trigonometry in Game Development - Trigonometric Functions - Angles and Arcs - Applications in Animation and Physics

Vectors - Vector Spaces - Matrices and Transformations

UNIT - III

Overview of game programming patterns - Benefits and drawbacks of using patterns in game programming - Common game programming patterns - Implementing patterns in game programming.

Intro to creational patterns - Factory Method pattern - Abstract Factory pattern - Builder pattern - Prototype pattern - Singleton pattern

UNIT - IV

Intro to structural patterns - Adapter pattern - Bridge pattern - Composite pattern - Decorator pattern - Facade pattern - Flyweight pattern - Proxy pattern

Intro to behavioral patterns - Chain of Responsibility pattern - Command pattern - Interpreter pattern - Iterator pattern - Mediator pattern - Memento pattern - Observer pattern - State pattern - Strategy pattern - Template Method pattern - Visitor pattern

UNIT - V

Intro to architectural patterns - Model-View-Controller (MVC) pattern - Model-View-ViewModel (MVVM) pattern - Entity-Component-System (ECS) pattern - Service-Oriented Architecture (SOA) pattern - Data-Oriented Design (DOD) pattern - Layered Architecture pattern -

Microservices Architecture pattern - Event-Driven Architecture (EDA) pattern - Reactive Architecture pattern

LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	<ul style="list-style-type: none">• Apply mathematical concepts in game development.• Analyze and solve geometric and trigonometric problems relevant to game scenarios.
Unit II	<ul style="list-style-type: none">• Analyze game programming patterns.• Create and implement creational patterns in game programming.
Unit III	<ul style="list-style-type: none">• Apply structural patterns in game development.• Evaluate and choose appropriate behavioural patterns for game programming.
Unit IV	<ul style="list-style-type: none">• Apply architectural patterns in game development.
Unit V	<ul style="list-style-type: none">• Evaluate and select appropriate architectural patterns for game systems

List of Laboratory Experiments

1. Pick a suitable creational pattern and implement it in a game.
2. Pick a suitable structural pattern and implement it in a game.
3. Pick a suitable behavioural pattern and implement it in a game.
4. Pick a suitable Architectural pattern and implement it in a game.

Course Code: CAP502R02

Semester: II

COURSE NAME: Advanced Java Programming (Semi Theory Semi Practical)

UNIT- I: OOP and Java Fundamentals

Basic OOP features – Encapsulation, Inheritance, Polymorphism-Java introduction and history- data types, constants, variables, operators - control structures –arrays- Classes and Objects- Constructors-overloading: constructor and method overloading

UNIT- II: Java Features and AWT

Abstract classes and interfaces-packages-Multi-threading-Exception handling- IO Streaming - Object Serialization - Networking - Introducing the AWT: Working with Windows, Graphics, and Text- Event handling-Java Swing

UNIT- III: JDBC and Images

Java client-server architecture – JDBC Introduction – JDBC connectivity, Types of JDBC ODBC drivers - Simple JDBC applications-Images: Displaying images-Media Tracker- Image producer- Image consumer-Image Filter: crop image filter- RGB image filter

UNIT- IV: J2EE: Servlet and JSP

J2EE Architecture-Java Servlets - Servlet as an improved CGI-Servlet Fundamentals-Generic Servlet- HTTP Servlet –Servlet Context- Developing and Deploying Servlets -Storing User data -State Management using Cookies and Session-Servlet Chaining- JSP introduction and Architecture- JSP scripting elements-Implicit objects-JSP directives-action elements-JSTL- Database connectivity using servlet and JSP.

UNIT- V: Java Server Faces and EJB

Java Server Faces: Creating project-creating the faceletsfile-Deploying project-Components- Life Cycle- Form components- Enterprise Java Beans: Introduction to Server-Side Components, EJB Architecture, Types of EJB, EJB Container Services, Session Beans, hibernate, Message driven bean.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of fundamentals in OOP and Java language.
Unit II	The learner will be able to understand the features of Java; and solving problems using Java features. The learner will be able to understand the importance of input output, AWT and swing packages.
Unit III	The learner will be able to understand JDBC concepts and will be able to write simple Java applications using database connectivity. The learner will be able to solve problems using graphics programming with Java
Unit IV	Students will learn to build scalable n-tiered web applications using Java/J2EE Students will be able to create applications using Servlets and JSP
Unit V	Students will learn how to build user interface using JSF. Learners will gain knowledge on Enterprise Java Beans (EJB) technology

Course Code: CAPOL411R01

Semester: II

COURSE NAME: Database Management Systems Laboratory

Course Objective: The study of this course will enable the students to develop queries and procedures using SQL and PL/SQL. The learners will be able to understand the concept of database systems, develop programs with security and integrity.

SQL Commands:

1. Implement the basics of SQL commands (DDL).
2. Implement the basics of SQL commands (DML).
3. Implement the basics of SQL commands (DCL).
4. Write queries using clauses such as GROUP BY, ORDER BY and retrieve data by joining tables.

5. Write queries using set operations.
6. Write queries using nested queries.
7. Develop queries using functions and views.

PL/SQL:

8. Write a PL/SQL block for inserting rows into EMPDET table with the following Calculations:
 - a. HRA=50% of BASIC
 - b. DA=20% of BASIC
 - c. PF=7% of BASIC
 - d. NETPAY=BASIC + DA+HRA-PF
9. Write a PL/SQL block to generate Armstrong number and Fibonacci series.
10. Write a program to update the database using cursors based on the following conditions
 - a. If basic >Rs.15000.00 then give increment of Rs.200.00
 - b. If basic is between Rs.1501.00 and Rs.3000.00 then give increment of Rs.500.00.
 - c. If basic > Rs.3000.00 then give increment of Rs.750.00.
11. Write a function to get the factorial of given number.
12. Create a procedure that displays the instructor details, class details and the student details of a particular student which the user inputs.
13. Write a PL/SQL block to check whether the given String is palindrome or not.
14. Write a PL/SQL block to handle string manipulations.
15. Write a PL/SQL block that uses date and time functions to find the age of a person by accepting his DOB.
16. Write a PL/SQL block that handles the following types of records:
 - a) Table-based
 - b) Cursor-based records
 - c) User-defined records
17. Write a PL/SQL block to handle built-in exception like NO_DATA_FOUND, TOO_MANY_ROWS.
18. Write a PL/SQL block to handle user-defined exceptions.
19. Write a database trigger before insert/update/delete for each row not allowing any of these operations on the table instructor between 6 pm and 10 am.
20. Write a package with functions isprime, ispositive, isnegative to check whether the given number is prime, positive, negative respectively.

LEARNING OUTCOMES

SQL Commands:

Ex.1	The learner will have an understanding of the basic concepts of SQL commands (create, select).
Ex.2	The learner will have an understanding of the basic concepts of SQL commands (insert, update, delete and alter).
Ex.3	The learner will have an understanding of the basic concepts of SQL commands (grant and revoke).
Ex.4	The learner will be able to manipulate the table using order by and group by commands.
Ex.5	The learner will be able to know the implementation of set operations.
Ex.6	The learner will be able to know the implementation of nested queries.
Ex.7	The learner will be able to create functions and create views in database.

PL/SQL

Ex.8-16	The learner will be able to implement pl/sql constructs, logical operators, relational operators, conditional loops and write queries based on constraints.
Ex.17	The learner will implement a PL/SQL block to handle user defined exception.
Ex.18	The learner will implement a PL/SQL block to handle built in exception like <code>NO DATA FOUND</code> , <code>TOO MANY ROWS</code> .
Ex.19	The learner will create database and create trigger using the operations like insert / update / delete for each row.
Ex.20	The learner will create a package with functions like isprime, ispositive, isnegative to manipulate database data.

Course Code: CAPOL525R01

Semester: II

COURSE NAME: Software Design & Testing Laboratory

Course Objective: Realization Implementation of SDLC for projects using CASE tools.

1. Understanding RUP
2. Study of all Tools in Rational Suite Enterprise
3. The installation procedure of Rational Suite.
4. Project registration, User creation, and Group creation.
5. Analyzing requirements for a specific problem (such as Course Registration)
 - a. Vision document
 - b. Analyzing the Requirements
 - c. Documenting Feature, Glossary, Usecase, Supplementary requirements
 - d. Generation of Traceability Tree, Traceability Matrix and Attribute Matrix.
6. Creation of various reports on requirements.
7. Analyzing the problem Statement. To
 - a. Identify Use cases
 - b. Identify Actors
 - c. Identify the Relationships between them.
8. Drawing Use case Diagram.
9. For each identified Use case drawing the following
 - a. Activity Diagrams
 - b. Sequence Diagrams /Collaboration Diagrams
10. Drawing Class Diagrams. Studying the relationships among the classes, packages. Extracting methods for the classes from the Sequence diagram.
11. Generating reports on the above diagrams.
12. Generation of code.
13. Website Testing and generating various test reports.
14. Preparing test plan and test cases for functional testing.
15. Preparing test plan and test cases for performance testing.

LEARNING OUTCOMES

Ex. 1 & 2	The learner will have an understanding about the RUP and all the Tools in Rational Suite Enterprise
Ex. 3	The learner will be able to Install the Rational Suite enterprise

Ex. 4	The learner will be able to register for a Project, create users and group the creation
Ex. 5	The learner will be able to analyze the requirements for a specific problem and document the feature, glossary, usecase and supplementary requirements
Ex. 6 &7	The learner will be able to create various reports on requirements and analyze the problem statement to relate the usecase and actors
Ex. 8 & 9	The learner will be able to draw the various diagrams
Ex. 10	The learner will be able to know to extract the methods from the classes
Ex. 11 &12	The learner will be able to generate the reports and code
Ex. 13	The learner will be able to test the website and generate various test reports
Ex. 14 & 15	The learner will be able to prepare a test plan and test cases for functional testing and performance testing

Course Code: TNPOL102R01

Semester: II

COURSE NAME: SOFT SKILLS-2

Course Objective: To make learners understand the employer expectations and help them to equip and face the job interviews successfully.

S.NO	TOPICS	No. of Classes
1	Employers Expectation and Selection Process	2
2	Experiential sharing and writing of Statement of Purpose	2
3	Resume Writing & Presentation	2

4	Aptitude Test	1
	Verbal	1
	Logical	1
	Numerical	1
	Analytical	
5	Getting ready for Interview	1
6	Technical Quiz (Core Subject)	2
7	Technical Interview (Core & Programming)	2
8	Group discussion on Current Affairs	4
9	Mock GD	3
10	Mock Interview	4
11	Semester Practical	3
12	Semester Theory Exam	1
TOTAL		30

LEARNING OUTCOMES

Employer Expectations	The learner get to know the expectations of employer from the prospective future employees
Experiential sharing and writing of Statement of Purpose	Learner becomes familiar about selection process through any senior student who will share his/her experience about their interview Learner becomes familiar about how to prepare SOP for higher studies / research
Resume Preparation & Presentation	The learner learns the art of writing a successful resume.
Aptitude test	The learner undergoes Verbal, Logical, Numerical and Analytical test.

Getting ready for an interview	The learner comes to know the ways to equip himself to face a job interview.
Technical Quiz (Core)	The learner will understand the importance of domain knowledge to face the technical round in job interview.
Technical Interview (Core & Programming)	The learner will understand the importance of domain knowledge to face the technical round in job interview.
Group Discussion on Current Affairs	The learner realizes the importance of knowledge on current affairs through Group Discussion
Mock GD	The learner understands the Do's and Don't's of a group discussion.
Mock Interview	The learner evaluates his personal preparedness for the future job interview.

Course Code: CAP527R01

Semester: III

COURSE NAME: ALGORITHM DESIGN & ANALYSIS

Course Objective: To impart knowledge on various design strategies to solve specific problems and to understand their time complexities. To expose knowledge on NP-hard and NP-complete problems.

UNIT- I: Asymptotic Analysis of Algorithms

Definition - Criteria of an algorithm - Algorithm specification - Designing recursive and non-recursive algorithms - Performance analysis - Space complexity - Time complexity - Asymptotic notations - Properties of asymptotic notations - Practical complexities - Performance measurement.

UNIT- II: Searching and Sorting

General divide and conquer method - Solving recurrences using substitution method - Searching: linear search - binary search; Internal sorting: Insertion sort - Bubble sort - Binary trees - Properties of binary trees - Heap sort - Quick sort – Merge sort ; External sorting: Poly-phase merge sorting.

UNIT- III: Graph algorithms and Pattern Matching

Fundamentals of graphs - Graph representations - Spanning tree - The general greedy method – Minimal spanning tree algorithms: Prim’s algorithm - Kruskal’s algorithm - Single-source shortest paths: Pattern matching: Naïve approach - Finite automaton - KMP flowchart construction and scan algorithm.

UNIT- IV: Polynomials and Dynamic Programming

Polynomials: Representing polynomials - Evaluating polynomials - Straight forward method - Horner’s method - Newton forward & backward interpolation methods - Lagrange’s interpolation.

Dynamic programming: Optimality principle – backward & forward recurrence relations - Traveling salesman problem – Minimal spanning tree problem - 0/1 knapsack problem - All-pairs shortest path problem.

UNIT- V: Other Problems

Conventional matrix multiplication with & without recursion - Strassen’s matrix multiplication - Greedy strategy for the knapsack problem - Job sequencing with deadlines - Branch and bound technique: LCBB algorithm for traveling salesman problem – Method of Backtracking: General method - N queens problem - Graph coloring problem - NP-hard and NP-complete problems - Approximation algorithms for NP-hard problems: absolute approximations – planar graph coloring – maximum clique problem

LEARNING OUTCOMES:

Unit I	The learner will get introduced to various standard design strategies of algorithms with its analytics
Unit II	The learner will gain knowledge on internal and external sorting techniques and their comparisons. Linear and binary searching techniques are also learnt

Unit III	The learner will gain knowledge on graph and string matching algorithms
Unit IV	The learner will gain knowledge on designing algorithms for polynomial evaluation and interpolation. They are also exposed to dynamic programming approach to solve problems
Unit V	The learner will understand matrix multiplication using recursions and their comparisons. Problems using backtracking and branch & bound are also gained. Knowledge on NP-hard and NP-complete are also gained

Course Code: CAP442R01

Semester: III

COURSE NAME: WEB TECHNOLOGY

Course Objective: This course will introduce students to the World Wide Web and scripting languages. By the end of this course, students should possess a firm grounding in some of the existing web technologies as well as commercial web applications. The emphasis is on the contemporary use of mark-up and scripting to create effective and attractive web sites.

UNIT- I: HTML5 and CSS

Introduction to Web development – Websites – Languages – Tools - Structure of HTML – Contents: Text, Links, Images, Lists, Tables, Global Attributes, Form - Definition, Elements, Submission- Cascading Style Sheets - Applying Styles – **References:** Keywords, Id Attribute, Class Attribute, Other Attributes, Pseudo-Classes – Properties: Text, Colors, Sizes, Background, Borders, Shadows, Gradients, Filters, Transformations, Transitions, Animations

UNIT- II: JavaScript

Introduction to JavaScript – Variables, Conditionals and Loops, Control Transfer Instructions – Functions: scope, anonymous, standard function – Objects – methods, constructor, inheritance - keywords, constructors - Standard objects: String Objects, Array Objects, Date Objects, Math Object, Window Object, Document Object, Element Objects, Creating Element Objects – Events – Debugging – error event, exception - APIs

UNIT- III: PHP and MySQL

Introduction to PHP – Expressions and Control flow – PHP functions and objects – Array – Form handling – Cookies, Sessions and Authentication – Introduction to MySQL – Accessing MySQL using PHP -

UNIT- IV: Node.js

Setting up the environment: installation and execution-setting up IDE-understanding Node.js: variables- functions-understanding Node.js performance-More Node.js Internals: Thread starvation- data-intensive applications-More java script-Node.js File-based Module system-important globals-core modules-Node.js packages-Events and streams

Unit-V- AngularJS

Full-stack developers-Web development-architecture of modern web applications-front-end and back-end framework-setting up AngularJS: introduction to AngularJS-basic components-life style-architecture-setting up the development environment: AnglurJS to spring boot-developing single-page application-bootstrapping the application-dependency injection-AngularJS Routes-Templates-implementing MVC-running application

LEARNING OUTCOMES:

Unit I	The students should be able to create HTML5 documents, and establish adequate formatting for presentation purpose, manipulation of images, tables, links and realize the power of Cascading Style Sheets (CSS) to control the look and feel of their HTML documents in an organized and efficient
Unit II	The learner will have an in-depth knowledge-on writing client-side JavaScript and to integrate JavaScript into web pages

Unit III	The learner will gain a good practical knowledge on writing successful HTML/PHP code utilizing MySQL database
Unit IV	The learner will get exposed to handle cross-platform, event driven I/O model based intensive applications using Node.js
Unit V	The learner will have an in-depth knowledge on structural framework for dynamic web apps

Course Code : CAP512R02

Semester : III

COURSE NAME: BIG DATA ANALYTICS

Course Objectives:

This course will help the learner to familiarize with fundamental techniques of data science and data analysis suitable for big data. It will also help the learner to get hands-on Big Data Analytics tools such as Hadoop, R environments and apply analytics for the given problem and solve it using R in Map-Reduce framework.

UNIT – I

Introduction to Big Data Analytics: Big Data Overview - Data Structures -Analyst Perspective on Data Repositories -State of the Practice in Analytics.

Data Analytics Lifecycle: Data Analytics Lifecycle Overview -Key Roles for a Successful Analytics Project.

Background and Overview of Data Analytics Lifecycle: Phase 1: Discovery -Phase 2: Data Preparation -Phase 3: Model Planning -Phase 4: Model Building -Phase 5: Communicate Results -Phase 6: Operationalize.

Getting Ready to Use R and Hadoop: Performing data modeling in R -Understanding Hadoop features -Understanding HDFS components -Understanding the MapReduce architecture – Understanding MapReduce components -Understanding the HDFS and MapReduce architecture by plot

UNIT - II

Mining Data Streams: Stream Data Model - Sampling Data in a Stream - Filtering Streams - Counting Distinct elements in a Stream - Estimating moments - Counting ones in a Window - Decaying Windows.

Link Analysis: PageRank Algorithm - Efficient Computation of PageRank - Topic-SensitivePageRank - Link Spam

UNIT - III

Recommendation Systems: A Model for Recommendation System -Content-Based Recommendations -Collaborative Filtering - Dimensionality Reduction.

Mining Social-Network Graphs: Social Networks as Graphs - Clustering of Social Network Graphs - Direct Discovery of Communities - Partitioning of Graphs - Finding overlapping communities –Simrank- Counting –Triangles

UNIT - IV

R Programming: Getting Started - Introduction - Packages – Working with large datasets - Creating a dataset – Annotating Datasets - Getting started with graphs –Graphical Parameters – Basic data management - Renaming Variables – Merging Datasets – Subsetting Datasets - Advanced data management

Basic Methods: Graphs - Bar Plots – Pie chart – Histograms -Statistics– Correlation – Nonparametric tests of group differences

UNIT - V

Building models: Develop a model in a content based recommendation system or collaborative recommendation system using R Programming using real-time data.

LEARNING OUTCOMES:

Upon successful completion of each unit, the learner will be able to

UNIT – I	• Discuss the fundamental concepts of big data and Hadoop - MapReduceenv.
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UNIT – II	<ul style="list-style-type: none"> • Explain the methods of processing and filtering of data streams • Employ link analysis for page rank computation.
UNIT – III	<ul style="list-style-type: none"> • Describe the methods for developing a model for recommendation system with dimensionality reduction
UNIT– IV	<ul style="list-style-type: none"> • Solve community detection problems in social network graphs by applying algorithms for clustering and partitioning
UNIT – V	Analyse massive data using R

Course Code: CAP513R01

Semester: III

COURSE NAME: XML APPLICATIONS

Course Objective: To explore the importance and capabilities of the eXtensibleMarkup Language and examine an environment used to develop XML documents. This course aims at facilitating the learners to create well-formed XML documents and validate XML documents, access and manipulate XML documents. This course also focuses on formatting and transforming XML documents

UNIT- I: Introduction to XML and DTDs

XML Definition, origins of XML, Goals of XML, Viewing XML, Wellformness. DTDs: Declaring Elements, Declaring Attributes, Declaring Entities. DTDs in Depth: Element Type Declarations, Attribute List Declarations, and Types of Entities.

UNIT- II: XML Namespace and XML Schema

Namespaces: definition, Declaration, XML schema structure and components – Types: simple, complex, named, anonymous schema, Elements and attributes – global and local - Facets - Restrictions, Content models, Element and Attribute reuse: Named Groups, Annotations.

UNIT- III: XML Related Technologies

Xpath, Xpointer, XLink Elements, Extended and Simple XLinks, CSS, XSLT.

UNIT- IV: Manipulating Data with XML and Displaying using HTML

XML Data Source Object (DSO), Databases and Remote Data Access, Remote data Services and DSOs, understanding TDC DSO, XML DSOs, and Working of Data Islands: Binding HTML elements to a Data Islands Record Set, binding HTML elements to a DSO, add records to a data Islands and navigating through the Data Island Record Set.

UNIT- V: Application Development using XML

Types of XML Applications- Web and Internet Applications- Meta data and Archival applications- Multimedia Applications- Scientific, Finance and Business oriented applications, Language oriented Applications.XML APIs: SAX and DOM. Introduction to SOAP, WSLD and UDDI.

LEARNING OUTCOMES

Unit I	Learners will have an understanding of rules for creating XML documents. In addition, the learner will be able to validate the XML documents using DTD
Unit II	Learners will be able to analyse various elements, attribute definition using Schema and associate an XML document with XML Schema
Unit III	Learners will have an understanding of formatting and transformation of XML content. The learners will be able to display XML content in HTML
Unit IV	Learners will be able to understand the manipulation of XML documents using various data source objects. The learner can apply these concepts to retrieve and display XML data
Unit V	Learners will be able to understand SOAP, WSLD, UDDI concepts and develop XML applications

Course Code: CAP414R02

Semester: III

COURSE NAME:MOBILE COMPUTING

Course Objective: This course facilitates the learners to know wireless communication and computing facilities. It also provides comprehensive coverage of both communication and android development.

UNIT- I: Introduction

Medium access control (MAC) – Hidden and exposed terminals , Near and far terminals, SDMA, FDMA, TDMA – Telecommunication systems – GSM - Satellite systems – Basics, GEO, LEO, MEO.

UNIT- II: Standards and Protocols

Wireless LAN – IEEE 802.11 – System and Protocol Architecture, Physical and MAC layer, MAC management - Blue tooth – Physical and MAC layer, Networking and security and Link Management.

UNIT- III: Ad hoc Networks and Issues

Mobile IP – Goals – Entities and terminology – agent discovery – registration – optimization - Routing – Destination Sequence Distance Vector – Dynamic source Routing - Hierarchical Algorithms – Alternative metrics - Mobile transport layer – Indirect TCP – Snooping TCP – Mobile TCP – Transmission/time – out freezing – Selective retransmission – Transaction oriented TCP

UNIT -IV: WAP and Mobile App Development

Wireless application protocol – WDP – WTLS – WTP – WSP – WAE – Mobile App Development – why mobile app? – Mobile app design issues and considerations- Emulator- Overview- Android- AVD

UNIT- V: Developing the Android App

Setting up an Android studio development environment- User interface–Constraint Layout- XML layout-Activity- Life cycle- Intents-Event handling-Android navigation and interface design – Persistent data in android

LEARNING OUTCOMES:

Unit I	The learner will understand the concepts and implementation of mobile communications
Unit II	The learner will be able to apply the principles of protocols and their characteristics
Unit III	The learner will be able to analyze various routing techniques and algorithms. The learner will also have an understanding of various implementation issues and solutions related to networks
Unit IV	The learner will understand the protocols used in mobile environment and the basic idea behind the mobile app development.
Unit V	The learner will be able to develop android applications and able to persist the mobile content.

Course Code: CAP509R02

Semester: III

COURSE NAME: CLOUD COMPUTING

Course Objective:

This course will help the learner to describe cloud computing technologies, its applications and layers for different solutions. This course will also help the learner to identify solutions for cloud challenges.

UNIT - I

Cloud Computing: Cloud Components - Infrastructure - Applications - Benefits - Limitations - Cloud Deployment Model - Cloud Technologies - IaaS: Storage as a Service: S3 - Compute as a Service: EC2 - PaaS: Windows Azure - Google App Engine - Storage Aspects - Apache Hadoop -SaaS: CRM as a Service - Social Computing Services - Document Services.

UNIT - II

Virtualization: Server Virtualization - Hypervisor: VMware - XenServer - Storage virtualization - **Hardware and Infrastructure:** Clients - Network - Services - Accessing the Cloud: Web Applications - Web API - Web Browsers - Cloud Storage.

UNIT - III

Developing Cloud Applications: Introduction - Scalable data storage techniques - Map-reduce Revisited: Fundamental Concepts - Amazon EMR - Overview - Concepts - Designing Cloud Security: Requirements - Risk Management - Security Design pattern.

UNIT - IV

Cloud Challenges: Introduction - Scaling computations - Scaling Storage - Availability - Cloud Services for individuals - Cloud Services for Enterprises - Migration - Cloud Best Practices - Future of Cloud Computing.

UNIT - V

Getting Exposure on Cloud Tools:

Local clouds and thin clients: virtualization in your organization-server solutions-Thin clients-Case study-McNeilus Steel - Develop and deploy a cloud-based project on any of the cloud tools like Azure, Google App Engine, IBM Bluemix

LEARNING OUTCOMES:

Upon successful completion of each unit, the learner will be able to

Unit I	Learners will learn the concepts of cloud components and cloud services.
Unit II	Learners will have an understanding of the subtleties of server and storage virtualizations and also the infrastructure for cloud services
Unit III	Learners will be able to develop cloud applications by making use of development platforms such as map reduce. Learners will have an understanding of issues in designing cloud security
Unit IV	Learners will have a knowledge on the challenges in scaling of resources and Services and issues in extending services to individuals and enterprises
Unit V	Learners will have an exposure on various Cloud tool

Course Code: CAPOL431R01

Semester: III

COURSE NAME: GRAPHICS & MULTIMEDIA

Course Objective: To teach various basic sciences pertaining to graphics and multimedia. Various 2D and 3D transformations are covered to make the learners understand the basics of animations. Also aims at giving an exposure to the learners about multimedia designing, operations and multimedia technologies.

UNIT- I: Introduction to Graphics System

Overview of Graphics System: Video display devices-refresh CRT-raster scan displays – random scan displays-Color CRT-DVST-Flat Panel displays- raster scan and random scan systems-Input devices- Hard copy devices- Graphics s/w- Output primitives- Line, circle, ellipse generating algorithms- Basics of attributes of output primitives

UNIT- II: Polygon Filling

A simple parity scan conversion algorithm- Ordered edge list polygon scan conversion algorithm-Edge fill algorithm-Fence Fill- Edge flag algorithm- Seed fill algorithms- Fundamentals of antialiasing- Halftoning

UNIT- III: Two-dimensional Graphics

Basic transformations- Matrix representation and Homogeneous co-ordinates- Composite transformation- Other transformations- Two-dimensional viewing- a window to viewport transformation- Clipping operations- Point clipping- Line clipping: Cohen Sutherland and Liang Barsky line clipping- Polygon clipping: Sutherland Hodgeman and Weiler-Atherton polygon clipping - GUI and Interactive input methods: Logical classification of input devices- Input modes- Interactive picture construction techniques.

UNIT- IV: Three-dimensional Graphics

3D concepts- 3D display methods- 3D object representations: Polygon surfaces-curved lines and surfaces- Quadric surfaces- Blobby objects- Spline representations- Bezier curves and surfaces-Sweep representations- Octree- BSP tree- 3D geometric transformations-3D viewing: Projections- 3D clipping- Visible surface detection methods: Classification of visible surface detection algorithms- Backface detection- Depth buffer method- A buffer method- Color models

UNIT- V: Multimedia Systems

What is multimedia- Multimedia skills-Animation- Principle behind an animation- Multimedia Authoring tools- Audio, video and graphics file formats- Video compression – Video broadcasting standards- Planning and costing-: The process of making multimedia- Scheduling, Estimating –RFP and bid proposals- Delivering: testing, preparing for delivery- delivery on CD-ROM- CD-ROM technology

LEARNING OUTCOMES:

Unit I	The learner will have an idea about the devices used for graphics manipulations and the methods used to produce basic output primitives and its attributes
Unit II	The learner will have an understanding of various polygon filling algorithms
Unit III	Learners will be able to understand and manipulate 2D images, model the transformation, interactive picture construction techniques
Unit IV	Learners will have an understanding of 3D concepts, methods to represents 3D images and 3D transformations, besides gaining knowledge on back face removal procedures
Unit V	Learners will be introduced with multimedia designing, operations and the technologies used for multimedia

Course Code: CAPOL529R01

Semester: III

COURSE NAME: ASSEMBLY LANGUAGE PROGRAMMING

Course Objective: To expose the basic knowledge of microprocessors and its architecture, to teach the instruction set and interfaces available for the microprocessors.

UNIT- I: 8-Bit Microprocessors

Microprocessor concepts - Intel 8085 Microprocessor - Architecture. Instruction set - Addressing modes-Signals and timing - DMA.Interrupt and Serial Interface.

UNIT- II: Intel 8086 Software Aspects

16 bit microprocessor - Intel 8086 architecture -Instruction set - Assembly language Programming structure and subroutines - Macros - Interrupts and interrupt routines.

UNIT- III: Signals & Timing

8086 signals and timing - MIN./MAX. Mode of operation - Addressing memory and I/O - System design using 8086 - Bus structure - Multiprocessor configurations - Coprocessors.

UNI- IV:I/O Interfaces

Serial Communication interface - Parallel communication interface - Timers - Keyboard/Display controller - DMA controller- Interrupt controller - Micro controllers: 8096 family, 8051 family- Programming and applications.

UNIT- V: Advanced Processors

Introduction to Intel 386,486 Microprocessor -Pentium Microprocessor - Pentium Pro - Intel P7 Microprocessor - Power PC, Mips and Alpha Microprocessors - 32-bit Motorola Microprocessors.

LEARNING OUTCOMES:

Unit I	The learner will understand the basic concepts of microprocessor, architecture and instruction set of 8085.
Unit II	The learner will understand the basic concepts of 8086 microprocessor architecture and its instruction set.
Unit III	The learner will understand memory addressing and I/O addressing using 8086 microprocessor.
Unit IV	The learner will understand various interface devices and its application with 8086 Micro[processor
Unit V	The learners will compare and understand about advanced 16-bit and 32-bit processors in detail

Course Code: IE006

Semester: III

MULTIPLAYER GAME DEVELOPMENT USING UNITY

Course Objectives:

This course will help the learner to gain proficiency in multiplayer game development using Unity. Master Unity networking fundamentals, network architectures, and advanced development techniques, participants will acquire practical skills in setting up, designing, and troubleshooting multiplayer projects. Additionally, they will delve into implementing effective game mechanics for fair and enjoyable multiplayer experiences, exploring topics such as authentication, session management, input synchronization, real-time communication, and community-building aspects in multiplayer games.

**UNIT - I
Periods**

15

Intro to Multiplayer Game Development in Unity - Evolution of Multiplayer Games - Significance and Impact of Multiplayer Experiences - Key Challenges in Multiplayer Game Development - Unity's Role in Multiplayer Development - Overview of Successful Multiplayer Games Developed with Unity - Unity Multiplayer Development Community and Resources - Setting Up a Basic Multiplayer Project in Unity - Intro to Multiplayer Game Design Principles

**UNIT - II
Periods**

15

Unity Networking Fundamentals - Core Concepts of Unity Networking - Components and Scripts for Networking in Unity – Network Views and Synchronization in Unity - Remote Procedure Calls (RPCs) in Unity Networking - Unity's High-Level Networking API (HLAPI) - Unity's Low-Level Networking API (LLAPI) - Unity Multiplayer Services: UNET vs. MLAPI - Debugging and Troubleshooting Unity Networking Issues

UNIT – III **15**
Periods

Overview of Network Architectures in Multiplayer Games - Client-Server Architecture and Its Variants - Peer-to-Peer Architecture and Its Applicability - Hybrid Network Architectures and Use Cases - Load Balancing Strategies in Multiplayer Environments - Scalability Considerations for Network Architectures - Impact of Network Topologies on Multiplayer Game Performance - Case Studies of Successful Network Architectures in Popular Games.

UNIT - IV **15**
Periods

Multiplayer Game Mechanics - Authentication and Authorization of Players - Effective Game Session Management - Strategies for Player Input Synchronization - Real-time Communication Techniques - Addressing Latency Issues in Multiplayer Games - In-Game Economy and Progression Systems - Balancing Game Mechanics for Fair and Enjoyable Multiplayer Experiences - Incorporating Social Features and Community Building in Multiplayer Games.

UNIT - V **15**
Periods

Advanced Multiplayer Game Development in Unity - Integrating Third-Party Networking Frameworks - Security Measures and Anti-Cheating Mechanisms - Strategies for Scaling and Optimizing Advanced Multiplayer Games in Unity.

LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	<ul style="list-style-type: none"> • Understand the evolution and significance of multiplayer games. • Apply practical skills in setting up a basic multiplayer project in Unity.
Unit II	<ul style="list-style-type: none"> • Understand the core concepts of Unity networking. • Apply their knowledge to troubleshoot and debug Unity networking issues.
Unit III	<ul style="list-style-type: none"> • Analyze different network architectures in the context of multiplayer games. • Evaluate and apply network architectures to specific multiplayer game

	scenarios.
Unit IV	<ul style="list-style-type: none"> Apply effective multiplayer game mechanics.
Unit V	<ul style="list-style-type: none"> Create advanced multiplayer game features in Unity.

List of Laboratory Experiments

1. Create a simple multiplayer game for android platform.

Course Code: IE007

Semester: III

Software Engineering Agile DevOPs

Course Objectives: Through a combination of instructor-led presentations and technical demonstrations, the learner will get to know how to get started with basic web technologies, cloud concepts and agile.

UNIT - I

Introduction: Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Waterfall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models. SDLC Phases, High level of Waterfall vs Agile, Agile – Why, Framework, Estimation Methods, Values, Principles, Framework (Scrum, Kanban), Estimation Methods (Dot Voting, Reference Value)

UNIT – II

Software Engineering: Planning, Estimation, Requirement gathering, Design Documentation, Pseudo Code, Flow charts, System Design, Test Documentation,

UNIT – III

Software Testing -Overview:Testing Objectives, Unit Testing using Junit, Integration Testing using Mockito, Acceptance Testing, Regression Testing, Testing for Functionality using Selenium and Testing for Performance under load using load testing tool Jmeter, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection.

UNIT – IV

Software Security Testing:Compliance with Design and Coding Standards using tools such as sonarqube, code security practices, Top 10 OWASP vulnerabilities.

UNIT - V

Software Project Management: Jira, Requirement identification, Task segregation, Generation of Scrum Entities like Epic, User Story, Task, Subtask.Project Breakdown – Product and ScrumBacklog, Kanban, Kanban Board, Effort Estimation, Team Optimizationand Task Management.

LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	The learner will be able to understand the SDLC/STLC as well the various methodologies to create software
Unit II	The learner will have an understanding of the Software Development/Testing Lifecycle documentation needs
Unit III	The learner will understand various testing Tools like Jmeter, selenium and packages like mockito
Unit IV	The learner will understand security practices, best practices of various language using tools like Sonarqube, Common vulnerabilitiesincluding OWASP Top 10 vulnerabilities etc.
Unit V	The learner will have an understanding of fundamentals in Agile Frameworks and their implementation including Scrum, Kanban through tool.

Course Code: CAPOL432R01

Semester: III

COURSE NAME: DIGITAL IMAGE PROCESSING

Course Objective: This course is framed to impart in-depth knowledge on the concepts of digital image processing with its relevant techniques on spatial and frequency domains. Emphasis has been given to image enhancement, restoration, segmentation and compression techniques.

UNIT- I: Introduction

Image digital representation. Elements of visual perception. Sampling and Quantisation. Image processing system elements. – Fourier transforms, Walsh, Hadamard, Discrete cosine transforms

Pixel relationships – neighborhoods – adjacencies

UNIT- II: Image Enhancement and Restoration

Histogram modification techniques – Image smoothing – Image Sharpening – Image restoration
– Degradation model – Noise models – Spatial filtering – Frequency domain filtering

UNIT- III: Image Segmentation

Thresholding – Threshold detection methods – multi-spectral thresholding – Edge-based segmentation – Edge image thresholding – Edge relaxation – Boarding tracing – inner/outer boundary tracking – Region-based Segmentation – Region growing – Region splitting and merging

UNIT- IV: Image Data Compression

Fundamentals – Image Compression models – Elements of information theory – Error-free compression coding – Run-length coding – Huffman Coding – LZW coding – Bit-plane coding – Lossless predictive coding -Relative encoding for Video files – Lossy Compression – Lossy Predictive coding – Transform coding

UNIT- V: Knowledge Representation

Knowledge Representation and Use: Image analysis using knowledge about scenes-Image understanding using two-dimensional methods- Image understanding and Control Strategies

LEARNING OUTCOMES:

Unit I	This introductory unit will expose the students to various image fundamentals on human visual perception, image acquisition and representations. Learners will gain knowledge on basics of frequency domains; pixel relationships with various metrics
Unit II	Learners will understand various noise removal techniques on image enhancement and restoration

Unit III	Gain knowledge on various image segmentation techniques
Unit IV	Learner will understand various lossy and lossless image compression techniques.
Unit V	This unit will expose the students to understand and analyze knowledge representation using various two-dimensional methods and control strategies

Course Code: CAPOL530R01

Semester: III

COURSE NAME: NATURAL LANGUAGE PROCESSING

Course Objective: To impart knowledge on speech processing which includes time domain and frequency domain methods. Emphasis has been given to linear predictive coding and homomorphic speech analysis.

Unit I: Nature of Speech Signal

Speech production mechanism, Classification of speech sounds, Nature of Speech signal, Models of speech production.

Speech Signal Processing: Purpose of speech signal processing, Digital models for speech signal, Digital processing of speech signals, Significance of short-time analysis.

Unit II: Time Domain Methods for Speech Processing

Time Domain Parameters of speech, Methods for extracting the parameters, Zero Crossings, Auto Correlation function, Pitch Estimation.

Unit III: Frequency Domain Methods for speech processing

Short-time Fourier analysis, Filter-bank analysis, Spectrographic analysis, Formant extraction, Pitch Extraction, Analysis - Synthesis System

Unit IV: Linear Predictive coding of Speech

Formulation of linear prediction problem in time-domain solution for normal equations, Interpretation of linear prediction in auto-correlation and spectral domains

Unit V: Homomorphic Speech Analysis

Cepstral analysis of speech formant and pitch estimation, Applications of Speech Signal Processing: Speech recognition, Speech synthesis and speaker verification.

LEARNING OUTCOMES:

Unit I	The learner will have an understanding of fundamentals in speech signal and its processing
Unit II	The learner will gain knowledge on time domain methods for speech processing
Unit III	The learner will gain knowledge on frequency domain methods for speech processing
Unit IV	Learner will understand the concepts on linear predictive coding of speech
Unit V	This unit will enable the students to understand and analyze homomorphic speech analysis with its applications

Course Code:CAPOL531R01

Semester: III

COURSE NAME: DIGITAL SIGNAL PROCESSING

Course Objective: This course helps to explore the basic concepts of digital signal processing in a simple and easy-to-understand manner and enables the learners to gain knowledge on discrete transforms and the design of FIR and IIR digital filters.

UNIT – I Basics of Signal Processing

Linearity shift-invariance - Unit sample response characterization – Convolution summation, causality, linear difference equations with constant coefficients and their solution using the Z-transform – System function concept.

UNIT – II Discrete Transforms

Review of DTFT- Discrete Fourier Transform - Properties – Computational complexity of DFT – Frequency analysis of signals using DFT. Fast Fourier Transform (FFT) - Decimation-In-Time (DIT) – Decimation-In-Frequency (DIF) – Inverse FFT. Frequency domain characteristics of LTI systems – response to complex exponential – steady-state response to periodic and non-periodic input signals – LTI system as frequency-selective filters.

UNIT – III FIR Filter Design

Symmetric and Antisymmetric FIR filters–Design of Linear Phase FIR filters using Hamming, Hanning, Blackman & Kaiser windows and frequency sampling method – Structures for Realization of FIR filters.

UNIT – IV IIR Filter Design

Butterworth & Chebyshev approximation techniques – Bilinear Transformation – Impulse Invariant Transformation – Analog/Digital frequency transformation – Structures for Realization of IIR filters.

UNIT – V Quantization Effects in Digital Filters, Multirate DSP and Spectrum Estimation

Representation of numbers - Quantization of filter coefficients - Round-off effects in digital filters – Signal Scaling. Introduction to multi-rate digital signal processing – Decimation by an Integer factor D- Interpolation by an Integer factor I – Sampling rate conversion by a rational factor (I / D) – Polyphase filters for decimator and interpolator – Power spectrum estimation using periodogram method.

LEARNING OUTCOMES:

Unit I	The learner will have an idea on Basics of Signal Processing
Unit II	The learner will have an understanding of Discrete Transforms, FFT, and LTI system
Unit III	Learners will be able to understand basic concepts of FIR Filter Design using various filters
Unit IV	Learners will understand the different IIR Filter Design techniques
Unit V	Learners will be understand Quantization Effects in Digital Filters, Multirate DSP and Spectrum Estimation

Course Code: CAPOL438R01
Semester: III

COURSE NAME: INTERNET OF THINGS

Course Objective: To understand the fundamentals of the Internet of Things with its protocols and to apply the Internet of Things concepts in a real-world scenario.

UNIT I INTRODUCTION TO IoT

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain-Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG - IoT Platforms Design Methodology

UNIT II IoT ARCHITECTURE

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture – IoT reference model - Domain model - information model - functional model – communication model IoT reference architecture

UNIT III IoT PROTOCOLS

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security

UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO

Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

UNIT V CASE STUDIES AND REAL-WORLD APPLICATIONS

Real-world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities - participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs – Cloud for IoT - Amazon Web Services for IoT.

LEARNING OUTCOMES:

Unit I	The learner will be able to understand IoT concepts and analyse IoT platforms
Unit II	The learner will be able to understand IoT architecture
Unit III	The learner can understand various protocols of IoT
Unit IV	The learner can design a portable IoT using Rasperry Pi
Unit V	The learner can apply IoT in real time scenario. Also, the learner can deploy an IoT application and connect to the cloud.

Course Code: CAPOL532R01
Semester: III

COURSE NAME: SOFT COMPUTING TECHNIQUES

Course Objective: Aims at offering the learners, knowledge of soft computing algorithms about popular optimization methods, multi-objective methods, genetic programming, and applying the genetic and swarm intelligence techniques in different applications.

UNIT- I: Evolution Strategies & Operators

Fundamentals in NP: NP-hard and NP-complete problems – Approximation algorithms - Hard computing versus soft computing. Evolutionary computing: Applications and advantages - Goals of optimization – Principles of evolutionary processes – Fundamental concepts in genetics – Biological terminology – Evolutionary programming – Evolution strategies – General outline of evolutionary algorithms - Genetic algorithms – Encoding – Selection strategies – Recombination and Mutation operators

UNIT- II: Schema Theorem & Rival Methods

Mathematical foundations: Who shall live and who shall die? – The fundamental theorem of genetic algorithms - Similarity templates – Schemata – Schema properties – Effect of reproduction operation – Reformulating the schema difference equation – Effect of recombination and mutation. Performance of genetic algorithms over rival methods: Steepest-ascent hill-climbing - Next-ascent hill-climbing - Random-mutation hill-climbing - simulated annealing - population-based incremental learning - Tabu search

UNIT- III: Multi Objective Optimization

Search fundamentals: global optima – maxima and minima - neighborhoods and local optima – Pareto optimality and multiple objectives. Multi-objective optimization: Fitness evaluation - Current evolutionary approaches to multi-objective optimization – Vector Evaluated Genetic Algorithm (VEGA). Niching Methods: Fitness sharing- crowding. Constrained Optimization: Lagrange Multipliers - Constrained Optimization by Multi-Objective Genetic Algorithms (COMOGA)

UNIT- IV: Genetic Programming & Genetics based Machine Learning

Genetic Programming: Preparatory steps of genetic programming: Functions and terminals. Executional steps of genetic programming: flowchart – creation of initial population – main generational loop of genetic programming – crossover and mutation operations. Genetics based Machine Learning: Applications - Learning Classifier Systems (LCS) - Types of learning problem – Structure of an LCS – Michigan and Pitt style LCS – the bucket brigade algorithm

UNIT- V: Combinatorial Optimization & Swarm Intelligence Methods

Combinatorial Optimization: Ant Colony Optimization (ACO) – From real to artificial ants - The framework of a basic ACO algorithm – Current applications of ACO algorithms - Artificial Ant Systems – Solving Travelling Salesman problem – Bin packing problem. Particle Swarm Optimization (PSO): Application areas – the canonical PSO algorithm – Fully Informed Particle Swarm (FIPS) – Comparison of GA and PSO – Discrete PSO – Meta heuristic & Memetic algorithms – Cuckoo search optimization. Solving graph coloring and channel allocation problems using Swarm Intelligence

LEARNING OUTCOMES:

Unit I	The learner will have an understanding of the fundamentals in genetic algorithms, fitness evaluation functions, different selection and crossover operators
Unit II	The learner will be able to understand the schema theorem and rival methods to genetic search.
Unit III	The learner will be able to solve problems applying multi-objective methods
Unit IV	The learner will have an understanding of genetic programming and classifier systems with examples
Unit V	The learner will have an understanding of combinatorial optimization and will be able to apply the swarm intelligence methods in solving real life applications

Course Code: IE008

Semester: III

AI AND ML IN GAMES USING UNITY

Course Objectives:

This course will help the learner to master the fundamentals of AI and ML in gaming, integrating them seamlessly with Unity. From understanding historical contexts to implementing advanced techniques, participants will gain practical skills in optimizing AI, creating ML-enhanced game designs, and adapting dynamic features for personalized player experiences.

UNIT - I

15

Periods

Overview of AI and ML in Gaming - Significance of AI/ML in Game Development - Unity's Role in AI and ML Integration - Historical Evolution of AI/ML in Gaming - Current Trends and Applications.

UNIT - II

15

Periods

Unity and ML Fundamentals - Understanding Machine Learning Concepts - Integration of ML with Unity - Introduction to ML Frameworks Compatible with Unity - Practical Examples and Use Cases

UNIT - III

15

Periods

Creating AI Agents in Unity - Building Basic AI Agents - Implementing Decision Trees and Behavior Trees - Pathfinding Algorithms for AI Navigation - State Machines in Unity - Optimizing AI Performance in Unity

UNIT - IV

15

Periods

Advanced AI/ML Techniques in Unity - Neural Networks and Deep Learning in Unity - Reinforcement Learning for Game Agents - Genetic Algorithms and Evolutionary Strategies - Swarm Intelligence and Unity Integration - Case Studies of Advanced AI in Popular Games

UNIT - V

15

Periods

ML for Game Design and Development - Enhancing Game Design with ML Features -
Procedural Content Generation Using ML - Dynamic Difficulty Adjustment in Games -
Personalization and Player Experience

LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	<ul style="list-style-type: none">• Understand the significance of AI and ML in game development.• Apply ML fundamentals in Unity.
Unit II	<ul style="list-style-type: none">• Apply fundamental AI techniques in Unity.• Analyze and optimize AI performance in Unity.
Unit III	<ul style="list-style-type: none">• Analyze AI performance in Unity.• Apply optimization techniques to enhance AI performance in Unity.
Unit IV	<ul style="list-style-type: none">• Create ML-enhanced game designs.
Unit V	<ul style="list-style-type: none">• Apply ML techniques for procedural content generation and dynamic difficulty adjustment.

List of Laboratory Experiments

1. Implement pacman game using A-Star path finding algorithm.
2. Implement a simple ML model in Unity

Course Code: CAPOL528R01

Semester: III

COURSE NAME: ALGORITHMS DESIGN LABORATORY

Course Objective: Use of various design techniques to implement the algorithms defined for the following problems using C / C++ / Java languages.

1. Write a program to use Divide and Conquer design method to find the minimum and maximum of 100 numbers that are stored in a file and compare its execution time with a conventional recursive design.

2. Write a program to use Divide and Conquer design method to implement Recursive Binary Search and Linear Search and compare their execution times. Numbers are stored in a file.
3. Sort a given set of n integer elements using the Quick Sort method and compute its time complexity. Run the program for varied values of $n > 500$ and record the time taken to sort. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C or C++, how the divide and- conquer method works along with its time complexity analysis: worst case, average case and best case.
4. Write a program to implement heap sort algorithm to sort a given set of n elements and calculate the execution time taken to sort the elements. Experiment with the different values of n , the number of elements to be sorted in the array, and plot a time taken graph versus n
5. Consider ' n ' objects and a knapsack. Object j has a weight w_j and the knapsack has the capacity m . If a fraction n_j $0 \leq n_j \leq 1$ of object j is placed into knapsack then a profit of p_j , x_j is earned .The objective is to obtain a filling of the knapsack that maximizes the total weight of all chosen objects to be at most m . Write a program to implement 0/1 Knapsack problem using and check it with an instance:
 - a. Dynamic Programming method
 - b. Greedy method.
 - c. Compare the results of Dynamic programming and Greedy method and display the output as complexity of space and time.
6. Write a program to use Greedy approach to implement the following
 - a. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
 - b. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union and Find functions in your program.
 - c. Compare the results of Prim's and Kruskal's method and display the output as complexity of space and time.
7. Write a program using Method of Backtracking to solve n -queen problem and check the execution times of the same for 4-Queen and 8-Queen instances.
8. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
9. Write a program to implement the following matrix multiplication methods and compare their execution times for multiplying two matrices of order (8×8) and (8×8) :
 - a. Conventional non recursive.
 - b. Divide and Conquer recursive.
 - c. Strassen's matrix.

10. Implement any scheme to find the optimal solution for the Travelling Sales Person problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
11. Implement the naive and KMP pattern matching algorithms and compare the count of the number of comparisons performed.
12. Implement the backtracking method to find the chromatic number of a given connected graph with n vertices.
13. Generate 100 random integers in between 1 and 100000. Find its maximum and minimum using genetic algorithm with the number of generations $g = 2500$. Apply different crossover and mutation operators and compare the results.

LEARNING OUTCOMES:

Ex 1	The learner should understand the control abstraction of dividing and conquer, and traditional recursive methods.
Ex 2	The learner will have an understanding of how to apply divide and conquer approach to recursive binary search and compare linear search with their time of execution.
Ex 3	The learner will have an understanding of how to sort a given set of elements using the quick sorting method and will decide the time taken to sort the elements.
Ex 4	The learner must understand how to sort a given set of elements using the heap sorting method and will decide the time taken to sort the elements.
Ex 5	The learner will get an understanding of dynamic programming implementation, a greedy method using the 0/1 knapsack problem. And know about comparing output with the complexities of their time and space.
Ex 6	The learner will get an understanding of finding the Minimum Cost Spanning Tree of a given connected graph using the method of Prim's and Kruskal's, and will compare with the complexities of their space and time.
Ex 7	The learner will have an understanding of the application of Backtracking to solve 4-Queen and 8-Queen problems and test the same execution times for 4-Queen and 8-Queen instances.
Ex 8	The learner will have an understanding of the implementation of Dijkstra's algorithm to find the shortest paths to other vertices.
Ex 9	The learner will have an understanding of non-recursive and recursive matrix multiplication methods and compare their execution times to multiply two matrices.
Ex 10	The learner will have an understanding of Travelling Sales Person problem and then solve the same problem instance using any approximation algorithm.
Ex 11	The learner will have an understanding of pattern matching algorithms.
Ex 12	The learner will have an understanding of the method of backtracking in solving graph coloring problem
Ex 13	The learner will have an understanding of applying genetic algorithm and its operators in finding minimum and maximum of n numbers

Course Code: CAPOL510R01

Semester: III

COURSE NAME: INFORMATION SYSTEM DEVELOPMENT LABORATORY

Course Objective: This course enables students in the development of software systems with a focus on the best practices of software engineering.

Students have to complete a project by following SDLC framework and implementation should be done using J2EE or DOT NET.

LEARNING OUTCOMES:

The students will be able to apply the project management skills, processes, methodologies, tools and techniques to develop manage IT projects.

Course Code : CAPOL523R02

Semester : III

COURSE NAME: BIG DATA ANALYTICS LABORATORY

Course Objectives: This course will help the learner to understand different data analytics techniques and demonstrate the experience by using various Big Data analytical tools such as R, Hadoop.

1. Demonstrate Import and export of data sets in different formats using R, Weka and KNIME
2. Demonstrate pre-visualization of data set applied for Analysis
3. Perform missing data analysis and validate the given data set for Big Data Analytics

4. Pre-processing of Data and methods to be applied for Analytics
5. Understanding of various basic statistical measures and their usage in Analytics
6. Representation of post-analysis data set results using different graphs
7. Apply dimensionality reduction using Principal Component Analysis
8. Demonstrate Prediction: Linear Regression Approach to Analytics
9. Demonstrate Clustering: k-Means, Hierarchical Clustering approach and their importance in Analytics
10. Demonstrate the application of Apache Scala on Hadoop, along with MLib module for a given data set

LEARNING OUTCOMES:

Ex. 1	Learner will be able to know about data analytics tools like R, Weka and KNIME
Ex. 2	Learner will get understanding of pre-visualization of a dataset
Ex. 3	Learner can analyse the missing data of the taken dataset.
Ex. 4	Learner will be able to know the pre-processing applying procedure.
Ex.5	Learner will understand basic statistical measures and their usage.
Ex.6	Learner can analyse the processed data using graphs
Ex.7	Learner can learn how to apply PCA
Ex.8	Learner will be able to perform prediction
Ex.9	Learner will be understanding clustering techniques
Ex.10	Learner will be able to know the usage of Hadoop.

Course Code: CAPOL533R01

Semester: IV

COURSE NAME: Theory & Practices of Artificial Intelligence

Course Objective:

To know about basic concepts of various knowledge representation schemes To study various heuristic and game search algorithms, Also provide insight details about learning and planning and also to know about various Expert System tools and applications. It also provides an overview of NLP applications.

UNIT- I: Problem Solving Techniques

State Space Search: Production systems, Problem characteristics, Production system Characteristics
Uninformed Search: Breadth first search, Depth first search, comparing DFS and BFS
Informed Search: Heuristic search, Hill climbing, Best First Search-A* algorithm
Game Playing: Game tree, Minimax, Alpha-beta cut off

UNIT- II: Knowledge Representation

Propositional Logic – First-Order Logic– Syntax and semantics – using first order logic -
Inference in First Order Logic – Forward and Backward Reasoning – Resolution - Logical Reasoning Systems – Frame Systems and Semantic networks.

UNIT- III: Planning & Learning

Planning: planning as search, partial order planning, construction and use of planning graphs
Learning: Rote learning, learning in Problem solving, Learning by induction, learning in Neural networks-Back propagation network

UNIT- IV: Expert Systems

Definition – Features – Limitations - Building an Expert system - Knowledge representation in Expert systems - Knowledge acquisition. Case study: MYCIN, R1, PROSPECTOR

UNIT – V – Intelligent Agents

Intelligent agents: reactive, deliberative, goal-driven, utility-driven, and learning agents

Natural Language Processing – Language Understanding – Speech recognition – Language Generation- Speech Synthesis- Applications.

LEARNING OUTCOMES

Unit I	The learner will have an understanding of the problem solving techniques which are used to solve AI problems
Unit II	The learner familiarizes with propositional and predicate logic. They will learn various knowledge representation methods and reasoning techniques in rule-based systems
Unit III	The learner will acquire knowledge in machine learning techniques such as decision tree induction, artificial neural networks, and genetic algorithm
Unit IV	The learner will understand the basics of expert systems with relevant case studies
Unit V	The learner will understand the basics of Natural Language Processing and its application types with relevant case studies

Course Code: CAPOL534R01

Semester: IV

NETWORK PRINCIPLES & PROTOCOLS

Course Objective:

This course will help the learner to describe network basics, principles of networks and protocols required to communicate. The learner will understand advanced internetworking principles. This course will also help the learner to identify solutions for network challenges.

UNIT – I Introduction and Architecture

Foundation: Applications-Requirements: Scalable connectivity-Cost-Effective resource sharing-Support for common services-Network Architecture-Implementing Network Software-Performance.

UNIT – II Connecting Networks

Perspective-Encoding-Framing: Byte-Oriented Protocols-Bit-Oriented Protocols- Clock-Based Framing-Error Detection-Reliable Transmission: Stop-and-Wait-Sliding Window-Ethernet and Multiple Access Networks- Wireless: 802.11- Bluetooth.

UNIT – III Internetworking

Switching and Bridging - Basic Internetworking: Service Model-Global Addresses- Datagram Forwarding in IP-Subnetting and classless Addressing-Address Translation- Host Configuration- Error Reporting- Virtual networks and Tunnels-Routing-Implementation and Performance.

UNIT – IV Advanced Internetworking and End-to-End Protocols

The Global Internet -Multicast: Multicast Addresses- Multicast Routing-Multiprotocol Label Switching: destination-based Forwarding- Explicit Routing-VPN and Tunnels- -End-to-End Protocols: UDP-TCP-Remote Procedure Call-RTP

UNIT – V Congestion Control and Resource Allocation

Issues in Resource Allocation-Queuing Disciplines -TCP Congestion Control- Congestion Avoidance Mechanisms: DECbit- Random Early Detection- Source-Based Congestion Avoidance-Quality of Service: Application requirements-Integrated Services-EF and AF.

LEARNING OUTCOMES

Unit I	The learner will be able to understand basic concepts of networks and standards. They will learn the layers of network architecture. They will have the knowledge of network software performance
Unit II	The learner will be able to analyze the error detection techniques and apply the knowledge to different set of data. They will have the knowledge of data link control frames
Unit III	The learner will be able to understand internetworking principles and address translation. They shall understand the switching techniques.
Unit IV	The learner will understand multicast addressing and routing. They will also learn VPN and end-to-end protocols.

Unit V	The learner will understand the necessity of resource allocation. They will gain the knowledge of congestion control algorithms and the application requirements.
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Course Code: CAPOL423R01

Semester: IV

COURSE NAME: ENTERPRISE RESOURCE PLANNING

Course Objective: To familiarize students with how organizations are using technologies like Enterprise Resource Planning to stay ahead of the competition through both internal and external integration of their Business Processes.

UNIT- I: Introduction

ERP Concepts — Evolution of ERP – tangible and intangible benefits - emerging trends – ERP architecture

UNIT- II: Pre-Implementation Stage

Business Process Reengineering Concepts: Re-engineering and process improvement – BPR steps – organizational readiness – AS-IS and TO – BE analysis - Forward and Reverse engineering - successful BPR - Business Process Design and Analysis: Modelling business process using Work System Framework - ERP Selection: ERP vendor & package selection - need analysis– gap analysis – cost elements – feasibility analysis

UNIT- III: Modules and Market

ERP Business modules: Sales and distribution, materials management, production planning, financial management, human resource management

ERP Market– different ERP vendors

UNIT- IV: Implementation Stage

Implementation Approaches – ERP implementation life cycle - Project Management: Project team – steering committee – project manager – functional team – technical team - Managing ERP Projects – Risk factors, critical success factor

Unit V: Post Implementation Stage

Measuring ERP Benefits – Balanced Score card Method – ABCD Checklist Framework – Capability Maturity Framework.

LEARNING OUTCOMES

Unit I	The learner will understand the basic ERP concepts, architecture and current trends
Unit II	The learner will know the various activities involved in pre-ERP implementation
Unit III	The learner will get familiarized with ERP modules, its market and vendors
Unit IV	The learner will learn to successfully implement an ERP software
Unit V	The learner will learn post ERP implementation activities

Course Code: CAPOL425R01

Semester: IV

COURSE NAME: CUSTOMER RELATIONSHIP MANAGEMENT

Course Objective: This course aims at providing in-depth knowledge regarding the theory and practice of Customer Relationship Management.

UNIT- I: Introduction

Definition of CRM – CRM as a business strategy - CRM strategies: customers' strategies, channel and product strategies and infrastructure strategy.

UNIT- II: Customer Focus

Market – Oriented organization – customer acquisition strategies – customer retention strategies – customer loyalty - strategic customer – customer involvement in product/ service development.

UNIT- III: Operational CRM

Pre-order Issues: Online visibility- Real-time access to Product Information- Inventory integration – shipping and order tracking; Marketing Automation packages- Campaign Management, Lead Management, Contact Management - Point-of-order Issues: Ensuring smooth ordering process; Personalizing the website; Customer-friendly web navigation; Online Pricing Information; Security Issues - Sales Automation Packages: Pricing and Configuration Management; Sales/Territory Management: Order Management - Post-Order and Service Issues: Tracking Orders and online order status; Call Centers for Online Help; Warranty servicing; Online Spares ordering; Lifetime Customer Support

UNIT- IV: Analytical CRM

Importance of analytical tools: Online Analytical Processing – Data Warehousing – Data Marts - Data Mining - Data Mining techniques: Clustering, Nearest Neighbor, Decision Trees, Rule Induction and Neural Networks – Applications in Customer Segmentation, Customer Profitability, and Customer Retention; Deploying Data mining for CRM

UNIT- V: CRM Implementation

Planning the CRM program; Understanding Business Processes; CRM Readiness evaluation; choosing the right CRM software; Managing the Project; Measuring CRM success using Metrics.

LEARNING OUTCOMES

Unit I	The learner will understand the concepts in CRM, significance, decisions & business strategies
Unit II	The learner will be able to define market oriented organization, customer acquisition strategy, influences of acquisition and understand the trends in customer retention
Unit III	The learner will be able to understand the concept of Pre-order, Point-of order and post-order, service issues
Unit IV	The learner will have an understanding of Data warehouse, Data mining and OLAP technology
Unit V	The learner will be able to understand CRM planning, CRM success, concept and principles of BPR and to manage projects

Course Code: CAPOL426R01

Semester: IV

COURSE NAME: SUPPLY CHAIN MANAGEMENT

Course Objective: To impart students with the knowledge of decision making in planning, scheduling, control of supply chain and logistics functions in manufacturing and services.

UNIT- I: Introduction

Definition – Porter’s Model of Supply Chain – Value Chain – Supply Chain Management as a business strategy – Logistics as a Core Competency – Three Components of Supply Chain- Supply Chain Costs – Barriers to supply chain integration.

UNIT- II: Customer Focus

Customer service - Customer-focused marketing - Basic service capability – Increasing customer expectations – Value-based services – Customer satisfaction and success

UNIT- III: Designing the Supply Chain

Outsourcing the Supply chain activities– Developing Supply chain channels – Importance of alliances – Developing operational objectives for Logistics operation – Integrating inventory and information flows– Planning and coordination — Global Logistics Planning.

UNIT- IV: Supply Chain Administration

Managing a Supply Chain organization – Inventory Management – Managing materials flow – Decision strategies in Transportation – Warehousing and Distribution Management – Material handling – Packaging – Operational planning for logistics – Logistical performance measurements.

UNIT- V: SCM and Information Technology

Information systems for order processing – Logistics information flow – Use of distributed databases and networking technologies for business transactions, tracking products – Use of Decision Support Systems – Use of bar-coding and scanning technologies for product identification – Web technologies for electronics document interchange (EDI) and E-fund transfer.(EFT)

LEARNING OUTCOMES

Unit I	The learner will get exposed to the basics of SCM, components and its barriers
Unit II	The learner will understand value-based services and the importance of customer

	satisfaction
Unit III	The learner will learn to design supply chain and plan for logistics
Unit IV	The learner will learn the basics of supply chain administration
Unit V	The learner will learn the importance of WWW in supply chain

Course Code: CAPOL518R01

Semester: IV

COURSE NAME: E-COMMERCE

Course Objective: To impart various design issues & models related to online business process. Special emphasis has been given to security issues.

UNIT- I: Introduction to E-commerce

What is E-commerce? – Benefits and Classification of Electronic Commerce – Applications of E-commerce – Business Models of E-commerce- Framework of E-commerce- Information Distribution and Messaging - Information Publishing Technology -Advantage and Disadvantages of E-commerce.

UNIT- II: B2B Commerce

What is EDI? – Building block of EDI systems – Value Added Networks –EDI in Action - Benefits and Applications of EDI – Role of International Trade – Logistics of Transport and Financial EDI – Types: Checks, EFT, ACH - Standards :EDIFACT,ANSI X12- EDI legal and Privacy issues.

UNIT- III: B2C Commerce

Mercantile Process Models – Consumer Perspective , Merchant Perspective – Electronic Payment Systems – Online payment Systems – Prepaid and Postpaid payment systems - E-cash properties, Purchasing E-cash from currency server – Credit Card types – Encryption and credit card – Third party Credit cards – Advantage and Disadvantages of Credit cards.

UNIT- IV: Securing Network Transaction

Transaction security – Symmetric and Asymmetric key cryptosystems – Symmetric-key encryption by DES and AES – Public Key Encryption – RSA algorithm – Digital Signature – E-mail security – Digital Certificate and Certifying Authority.

UNIT- V: Case Studies

Web page - HTML Basics - Client Side Scripting - Server side scripting - The elements of e-commerce: Internet e-commerce security - A Web Site Evaluation Model - Internet Bookshops - Internet Banking - online share dealing - e-diversity -Technology Adoption.

LEARNING OUTCOMES

Unit I	The learner can understand e-business and its framework, classification of e-business with its merits and limitations
Unit II	The learner will have an understanding of B2B type of e-commerce that includes architecture of EDI, ANSI X.12 and EDIFACT. working of international trade and logistics, financial EDI
Unit III	The learner will understand B2C type of e-commerce that emphasize on mercantile process models and online payment systems
Unit IV	The learner can understand network transaction security, symmetric & asymmetric key cryptographic algorithms, digital certificate and digital signatures
Unit V	The learner will learn to deploy e-business applications

Course Code: CAPOL536R01

Semester: IV

COURSE NAME: DESIGN THINKING

Course Objective: To teach various basic concepts of Design Thinking. Understanding of Design thinking and the various stages of design thinking will be taught.

UNIT-1: Introduction

Principles of Design Thinking - The process of Design Thinking - How to plan a Design Thinking project. Search field determination - Problem clarification - Understanding of the problem - Problem analysis - Reformulation of the problem

UNIT-II : Problem observation and definition

Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design. Point-of-View Phase - Characterisation of the target group - Description of customer needs.

UNIT-III: Ideating

Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation of ideas.

Brainstorming, Idea menu, Decision Matrix

UNIT-IV : Prototyping

Prototype Phase - Lean Startup Method for Prototype Development - Visualization and presentation techniques.

Paper prototyping, Volumetric model, Staging, Story board, Service prototyping.

UNIT-V : Testing ideas and Implementation

Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing. How to conduct workshops - Requirements for space - Material requirements - Agility for Design Thinking.

LEARNING OUTCOMES

Unit I	The learner will understand what is design thinking and how to understand the problem that needs to be designed.
Unit II	The learner will understand to observe the problem and designing method and to define the problem.

Unit III	Help learners to understand the methods for finding ideas and select appropriate idea.
Unit IV	Learners will have an understanding of prototyping of ideas selected and know to represent those prototyping.
Unit V	Learners will learn to test the prototype for suitability and understand the implementation of the prototype.

Course Code: CAPOL537R01

Semester: IV

COURSE NAME: INFORMATION TECHNOLOGY & INFRASTRUCTURE MANAGEMENT

Course Objectives:

The purpose of IT infrastructure management is to provide structure and control of the functions responsible for diverse technical operations which generally involve hardware, software, and networking in both physical and virtual environments and moreover make the student understand the basic ideology of flexible, scalable and cost-effective computing environment.

UNIT-I

Introduction: Basics of OS concepts- Overview on Virtualization- Overview of Commandcenter-Network Fundamentals- Network and internet-computing resources- information Technology-IT infrastructure management- infrastructure- IT Infrastructure management-challenges in IT infrastructure management- design issues of IT organizations and IT infrastructure, determining customers' requirements- IT systems management process, IT service management process- information system design process-patterns for IT systems management- IT infrastructure library. Hands on Training: Windows operating system and file transfer operations.

UNIT-II

Service Strategy: Goals - Objectives - Scopes and values —Key principle —Process and Activities - Service Delivery Process: Service level management- financial management- IT service continuity management- capacity management- availability management. Hands on Training: Linux operating system and file transfer operations

UNIT-III

ServiceSupportProcess: Configuration management-incident management- problem management- change management- release management. **Storage Management:** Introduction to storage- **Storage Basics** - backup and storage- archive and retrieve- disaster recovery- space management-database and application protection- Bare Machine Recovery (BMR), data retention. Hands on Training: Hands of Training: Database hacking and its prevention.

UNIT-IV

Security Management: Introduction-**Fundamentals of Security**- computer security- internet security- physical security- identity management- access control- intrusion detection. **IT Ethics:** Introduction- intellectual property- privacy and law- computer forensics- ethics and internet- cybercrimes. IT Infrastructure acts.

UNIT-V

Emerging Trends in IT: Introduction – Ecommerce – Electronic Data Interchange – Global System for mobile communication–Bluetooth. **Service operation:** Purpose- key processes- activities- Key role- Key functions. **Continual service improvement:** Purpose- Key processes and activities- Key role- Service management processes and functions.

LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	<ul style="list-style-type: none">• Infer the basics on Network and internet• Perceive the knowledge of challenges in IT infrastructure management
Unit II	<ul style="list-style-type: none">• Develop the idea behind Service Strategy• Explain the concepts of Service Delivery Process
Unit III	<ul style="list-style-type: none">• Understanding the concepts of Service Support Process.• Elaborate the Storage Management
Unit IV	<ul style="list-style-type: none">• Summarize the Security Management• Outline the IT Ethics
Unit V	<ul style="list-style-type: none">• Point out the Emerging trends in IT• Interpret the concepts of Continual service improvement

Course Code: IE009

Semester: IV

AR AND VR DEVELOPMENT USING UNITY

Course Objectives:

This course will help the learner to acquire expertise in AR and VR game development using Unity. From fundamentals to advanced features, students will apply their skills, creating immersive experiences and analyzing real-world case studies for practical insights.

UNIT - I **15** **Periods**

Overview of Augmented Reality (AR) and Virtual Reality (VR) - Significance and Applications in Game Development - Unity's Role in AR/VR Integration - Historical Evolution of AR/VR in Gaming - Current Trends and Future Directions

UNIT - II **15** **Periods**

Unity and AR Fundamentals - Basics of Unity Development for AR - Understanding AR Concepts and Technologies - Integration of AR Features in Unity - Creating AR Experiences with Unity - Practical Examples and Use Cases

UNIT - III **15** **Periods**

Fundamentals of Unity Development for VR - VR Hardware and Platforms Compatible with Unity - Integrating VR Features in Unity - Building VR Experiences with Unity - Best Practices for VR Development

UNIT - IV **15** **Periods**

Advanced AR Features and Interactions - Markerless Tracking and Object Recognition - AR Cloud Integration in Unity - Implementing AR for Mobile Platforms - Case Studies of Advanced AR Applications

UNIT - V **15** **Periods**

Advanced VR Interaction Techniques - Room-Scale VR Development in Unity - Implementing VR for Various Platforms - VR Simulation and Testing - Case Studies of Advanced VR Applications

LEARNING OUTCOMES

Upon successful completion of each unit, the learner will be able to

Unit I	<ul style="list-style-type: none">• Understand the significance of AR and VR in game development.• Apply Unity fundamentals for AR development.
Unit II	<ul style="list-style-type: none">• Understand the fundamentals of Unity development for VR.• Apply best practices for VR development using Unity.
Unit III	<ul style="list-style-type: none">• Apply advanced AR features and interactions in Unity.• Analyze and evaluate case studies of advanced AR applications.
Unit IV	<ul style="list-style-type: none">• Apply advanced VR interaction techniques in Unity.
Unit V	<ul style="list-style-type: none">• Evaluate case studies of advanced VR applications

List of Laboratory Experiments

- 1. Design and develop a simple AR application using Unity. Focus on marker-based tracking and incorporate interactive elements.**
- 2. Create a VR experience using Unity. Consider interaction design principles and implement various VR interaction techniques.**

Course Code: CAPOL535R01

Semester: IV

COURSE NAME: MACHINE LEARNING TECHNIQUES & APPLICATIONS

Course Objective: To provide in-depth knowledge of machine learning algorithms with python programming. This course will also help the learner to learn Probabilistic Discriminative Models, Neural Networks, Convolution Networks, Recurrent and Recursive Nets

UNIT – I

Machine Learning Basics: Probability - Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, The Chain Rule of Conditional Probabilities, Independence and Conditional Independence, Expectation, Variance and Covariance, Common Probability

Distributions, Useful Properties of Common Functions. Learning Algorithms – Capacity - Over fitting and under fitting–Hyperparameters and Validation Sets - Estimators, Bias and Variance - Maximum Likelihood Estimation - Supervised Learning Algorithms - Unsupervised Learning Algorithms - Gradient-Based Optimization - Constrained Optimization - Example: Linear Least Squares, Stochastic Gradient Descent.

UNIT - II

Probabilistic Discriminative Models: fixed basis functions - Logistic regression - Iterative reweighted least squares - Multiclass logistic regression - Probit regression - Canonical link functions - The Laplace Approximation - Model comparison and BIC - Bayesian Logistic Regression - Laplace approximation - Predictive distribution. **Sparse Kernel Machines:** Maximum Margin Classifiers - Overlapping class distributions - Relation to logistic regression - Multiclass SVMs - SVMs for regression

UNIT - III

Neural Networks: Feed -forward Network Functions - Weight -space symmetries - Network Training - parameter optimization - Gradient descent optimization - Error Backpropagation - Early Stopping - Parameter Tying and Parameter Sharing - Sparse Representations - Bagging and Other Ensemble Methods – Dropout. **Convolutional Networks:** The Convolution Operation - Motivation - Pooling - Convolution and Pooling as an Infinitely Strong Prior - Variants of the Basic Convolution Function - Structured Outputs.

UNIT IV

Python and Machine Learning Applications: Elements of python – Operators, Expressions, Loops, Functions. Tuples, Lists, List Operations, Mutation, Aliasing, Cloning – Dictionaries: Functions as Objects. Object Oriented Programming, Class Instances, and Methods Classes and Inheritance. **Applications** :Linear Regression using TensorFlow – K means Clustering – Develop LSTM model using both Tensor flow and sklearn

UNIT V

Advanced Applications: Text cleaning methods using NLTK – Custom made machine learning model-Stochastic Thinking: Rolling a Die, Random walks– Inferential Statistics: Probabilities, Confidence intervals – Monte Carlo Simulations: Sampling, Standard error Experimental Data: Errors in Experimental Observations, Curve Fitting, Goodness of Fit, Model for Predictions

LEARNING OUTCOMES

Unit I	The learner will get an understanding of various learning models from data
Unit II	The learner will have an understanding a wide variety of learning algorithms
Unit III	The learner will get an understanding how to evaluate models generated from data
Unit IV	The learner will get an understanding to write programs in Python using basic operators ,tuples,lists,dictionaries, classes and inheritance
Unit V	The learner will have an understanding of applying the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

Course Code: CAPOL601R01
Semester: IV

COURSE NAME: Project Work & Viva Voce

Course Objectives

Project work empowers the learner to

- Understand research articles and technical documents
- Select appropriate scientific and mathematical model based on literature survey to solve the problem
- Develop innovative solutions by applying holistic knowledge and software engineering principles
- Improve Interpersonal skills, including ability to lead and to work cooperatively in a team
- Improve oral and written technical communication skills
- Abide by the legal and ethical standards and catering for social development

Course Description:

The Project work provides the learner an opportunity to apply and extend knowledge acquired throughout the program. Project work can be carried out individually or as a group of two to

three persons. It can be carried out either as an in-house project or as an intern at a company or an Institution. This course introduces the dimension of workload management into the program to enable completion of a large, relatively unstructured work

- In the initial stages, the learner is expected to choose a problem, along with the group members. This leads to the formulation of the problem, checking the feasibility of the work to be completed within the given stipulated duration
- The learner analyzes the chosen problem and design computationally efficient optimal algorithms, meeting the requirement specification, so that it leads to building energy efficient Software/Hardware system
- The learner employs advanced tools to implement the methodology by applying project management principles, while keeping in mind the professional ethics, societal and environmental impact
- The learner uses appropriate Software/Hardware testing strategies for the developed system and builds a user friendly interface
- Individual performance of the learner is continuously assessed by periodic reviews of the progress of the project work

COURSE LEARNING OUTCOMES

Upon successful completion of the project, the learner will be able to

- Identify the current societal and technological requirements
- Analyze and discuss the shortfalls of current system by performing literature survey
- Correlate the mathematical, conceptual and computing knowledge with the problem under study, considering uncertainties
- Plan the project development stages and distribute tasks among the team members
- Use technical literature and relevant information sources for designing cost effective solution based on acquired knowledge
- Implement the design by applying computational methods and technical skills using appropriate software tools
- Examine technical uncertainties during system development
- Evaluate the system by using appropriate testing strategies and refine the system through discussions among team members
- Write a report explaining the technical concepts of the developed system
- Apply legal and ethical standards

Project Rubrics:

Component		Marks
Review panel	Review I	30
	Review II	30
	Average	30
Project supervisor's component		20
Total		50

Reviews	Evaluation criteria	Marks
Zeroth Review	Not taken for evaluation	NA
	Students will brief on the area or problem identified by them and shall also discuss on the likely objectives for their chosen project to the review panel. The feasibility of the project (considering technical, time and cost factors) will be ascertained. The problem identified / objectives shall be appropriate for project to be executed by a team or as an individual	
Review I	Problem formulation/ Objective & Motivation/ Literature review or survey	10
	Experimental Design / Mathematical Model / Solution Methodology / Methods & Procedures and so on (Methodology / Work plan)	10
	Work carried out	10
	Total	30
Review II	Design/analysis/experiments/fabrication and following of ethical practices & Results	10
	Interpretation/Understanding, Discussion & Conclusion(s) Failed attempts shall also be disclosed and learning from failed	20

	attempts or negative results are also acceptable	
	Total	30

	Evaluation criteria	Marks
End Semester Examination	Project Report / Thesis	10
	Problem Formulation / Objective & Methods & Processes including experimental design, mathematical model and so on	15
	Results and Discussion	15
	Individual Contribution / Learning and Viva Voce	10
	Total	50

NAME OF THE PROGRAMME: Master of Business Administration

DURATION : 2 Years

ELIGIBILITY FOR ENROLMENT: Any recognized bachelor's degree of minimum three years duration.

PROGRAMME FEE : Tuition fee of Rs.55000/- per semester.



SASTRA
ENGINEERING · MANAGEMENT · LAW · SCIENCES · HUMANITIES · EDUCATION
DEEMED TO BE UNIVERSITY
(U/S 3 of the UGC Act, 1956)



THINK MERIT | THINK TRANSPARENCY | THINK SASTRA

TIRUMALAISAMUDRAM, THANJAVUR – 613 401

M.B.A. (Online Mode)

Scheme of Study

(for candidates admitted from January, 2023)

The program consists of a total of 19 Courses (17 Core courses and 2 Master courses) with one project amounting to 80 credits.

Semester – I (16 credits)

Course Code	Course Name	Credit
MBAOL 01	Foundations of Management and Organisational Behaviour	4
MBAOL 02	Economics for Decision Making	4
MBAOL 03	Accounting for Managers	4
MBAOL 04	Business Research Methods	4

TOTAL	16
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Semester – II (18 credits)

Course Code	Course Name	Credit
MBAOL 20	Contemporary Marketing Management	4
MBAOL 21	People Management	4
MBAOL 07	Financial Management	4
MBAOL 22	Operations & Supply Chain Management	4
MBAOLMC01	Master Class	2
TOTAL		18

Semester – III (20 credits)

Course Code	Course Name	Credit
MBAOL 09	Strategic Management	4
MBAOL 10	Business Analytics and Data Visualisation	4
MBAOL 23	Services Marketing & Customer Relationship Management	4
MBAOL24	Human Capital Strategy and Performance Management	4
MBAOL13	Investment Analysis and Portfolio Management	4
TOTAL		20

Semester – IV (26 credits)

Course Code	Course Name	Credit
MBAOL25	Corporate Laws and Governance	4
MBAOL26	Phygital Retailing	4
MBAOL17	Leadership & Change Management	4
MBAOL27	Project Management	4
MBAOLMC02	Master Class	2
MBAOL19	Project Work	8
TOTAL		26

CREDITS DISTRIBUTION

Semester	I	II	III	IV	Total
Courses	4	5	5	5	19

Credits	16	18	20	26	80
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Course Code: MBAOL01

Semester: I

FOUNDATIONS OF MANAGEMENT AND ORGANIZATIONAL BEHAVIOR

Course Objectives: To provide knowledge to students on basics of Management concepts, functions and organization behavior.

Unit - I: Introduction to Management

Historical perspectives of Management Principles; The changing paradigm of Management - Functional Management, Management levels – Key Managerial Roles – Management Skills, Approaches of Management – Systems, Behavioral and Integrated perspective – Nature and Structure of Planning, Phases in Planning, Planning Tools and Techniques – MBO.

Unit - II: Organizing and motivation

Fundamentals of Organizing, Designing Organizational Structure to achieve strategic goals; Factors affecting organizing structure, Departmentation – Span of Control - organizational structures - Centralization – Decentralization – Delegation of Authority- Staffing - Coordination & Control - Motivation –Theories: Maslow’s Need Hierarchy, Herzberg’s Motivation & Hygiene and McClelland’s Need Theory.

Unit - III: Foundations of Organisational behavior and Individual behaviour

Definition, need and importance of organizational behaviour – Nature and scope – Challenges and opportunities for OB – foundations of OB - Ethical values - Perceptions – Importance – Factors influencing perception – Interpersonal perception- Personality – types – Factors influencing personality – Theories – Learning –theories, process- Attitudes & values – Characteristics – Formation – Measurement.

Unit - IV: Group Behaviour

Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Foundations of Group behavior: Types of Teams, Team effectiveness, Team processes. Group

decision making techniques – Team building - team interpersonal relations- Leadership: Theories, styles and applications.

Unit - V: Conflict Management and Interpersonal Behavior Analysis

Conflict Management and Negotiation – sources of conflict, Interpersonal conflict Management Styles, Structural Approaches. Negotiation – process, Third party conflict resolution. Interpersonal Behavior Analysis – FIRO –B, Transactional Analysis, Johari Window. Organization Culture: Elements, Merging Cultures, Changing and Strengthening Cultures.

LEARNING OUTCOMES

Unit – I	The learner will have a basic understanding of managerial functions and roles and how historically these functions have evolved.
Unit - II	The learner will have an understanding of the organising and motivation process in an organization.
Unit – III	The learner will have an insight over the fundamentals of organizational behavior, individual behaviour and implications.
Unit – IV	The learner will get knowledge on the group behaviour in the organisation.
Unit – V	The learner understands the aspects of conflict management and interpersonal behavior analysis

Course Code: MBAOL02

Semester: I

ECONOMICS FOR DECISION MAKING

Course Objectives: To provide a strong foundation in economic theory for key business & managerial decision making for firms

Unit - I: Managerial Economics

Managerial economics-meaning-scope-circular flow of income-nature of economic problems and decision making- concepts in managerial economics: opportunity costs, total, average and marginal costs and revenues-reasons behind the existence of firms-role of profit in the economic system-role of managerial economist.

Unit - II: Demand and Supply

Demand: Concept, Law of Demand, Types, Law of Diminishing Marginal Utility, Elasticity of Demand, Demand forecasting methods. Supply: Law of Supply, Elasticity of Supply, Market Equilibrium - Consumer Behaviour: Concept, Theory and Consumer Equilibrium

Unit - III: Theory of Production

Production function-factors of production-factor payments-Theory of Production: Cobb-Douglas production function, relationship among total, average and marginal product functions, optimal employment of a factor of production,-production with two variable inputs - Isoquants and iso-cost curves. Economies of scale and economies of scope

Unit - IV: Different Market forms

Market structure- total and average cost curves in the long term and short run-relationship between average and marginal cost curves -price and output determination under perfect, monopolistic, monopoly and oligopoly market conditions-long term and short term

Unit - V: Macro economics

Meaning -Micro economics Vs Macro economics, origin and growth, Circular flow of income and Expenditure. National income - concepts and Measurement-Concepts, methods. Inflation- meaning - measure and effects. Balance of Payments- Meaning and purpose, BOP accounts, India's Balance of payments. Monetary and Fiscal policy. Role of IMF, World Bank and WTO.

LEARNING OUTCOMES

Unit - I	The learner will understand the fundamental aspects of managerial economics and also the role of managerial economist.
Unit - II	The learner will be able to understand demand, supply and consumer behaviour and also about consumer equilibrium.
Unit - III	The learner will understand the production function and also learn about the managerial application with regard to the economies of scale and economies of scope.
Unit – IV	The learner will understand the market structure and managerial applications in price fixation.
Unit – V	The learner will understand the various aspects of managerial economics like national income, inflation, balance of payments and monetary and fiscal policy.

Course Code: MBAOL03

Semester: I

ACCOUNTING FOR MANAGERS

Course Objectives: To provide insight view of accounting information from a managerial perspective and to provide in-depth knowledge in the field of costing and management accounting so as to apply them in the field of financial decision making.

Unit - I: Fundamentals of financial Accounting

Role of accounting in business; Generally Accepted Accounting Principles – Accounting Standards - Concepts and Conventions; Business transactions and accounting equation – capital and revenue expenditure; Accounting cycle: Journal, ledger and Trial balance, Preparation of financial statements - Income statement and Balance Sheet- Bank Reconciliation Statement- Error Management- Depreciation (Straight line and written down value method)- Reserves and Provisions.

Unit - II: Inter-firm and Intra-firm comparison

Interpreting the financial statements of Companies - Comparative and Common size Income statements, Balance Sheet- Trend analysis - Preparation and Interpretation of Fund Flow & Cash flow Statement (AS 3) - Ratio analysis- Du-Pont chart.

Unit - III: Fundamentals of cost and Management Accounting

Comparing management accounting with financial accounting and cost accounting – Role of Management Accountant- Basic Cost Concepts: Cost Unit – Cost Centre – Classification of Costs – Methods of Costing- Steps in preparation of Cost Sheet – Major components of cost: Material/Labour/Overheads- Reconciliation of cost and financial statements- Job Costing- Batch costing - Process Costing (with normal and abnormal loss and gain) - Contract Costing – Operations Costing – Operating Costing – Activity Based Costing - Target Costing.

Unit – IV: Budgetary Control and Marginal Costing

Budgeting as a Tool of Management Planning and Control – Functional Budgets – Master Budget – Performance Budgeting – Zero Base Budgeting- Responsibility accounting- Standard Costing: Standard Cost – Objectives – Need – Application – Advantages – Limitations of Standard Costing; Variance Analysis: Classification of Variances – Material Cost Variances – Labour Cost Variances – Overhead Variances – Sales Variances. Marginal Costing and Managerial Decision Making- Cost-Volume-Profit Analysis – Applications of CVP Analysis – Break Even Chart.

Unit -V: Recent Developments in Accounting and Auditing

Audit of Companies- Internal Controls and Audit – Social audit- Environmental audit- Audit under computerized environment – Accounting packages and ERP – International Financial Reporting

Standards (IFRS) – Introduction – need – and Content; XBRL – Introduction – Advantages of XBRL Reporting/Filing- Financial and auditing analytics for accounting firms.

LEARNING OUTCOMES

Unit - I	The learner will be familiar with the preparation of Income Statement and balance sheet from the perspective of recent amendment in the companies Act.
Unit - II	The learner will be able to analyse the performance of a company and also will have the ability to comment on the financial position of the business.
Unit - III	The learner will have an understanding of the scope and objectives of cost and management accounting. The learner will be able to prepare cost sheet and familiar with costing methods.
Unit - IV	The learner will be able to prepare the functional budgets and apply the standard costing technique for cost control. The learner will be able to apply various managerial decision making techniques by using CVP analysis.
Unit - V	The learner will know the recent developments in the field of auditing, ERP, XBRL reporting and accounting standards.

Course Code: MBAOL04

Semester: I

BUSINESS RESEARCH METHODS

Course Objectives: To familiarise the students with the principles of scientific methodology in business enquiry; to develop analytical skills of business research; to develop the skills for scientific communications.

Unit - I: Introduction

Business Research – Definition and Significance – Research process – Types of Research – Exploratory and causal Research – Theoretical and empirical Research – Cross –Sectional and time – series Research – Research questions / Problems – Research objectives – Research hypotheses – characteristics – Research in an evolutionary perspective – the role of theory in research.

Unit – II: Research Design and Measurement

Research design – Definition – types of research design – exploratory and causal research design – Descriptive and experimental design – different types of experimental design – Validity of findings – internal and external validity – Variables in Research – Measurement and scaling – Different scales – Construction of instrument – Validity and Reliability of instrument.

Unit - III: Data Collection

Types of data – Primary Vs Secondary data – Methods of primary data collection – Survey Vs Observation – Experiments – Construction of questionnaire and instrument – Validation of questionnaire – Sampling plan – Sample size – determinants of optimal sample size – sampling techniques – Probability Vs Non–probability sampling methods.

Unit - IV: Data Preparation and Analysis

Data Preparation – Editing – Coding –Data entry – Validity of data – Qualitative Vs Quantitative data analyses – Bi-variate and Multivariate Statistical Techniques – Factor analysis – Discriminant analysis – Cluster analysis – Multiple regression and correlation – Multidimensional scaling – Application of statistical software for data analysis.

Unit - V: Report Design, Writing and Ethics in Business Research

Research report – Different types – Contents of report – Need of executive summary – Chapterization – Contents of chapter – Report writing – The role of audience – Readability – comprehension – Tone – Final proof – Report format – Title of the report – Ethics in research – Ethical behaviour of research – Subjectivity and objectivity in research.

LEARNING OUTCOMES

Unit – I	The learner will be able to understand the definition, process, types and the evolutionary perspective of business research.
Unit – II	The learner will be able to analyze and evaluate the research design and measurement techniques appropriate for various types of research.
Unit – III	The learner will gain the ability to analyze various data collections methods and techniques.
Unit – IV	The learner earns the ability of data preparation and analysis of a research report.
Unit – V	The learner can develop the skill of report design & writing and understand the implication of ethics in business research.

Course Code: MBA0L20

Semester: II

CONTEMPORARY MARKETING MANAGEMENT

Course Objectives: The course will help the students to have an overview of the marketing function. It will help them to understand the dynamics of the market and to apply the marketing principles in real time situations.

Unit - I: Introduction to Marketing Management System

Introduction to Marketing Management: Introduction, Market and Marketing, the Exchange Process, Core Concepts and Functions of Marketing, Importance of Marketing, Marketing Orientations. The Marketing process: Introduction, Traditional and Modern Marketing Mix, Marketing Environment: Introduction, Environmental Scanning, creating customer value, satisfaction, and loyalty

Unit - II: Consumer Behaviour, Product & Branding Strategies

An overview of Segmentation, Targeting & Positioning (STP). Consumer & Business Market Buying Behaviour (B2C & B2B); Portfolio analysis – BCG Model & GE Model; Product Management: Decisions, Levels and Classification of Products, Product Line Strategies, Product Mix Strategies, New Product Development, Product Life Cycle (PLC); Introduction to Branding, Brand Positioning and Brand Management Decisions.

Unit - III: Managing Pricing, Promotion and distribution

Pricing: Introduction, Objectives and methods of Pricing, Initiating and Responding to the Price Changes; Promotion Management- Promotion Mix, Introduction to Advertising and Personal Selling Process, Sales Promotion – Tools & Techniques, Basics of Public Relations and Public Relations; Distribution Management: Channel Management Decisions & Strategies; An overview of Supply Chain Management and logistics.

Unit - IV: Contemporary Marketing Management tools and trends

Marketing Organization – evolution & structure of marketing department; Marketing Implementation – Skills required, Control – types of control; Customer Relationship Management, Customization &

Customerization; Industry convergence; Cause related marketing, Rural Marketing, Services Marketing, Online Marketing and Experiential Marketing. Green Marketing; Sustainable marketing - Introduction to Retailing.

Unit - V: Digital Marketing

Building online visibility for business –Various tools of digital marketing – Growing business with social media – Creating successful social media campaign; Understanding the basics of mobile marketing-Running mobile campaigns; Content Marketing -blogging and podcasting; Search Engine Optimization(SEO) through Adwords and keywords - Introduction to digital analytics.

LEARNING OUTCOMES

Unit - I	The learner will have an understanding about the fundamental marketing concepts and marketing environment.
Unit - II	The learner will have an understanding about segmentation and target market, consumer behaviour, product and brand management concepts.
Unit - III	The learner will be able to learn about various pricing and promotion strategies, distribution, supply chain and logistics management.
Unit - IV	The learner will have an understanding about contemporary marketing management tools and prevailing trends.
Unit - V	The learner will get an insight into the digital marketing tools and techniques.

Course Code: MBA0L21

Semester: II

PEOPLE MANAGEMENT

Course Objectives: To familiarize various aspects of People Management / Human Resource Management to manage the human resources of the organization in the best possible way to achieve the desired business results.

Unit – I: Introduction to People Management

Definitions – Functions of HRM, Changing role of HR managers, Globalization of HR Management, Strategic Human Resource Management, HRM & personnel management - An overview of Human Resource Information System.

Unit – II: Human Resource Planning, Acquisition & Development

Human Resource Planning, objectives and factors, Job analysis process, Job description, Job specification, Recruitment: Internal, External, Internet recruiting, Selection process, Tools for selection, Training and Development: Need analysis, Methods, Evaluation of training, Management Development Programmes – Career planning

Unit – III: Performance appraisal & compensation

Performance management- Meaning & importance -Appraisal: Process and Methods. Wage and Salary Administration: Principles and methods, Job evaluation: Incentive and Benefits, Executive compensation.

Unit – IV: Managing Labour Relations

Factors influencing Industrial Relations, Collective Bargaining - State Interventions and Legal Framework - Role of Trade unions, Management of Grievances, Worker's Participation in Management.

Unit – V: Employee Health, Safety, Security, Welfare and Discipline

Employee health, Safety, Security, Welfare and Employee Discipline, An overview of Labour legislations in India – The Factories Act, The Industrial Disputes Act, The Trade Union Act, The Workmen Compensation Act, The Employee State Insurance Act, The Employee Provident Fund Act .

LEARNING OUTCOMES

Unit - I	The learner will have an understanding about the global changes and the changing role of HR manager.
Unit - II	The learner will be able to understand the man power planning and importance of succession plan in the organisation.
Unit - III	The learner will have an understanding of performance appraisal methods and compensation designs.
Unit - IV	The learner will have an understanding about the negotiation and settlement of labour issues and trade union's challenges in India.
Unit - V	The learner will get an insight about labour legislation pertaining to employee welfare measures.

Course Code: MBAOL07

Semester: II

FINANCIAL MANAGEMENT

Course Objectives: To provide knowledge on successful way of mobilizing & managing finance in a business enterprise.

Unit - I: Nature and scope of financial management

Financial Management - Scope – importance – functions – objectives – role of finance managers - Treasurer Vs Controller - Financial planning - Over capitalization - Under capitalization - Sources of finance – characteristics – Security financing - Convertible debentures - Internal financing - Loan financing - Public deposits -Bridge finance - Loan syndication - Book building - Promoters contribution. Time Value of Money: importance - Finding present and future value – single flow and annuity - shorter period compounding - Equated annual & monthly Instalment analysis.

Unit - II: Capital Structure

Capital structure- Determinants – Characteristics - Cost of capital – Equity, Debt and Preference shares – WACC – Capital structure and Cost of capital – Net income approach - Net operating income approach - Modigliani-Miller approach - Leverage, Capital structure and Optimal capital structure – EBIT & EPS – ROI & ROE analysis – break even analysis.

Unit - III: Capital Budgeting

Objectives and significance - Capital budgeting process - Capital budgeting decisions - Information required for capital budgeting - Techniques and evaluating projects - Risks in capital budgeting - Independent projects and capital rationing - Mutually exclusive projects - Capital budgeting and price level adjustments - Economic rate of return

Unit – IV: Working Capital Management

Meaning and scope - Cash conversion cycle - Working capital policy - Estimation of working capital require requirements working – Working capital financing - Inventory management – objectives,

Receivables management – credit policy, credit standards & credit terms - Cash management – Baumol, Miller & Orr Model.

Unit - V: Dividend Decisions & Firm's Value

Dividend policy formulation- Legal and procedural aspects - Dividend policies in practice - Irrelevance of dividend - Relevance Vs irrelevance of dividends - Theory of relevance - Rational dividend policy under business situations – Walter and Gordon Model.

LEARNING OUTCOMES

Unit - I	The learner will be able to understand the introductory aspects of management of finance and will be able to calculate present and future value of benefits.
Unit - II	The learner can know about the role of capital structure decisions and its influence on firm's value.
Unit - III	The learner will be equipped with how to apply various techniques on investment decisions.
Unit - IV	The learner will enhance their understanding on the importance and managing of short term capital requirements.
Unit - V	The learner can understand to measure the firm's value under different payout scenarios.

Course Code: MBAOL22

Semester: II

OPERATIONS AND SUPPLY CHAIN MANAGEMENT

Course Objective:

This course aims at providing a conceptual background and understanding of Operations and Supply Chain management functions. The student gets acquainted with the dimensions of managerial decisions in managing business operations and supplies.

Unit – I: Introduction to Operations Management

Operations Management, Meaning and definitions of Operations, Definitions of production management, Objectives- Distinction between production and operations management, Products versus services, Operations Strategy, Process Strategy and Analysis -Tools, History of production/operations management, Lean manufacturing Flexible manufacturing system: Forecasting: Steps, Classification, Qualitative Techniques, Quantitative Techniques

Unit – II: Operations Management Decisions

Facilities Location: Importance, Primary and secondary Location factors, Plant Layout: Definition, Importance, Objectives, Principles, Factors influencing, Types, Techniques and tools for plant layout- Capacity Planning: Planning term; Capacity timing and sizing strategies; Tools for capacity planning. Total Quality Management, Quality Concepts, ISO Standards

UNIT – III: Introduction to Supply Chain

Introduction- Evolution of Supply chain management, Decisions in Supply Chain, Importance of the Supply Chain; Customer service and cost trade-offs – Order delivery, lead time, Supply Chain responsiveness, Delivery reliability; Supply Chain performance measure – Drivers of Supply Chain performance – facilities, inventory, transportation and information.

UNIT – IV: Designing the Supply Chain

Designing the distribution network in a supply chain –Factors influencing distribution network design- Distribution networks in practice and design options for a distribution network - E-Business and the supply chain – E-Business framework and E-business in Practice- Green logistics- Reverse logistics- supply chain sustainability.

Unit –V: Inventory Management

Introduction to inventory: Reasons for holding Inventory, Types of Inventories, Inventory Costs, Economic Ordering Quantity, Determination of EOQ, Economic Production Quantity, Stock levels, Stock replenishment methods, Inventory control -Materials Requirement Planning MRP: MRP I, MRP II, and ERP- Material Handling: Principles of material handling, and classification of material handling equipment.

LEARNING OUTCOMES

Unit I	The learner will understand the basic concepts of operations management
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Unit II	The learner will understand the importance of forecasting, location, layout and capacity.
Unit III	The learner will become aware of supply chain management and its importance
Unit IV	The learner will understand the designing of the distribution network and supply chain
Unit V	The learner will gain a basic understanding of various inventory management concepts

Course Code: MBAOL09

Semester: III

STRATEGIC MANAGEMENT

Course Objectives: To learn the major initiatives taken by a company's top management on behalf of corporate, involving resources and performance in external environments. It entails specifying the organization's mission, vision and objectives, developing policies and plans to understand the analysis and implementation of strategic management in strategic business units.

Unit - I: Strategy and Process

Conceptual framework for strategic management, the Concept of Strategy and the Strategy Formation Process – Stakeholders in business – Vision, Mission and Purpose – Business definition, Objectives and Goals - Social responsibility-case study.

Unit – II: Competitive Advantage

External Environment - Porter's Five Forces Model-Strategic Groups Competitive Changes during Industry Evolution-Globalisation and Industry Structure - National Context and Competitive advantage Resources- Capabilities and competencies–core competencies-Low cost and differentiation Generic Building Blocks of Competitive Advantage- Distinctive Competencies-Resources and Capabilities durability of competitive Advantage- Avoiding failures and sustaining competitive advantage-Case study.

Unit – III: Strategies

The generic strategic alternatives – Stability, Expansion, Retrenchment and Combination strategies - Business level strategy- Strategy in the Global Environment-Corporate Strategy-Vertical Integration-Diversification and Strategic Alliances- Building and Restructuring the corporation- Strategic analysis and choice - Environmental Threat and Opportunity Profile (ETOP) - Organizational Capability Profile - Strategic Advantage Profile - Corporate Portfolio Analysis - SWOT Analysis - GAP Analysis - Mc Kinsey's 7s Framework - GE 9 Cell Model - Distinctive competitiveness - Selection of matrix - Balance Score Card-case study.

Unit – IV: Strategy Implementation & Evaluation

The implementation process, Resource allocation, designing organisational structure-Designing Strategic Control Systems- Matching structure and control to strategy-Implementing Strategic change-Politics-Power and Conflict-Techniques of strategic evaluation & control-case study.

Unit – V: Other Strategic Issues

Managing Technology and Innovation- Strategic issues for Non-Profit organizations, New Business Models and strategies for Internet Economy-case study

LEARNING OUTCOMES

Unit – I	The learner will be able to understand the concept of strategy and process.
Unit – II	The learner will be able to analyze the industry and gain the ability to identify the competitive advantages by applying various methods and techniques of strategy.
Unit – III	The learner can understand the application of various strategies at different levels of the organization.
Unit – IV	The learner can gain the ability to understand strategy implementation and evaluation.
Unit – V	The learner understands the other issues related to strategies, technological implication & strategies and business model development for contemporary business environment.

Course Code: MBAOL10

Semester: III

BUSINESS ANALYTICS AND DATA VISUALIZATION

Course Objectives: To understand the concept and tools of business analytics for informed business decisions

UNIT I : Introduction to Business Analytics

Need-Importance- Types- Fundamentals of Business Analytics-Data types-tools – An overview

UNIT II : Descriptive Analytics

Describing and Summarizing Data- Types of Data – Modifying Data- Data Normality-Creating Distributions from Data – Measures of Location – Measures of Variability – Analyzing Distributions – Measures of Association between Two Variables using MS Excel

UNIT III : Predictive Analytics

Linear Regression & Forecasting – Simple Linear Regression Model – Least Square Method- Multiple Regression Model – Time Series Patterns – Forecast Accuracy – Moving Averages and Exponential Smoothing using R

UNIT IV : Prescriptive Analytics

What-If Analysis – Price Bundling- Excel Functions for Modelling – Linear Optimization Models – Simple Maximization Problem& Minimization Problem – Sensitivity Analysis- Fraud Detection using Python

UNIT V : Data Visualization

Data Visualization –Table – Charts – advanced Data Visualization – Data Dashboards – story telling – using Tableau and Power BI.

LEARNING OUTCOMES

Unit - 1	Students will understand business analytics applications in managerial decision making
Unit – 2	Students will be able to formulate and solve business problems
Unit – 3	Students will be familiar with the processes needed to develop, report, and analyze business data
Unit – 4	Students will be able to understand analytics tools for business problem
Unit - 5	Students will be able to describe data using analytical tools

Course Code: MBAOL23

Semester: III

SERVICES MARKETING & CUSTOMER RELATIONSHIP MANAGEMENT

Course Objective:

This course aims at providing a perspective on the concepts, framework and analytical procedures available to service marketers to resolve the varied challenges faced in different situations.

UNIT – I: Understanding Services

Definition and meaning of services, distinct aspects of service management, Service Marketing mix, factors stimulating the transformation of service economy, categorizing service process, Consumer behaviour in service encounters - Customer involvement in service processes

UNIT – II: Focus on Customers and Managing Relationships

Customer expectations, evaluation of services, service as a business system, complaint handling and service recovery, service guarantees, customer feedback; Designing Service – Relationships with customers, foundations of customer loyalty, curtailing customer defections, customer as co-producer, customer misbehaviour

UNIT – III: Creating Value in a Competitive Market

Positioning of services – Segmentation, targeting right customers and positioning; Creating value – defining nature of service offering; Pricing - objectives, Cost-based pricing, Value -based pricing, Competition -based pricing, revenue management; and Promotion of services – Challenges and opportunities of services, objectives, ethical issues in communication

UNIT – IV: Designing and Managing Service Delivery

Managing Service Delivery - Methods of service delivery, decisions about place and time, service delivery in cyber space; Balancing demand and capacity; Service quality – components, application of SERVQUAL model, GAP model, addressing quality problems –Root-Cause analysis, Blueprinting

UNIT – V: Customer Relationship Management

Characteristic and types. CRM constituencies. Models of CRM. Understanding relationships: Customer Life time value; Customer satisfaction, loyalty and business performance. Major phases in a CRM implementation. Customer portfolio management: Basic disciplines; Market segmentation; Sales forecasting. CRM and customer experience: Understanding Customer experience; Experiential marketing strategies and tactics. CRM for Service Industry

LEARNING OUTCOMES

Unit I	The learner will be able to understand the service sectors, concepts of service industry and also how consumers behave in service environments
Unit II	The learner will be able to analyse and discuss about how customer expectations are formed and how service industries are able to maintain their relationship with customers
Unit III	The learner will be able to analyse and evaluate the challenges and opportunities of the service marketers in positioning, pricing, and promotion of their services especially in the competitive environment
Unit IV	The learner will be able to appraise the methods of delivering services and also the various important aspects of service quality
Unit V	The learner will be able to demonstrate their understanding about the concept and models of CRM

Course Code: MBAOL24

Semester: III

HUMAN CAPITAL STRATEGY AND PERFORMANCE MANAGEMENT

Course Objective:

This course aims to impart knowledge to students regarding the interaction between organizational strategies and human resource practices to enhance the performance of the organization.

UNIT – I : Human Capital strategies –An overview

Human capital management and investment considerations - Investment in training and development- investment practices for improved retention- investments in job secure workforces. Ethical implications of employment practices. Non-traditional investment approaches.

UNIT – II : Emerging issues in HR environment

Technology and organizational structure, trends in utilization of human resources: management trends, demographic trends, International developments. equal employment opportunity- compensation-. Emerging issues and strategic impact: employee relations, collective bargaining, hybrid work culture and employee wellbeing

UNIT – III : HR Strategy Formulation

Importance of human resources to strategy- Theoretical foundations- Strategy-driven role behaviors and practices. Strategic human resource activity typology Network organizations and strategy. Organizational learning - Integration of strategy and human resource planning.

UNIT – IV : Implementation and Evaluation

Strategic workforce utilization and employment practices- Strategically oriented performance measurement system, compensation systems and recent trends - Contemporary HRD Practices and High-performance work practices Human resource evaluation: overview, Approaches to evaluation- HR Audit, Balanced scorecard perspective and benchmarking of HR practices

UNIT – V : Performance Design

Performance planning- methodologies of planning and barriers. Process and principles of setting performance criteria, competency-based PMS, Performance monitoring,-characteristics, process,

performance grid, and models, Performance Measurement- Critical Success Factors, and Key Performance Indicators, building and leading high-performance teams, Strategies for effective implementation,

LEARNING OUTCOMES

Unit I	The learner will be able to understand the concept of the strategic role of human capital management in the organization.
Unit II	The learner will be able to describe the emerging environmental trends, developments in human resource management & to examine the potential challenges and threats to the organization.
Unit III	The learner will be able to apply and formulate a human resource strategy related to the organization's overall strategy.
Unit IV	The learner will be able to evaluate and implement high-performance human resource practices
Unit V	The learner will be able to explain the performance design and administer the high-performing teams

Course Code: MBAOL13

Semester: III

INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT

Course Objective: The objective of this course is to enable students to understand various issues in Investment analysis and portfolio management.

UNIT -I: Nature and Scope of Investment Decisions

Investments - Elements of Investment - Avenues of Investment - Sources of financial information - Nature and scope of investment analysis - Approaches to Investment Analysis Financial Assets/Instruments - Investment Objectives - Risk and Return Analysis - Determinants of Required Rate of Return – Risk-free rate and factors influencing the risk-free rate; Risk Premium.

UNIT - II: Valuation of Securities

Valuation of Equity Shares Theory of Valuation - Alternative Valuation Methods - Valuation of Bonds – I Bond Valuation; Computing Bond Yields - Calculation of future bond prices; Yield curve - Analysis and Valuation of Bonds - II Determination of interest rates - Term structure interest rate theories - Bond price volatility - Efficient Market Concept; Different forms of Efficiency - Random walk theory - Challenges to the Efficient Market Hypothesis.

UNIT – III: Fundamental & Technical Analysis

Economic Analysis, Industry Analysis, Company Analysis and Technical Analysis - Trends, Support and Resistance level, Breadth of market (Advance/Decline) - Short selling - Chart Indicators, Indices and MACD, RSI, Dow Theory - Oscillators

UNIT – IV: Introduction to Portfolio Management

Measurement of Expected Risk and Return of Portfolio - Alternative Measures of Risk - Markowitz Portfolio Theory - The Efficient Frontier and Investor Utility - Capital Asset Pricing Model - Overview of Capital Market Theory-Market Portfolio - Capital Asset Pricing Model-Assumptions - Zero beta Model - Portfolio Selection.

UNIT – V: Equity Portfolio Construction and Evaluation Strategy

Active Vs Passive Equity Portfolio Management Strategy - Index Portfolio Construction Techniques - Tracking Error, Methods of Index Portfolio Investment - Technical Strategies - Evaluation of Portfolio Performance Treynor, Sharpe, Jensen and Information Ratio Performance Measures - Application of Portfolio Performance Measures - Factors affecting the use of Performance Measures Investor Behaviour and Stock Returns

LEARNING OUTCOMES

Unit I	The learner will be able to describe the basics of investments avenues and analyse the risk and return
Unit II	The learner will be able to examine the valuation of securities and effect of market information on stock prices.
Unit III	The learner will be able to interpret the aspects involved in Economy, Industry and Company analysis and Technical analysis
Unit IV	The learner will be able to assess the risk and return of portfolio
Unit V	The learner will be able to evaluate the portfolio performance

Course Code: MBAOL25

Semester: IV

CORPORATE LAWS AND GOVERNANCE

Course Objective:

To develop insight into legal aspects of Incorporation and Management of Companies as per the Companies Act 1956, with amendment Act 2013 and Competition Act, Consumer protection and Corporate Social responsibility Act., and familiarize with the need and importance for the best Corporate Governance practices

UNIT – I : Company Law: Corporate Incorporation and Management

Definitions and concepts: Nature of company – Types of companies – Formation and Incorporation of a company – Memorandum and Articles of Association – Doctrine of Ultra vires – Indoor Management - Board of Directors: Meaning, qualification, appointment, rights, duties and removal. Auditors: Procedure of appointment, rights, duties and removal – Liability of independent directors

UNIT – II : Competition Law

Definition: Competition – Objectives of Competition Law – Anti-competitive Agreement: adverse effect – Factors causing adverse effects – Dominance: elements – stages – factors determining dominance – provisions on abuse of dominance – Combination: Definition & Meaning – regulation of Combination: Mergers & Acquisition – Competition Commission of India: establishment – composition – duties, power, functions – penalties

UNIT – III: Consumer Protection Law and Corporate Social Responsibility Environment

Definition: Consumer – Service – Deficiency in Service – Unfair Trade Practices – Three tier redressal system: National commission – State Commission – District forum – role, responsibilities and powers – CSR: Need, Companies Act provisions on CSR – corporate best CSR practices

UNIT – IV: Understanding Corporate Governance

Meaning, need and importance of corporate governance, increasing awareness, Global concerns- reasons for corporate misgovernance- board processes and procedures- OECD Principles, concepts, – Committees recommendations on Corporate Governance - The CII’s initiative, SEBI’s initiatives- Narayana Murthy Committee report 2003, Uday Kotak Committee report 2017 and Recent initiatives on CG in Companies Act.

UNIT – V: Issues and problems of Corporate Governance in emerging economies

State of corporate governance in India, Corporate Governance in developing and transition economies – corporate governance models – Institutional framework for effective CG- Globalization and Corporate Governance – Caux Round Table- Role of multinational corporations- Emerging Trends in Corporate Governance. CG rating – Meaning, steps taken in India and abroad - Institutions promoting corporate governance –NFCG, ICSI, Global corporate governance forum.

LEARNING OUTCOMES

Unit I	The learner will be able to understand the procedures for incorporation of a company and its management.
Unit II	The learner will be able to understand the meaning of competition and the role of Competition Commission of India in regulation of competition in business.
Unit III	The learner will have an insight into the concept of consumer protection and the corporate social responsibility.
Unit IV	The learner will be able to understand the significance of corporate governance and the initiatives in Companies Act.
Unit V	The learner will be able to understand the emerging trends in corporate governance and the challenges of corporate governance in international business.

Course Code: MBAOL26

Semester: IV

PHYGITAL RETAILING

Course Objective:

To impart knowledge on the concepts of physical and electronic retailing to formulate retailing strategies and to enable its implementation in the retail industry.

UNIT - I: Introduction to Retail

Introduction to Retail – Meaning of Retail and functions of a retailer, Issues and Challenges, Retail as a career. –Drivers of Retail Change, Size of Retail Market in India. Theories of Retail Management and Business Models in Retailing, The concept of Life Cycle in Retail and Retail trends.

UNIT – II: Strategy and Planning

Understanding the Retail Consumer – Factors Influencing the Retail Shopper, The Customer Decision Making Process, Market Research. Retail Strategy – The Retail Perspective, International Expansion, Retail Value Chain. Delivering value through retail formats, Store Site Selection – Types of Retail location, Steps involved in choosing a retail location, Methods of evaluating a Trading Area. Retail Franchising – Types of Franchising, Advantages, Disadvantages, Legal issues.

UNIT – III: Merchandise and Price Management

Basics of Retail Merchandising – The Merchandiser Role and Responsibilities, Retail buying behaviour, Buying for a Single/Independence Store, The concept of lifestyle Merchandising. Retail Pricing, Elements of Retail Price, Determining the Price, Retail Pricing Policies / Strategies, Retail Promotion strategy.

UNIT – IV: E-Tailing

B2C Electronic Retailing, Characteristics, Advantages, Limitations, E-Tailing Business Models, Omni Channel Retailing, Social Shopping Aids – Recommendations, Reviews, Ratings, and Marketplaces, Real-

Time Online Shopping. Significance of Click-and-Brick models of retailing, The Online versus Off-Line Competition, Product and Service Customization.

UNIT - V: E-Tail Marketing and Retail Technologies

E-Tail Marketing mix for the digital age, Roles of cyber intermediaries in E-Tailing; E-retailing Promotional strategies of E-Tail business, Branding on the web, Online Payment Services-Challenges, Retail Management Information Systems– EDI, RFID, VMI and CPFR

LEARNING OUTCOMES

Unit I	The learner will be able to understand the basic concepts of retailing.
Unit II	The learner will be able to demonstrate the retail location development process
Unit III	The learner will be able to analyse the importance and role of merchandise management
Unit IV	The learner will be able to understand the various models of E-Tailing and their significance
Unit V	The learner will be able to understand the E-Tail marketing strategies and various Retail Technologies

Course Code: MBAOL17

Semester: IV

LEADERSHIP AND CHANGE MANAGEMENT

Course Objective:

This course aims to impart knowledge to students regarding leadership and decipher the various leadership practices and approaches for future application.

UNIT- I : Introduction

Introduction to leadership – management and leadership – Evolving theories of leadership – new reality of Today’s organization and leadership – major types of leadership behavior. Level 5 Leadership - Leading change– Developing leadership skill – Leader as a social architect -Strategic leadership

UNIT- II : Approaches to Leadership

Approaches to leadership: Trait approach – Behavioural approach - Individualized leadership – contingency approach; Personal side of leader – Personality, values, Emotions and mental model; courage and moral leadership – followership – Charismatic, Transformational, Transactional-visionary leadership. – Servant and spiritual leadership – Theories of Ethical leadership.

UNIT- III : Leader as a Relationship builder

Leader as a Relationship builder; leadership and motivation, Leadership and empowerment and Leader as a communicator. Leading teams – Developing diversity – Leadership Power and Influence. Leader as a social architect– Value-based leadership –Cross-Cultural Leadership – Cultural value dimension - designing and leading a learning organization.

UNIT- IV : Organisation change and transformation

Overview of change- forces of change-types of changes-theoretical framework for change -models of change-process based-content based-integration of change models-triggers of transformation change-change interventions- strategic, operational and cultural.

UNIT- V : Implementing organisational change

Role of change agent-Skills for managing change strategies for organising change- functions of organisation culture and change-resistance to organisation change: nature of resistance- factors contributing to resistance- human side, behavioural, cognitive and affective process-Interventions for managing resistance.

LEARNING OUTCOMES

Unit I	The learner will be able to understand the concept of leadership, its need, importance, different theories, and types.
Unit II	The learner will be able to describe the different leadership approaches to face organizational challenges.
Unit III	The learner will be able to apply the mode of leadership as a relationship-building practice to manage employees effectively.
Unit IV	The learner will be able to understand the purview of change management and its relevant model
Unit V	The learner will be able to understand the skills required for change leaders and Cross-Cultural Leadership.

Course Code: MBAOL27

Semester: IV

PROJECT MANAGEMENT

Course Objective:

To acquire a detailed knowledge of various stages of projects from planning to implementation and review of projects

UNIT – I : Project Planning

Project Planning and Analysis Overview: Phases of capital budgeting – Levels of decision making – Facets of project analysis - Objective. Resource Allocation Framework: Key criteria for allocation of resource – Portfolio planning tools – Diversification - Interface between strategic planning and capital budgeting. Generation and Screening of Project Ideas: Generation of ideas – SWOT Analysis – Preliminary screening – Project rating index.

UNIT – II: Project Analysis

Market and Demand Analysis: Situational analysis and specification of objectives –Survey Method – Characterization of the market – Demand forecasting – Market planning.

Technical Analysis: Study of material inputs and utilities – Manufacturing process and technology – Product mixes – Plant capacity – Location and site – Machinery and equipment – Structures and civil works – Project charts and layouts – Work schedule.

UNIT - III : Project Appraisal and Financing

Financial Analysis: Estimation of cost of project and means of financing – Projected profitability statement - Working capital assessment and its financing – Preparation of bankable business proposals - Projected cash flow statement – Projected balance sheet. Project cash flows: Basic principles – components of the cash flow streams - Appraisal criteria: Discounted cash flow techniques (DCF) - Urgency – Payback period – Accounting rate of return –Capital assets replacement decisions, Appraisal of projects having unequal lives - Investment appraisal in practice – Valuation of business

UNIT – IV: Social Cost Benefit Analysis (SCBA) and Risk Analysis

Social Cost Benefit Analysis (SCBA): Rationale for SCBA – UNIDO approach to SCBA – Little and MIRRLEES approach to SCBA - Environmental Appraisal of projects: Meaning and scope of the environment – Resources values - Analysis of Risk: Types and measures of project risk – Simple estimation of risk – Sensitivity analysis – Scenario analysis – MONTE CARLO simulation – Decision tree analysis – Selection of project – Risk analysis in practice.

UNIT – V: Network Techniques for Project Management and Project Review

Network Techniques for Project Management: Development of project network - Time estimation - Determination of the critical path - Scheduling when resources are limited - PERT model - CPM model - Network cost system - Project review and administrative aspects: Initial review – Performance evaluation – Abandonment analysis – Administrative aspects – Evaluating the capital budgeting system of an organization.

LEARNING OUTCOMES

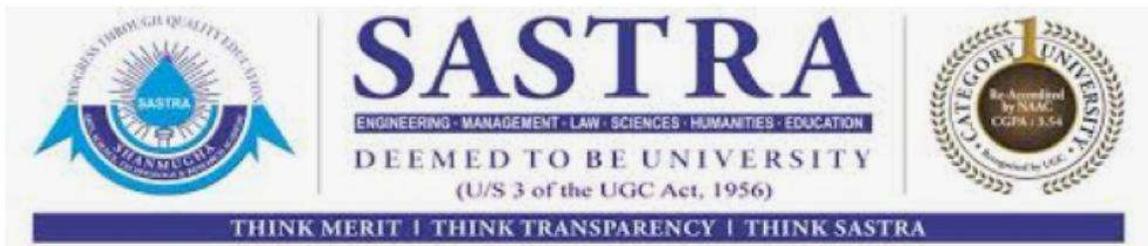
Unit I	The learner will be able to describe different aspects of capital budgeting
Unit II	The learner will analyse the demand and technical aspects of a project.
Unit III	The learner will be able to examine financial and business risks.
Unit IV	The learner will be able to interpret the importance of social cost benefit analysis.
Unit V	The learner will be able to explain the issues involved in the implementation of the project.

NAME OF THE PROGRAMME: Master of Science (Data Science)

DURATION : 2 Years

ELIGIBILITY FOR ENROLMENT: Any recognized bachelor's degree of minimum three years duration with Mathematics as subject of study in +2 or qualifying degree course.

PROGRAMME FEE : Tuition fee of Rs.25000/- per semester.



M. Sc. in Data Science

(for Online Students)

(Students admitted from the Calendar year Jan-2024)

(Total Credits: 80)

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The programme education objectives of M.Sc. in Data Science degree programme are to:

- PEO1.** Train learners to demonstrate proficiency with statistical analysis of data
- PEO2.** Equip graduates with necessary skills to execute statistical analyses with professional statistical software
- PEO3.** Enable graduates to create and implement solutions with advanced computing skills addressing data management
- PEO4.** Prepare learners to develop the ability to build and assess data-based models
- PEO5.** Equip graduates with capability to design, implement and test computational approaches to develop innovative and effective solutions for diverse sectors
- PEO6.** Enable the learners to apply data science concepts and methods to solve problems in the real-world context and communicate these solutions effectively
- PEO7.** Nurture creativity in the graduates to enable them to excel in industry and research organizations
- PEO8.** Create technically sound, socially conscious and ethically committed professionals

PROGRAMME SPECIFIC OUTCOMES

Upon completion of the M. Sc. Data Science programme, the graduates will be able to:

PSO1. Work as a Data Science professional in the corporate sector, academia, or research organizations

PSO2. Use, analyze, and visualize data using specialized software tools

PSO3. Undertake research/investigation independently as well as display teamwork and leadership skills to solve real-life problems

PSO4. Apply computing theory, languages, algorithms, mathematical and statistical models, and the principles of optimization to formulate and use data analysis in diverse sectors

PSO5. Integrate concepts of data science and mathematics to contribute towards key technologies in data science and business analytics including data mining, machine learning, visualization techniques, predictive modeling, and statistics

PSO6. Engage in life-long learning and employ technical knowledge and strategies to address economic, environmental, health, national, global, cultural, societal and sustainability issues

Scheme of Study

I Semester

Course Code	Course Name	No. of Contact Hours / Week			Credits
		L	T	P	
MATOL445	Probability & Statistics using R	3	1	0	4
MATOL446	Mathematics for Data Science	3	1	0	4
BINOL522	Python for Data Science	2	1	2	4
INTOL530	Artificial Intelligence & Reasoning	3	1	0	4
MATOL439	Applied Multivariate Analysis	3	1	0	4
TOTAL					20

II Semester

Course Code	Course Name	No. of Contact Hours / Week			Credits
		L	T	P	
INTOL534	Machine Learning	3	1	0	4
CSEOL614	Big Data Mining & Analytics	3	1	0	4
INTOL413	RDBMS, SQL & Visualization	3	1	0	4
INTOL531	Data Mining Techniques	3	1	0	4
INTOL416	RDBMS, SQL, Visualization & Analytics Laboratory	0	0	4	2
MANOL106	Research Methodology & IPR	2	0	0	2
TOTAL					20

III Semester

Course Code	Course Name	No. of Contact Hours / Week			Credits
		L	T	P	
CSEOL615	Deep Learning & Applications	3	1	0	4
INTOL418	Predictive Analytics Regression & Classification	3	1	0	4
OEHOL014	Ethics & Data Security	3	1	0	4
XXXXXX	Elective I	3	1	0	4
XXXXXX	Elective II	3	1	0	4
TOTAL					20

IV Semester

Course	Course Name	No. of Contact Hours / Week			Credits
		L	T	P	
ICTOL601	Machine Vision	3	1	0	4
XXXXXX	Elective III	3	1	0	4
XXXXXX	Elective IV	3	1	0	4
INTOL500	Project work & Viva voce	0	0	16	8
TOTAL					20

List of Electives I – Proposed for III Semester

Course Code	Course Name
INTOL424	Algorithmic trading
INTOL426	Bayesian data analysis
INTOL428	Financial data analysis

List of Electives II – Proposed for III Semester

Course Code	Course Name
BINOL533	Healthcare data analytics
BINOL529	Data science for structural biology
MATOL548	Epidemiological Modelling

List of Electives III – Proposed for IV Semester

Course Code	Course Name
CSEOL542	Social Networks & Graph Analysis
INTOL419	Spatial Data Analytics
INTOL433	Information Visualization

List of Electives IV – Proposed for IV Semester

Course Code	Course Name
CSEOL608	Image processing & Analysis
ICTOL529	Speech & Video processing
INTOL427	Information Retrieval & Natural Language Processing
MATOL549	Energy Systems Modelling & Analysis for Data Science

L	T	P	C
3	1	0	4

Course Code: MATOL445

Semester: I

PROBABILITY AND STATISTICS USING R

Course Objectives: This course will help the learner to understand and apply probability concepts and statistical methods, which aid data analysis and visualization. In addition, this course provides an elementary introduction to probability and statistics with applications. These modules aim to lay out foundations in probability and distribution theory, data analysis and the use of a statistical software package.

UNIT – I: Introduction to R Periods

15

Introduction to R – Downloading and Installing R – Vectors – Class of an Objects – Packages - R Data Structures - Reading and Saving Data in R - Working with Data – Logical Operators with Data Frames - Probability Functions - Flow Control - Creating Functions - plot () functions

UNIT – II: Probability and Random Variables

15Periods

Introduction – Counting Techniques - Axiomatic Probability - Random Variables - Discrete Random Variables - Continuous Random Variables - Markov's Theorem and Chebyshev's Inequality – Skewness - Moment Generating Functions - Univariate Probability Distributions - Discrete Univariate Distributions - Bernoulli - Binomial - Poisson Distributions; Continuous Univariate Distributions - Uniform - Exponential Distributions.

UNIT – III: Multivariate Probability and Sampling Distributions 15 Periods

Introduction - Joint Distribution of Two Random Variables - Independent Random Variables - Several Random Variables - Conditional Distributions - Expected Values, Covariance, and Correlation - Multinomial Distribution - Bivariate Normal Distribution – Sampling – Parameters – Estimators - Sampling Distribution of the Sample Mean.

UNIT – IV: Hypothesis Testing

15Periods Introduction - Type I and

Type II Errors - Power Function - Uniformly Most Powerful Test - p -Value or Critical Level - Tests of Significance - Hypothesis Tests for Population Means - Test for the Population Variance When Sampling from a Normal Distribution - Test for Equality of Variances When Sampling from Independent Normal Distributions - Testing the Proportion of Successes in a Binomial Experiment (Exact Test) - Nonparametric Methods - Sign Test - Wilcoxon Signed-Rank Test.

REFERENCES

1. María Dolores Ugarte, Ana F. Militino and Alan T. Arnholt, "Probability and Statistics with R", 2nd Edition, CRC Press, Taylor & Francis Group, 2016.
2. G. Jay Kerns "Introduction to Probability and Statistics Using R" 1st Edition (2010)
3. Peter Dalgaard, Introductory Statistics with R (Statistics and Computing), 2nd Edition, Springer, 2008.
4. Katarzyna Stapor, Introduction to Probabilistic and Statistical Methods with Examples in R: 176 (Intelligent Systems Reference Library), Springer, 2020.
5. Ronald E Walpole, Raymond H. Myers, Sharon L Myers and Keying Ye, "Probability and Statistics for Engineers & Scientists", 9th Edition, Pearson Education, 2012.
6. Robert P. Dobrow, "Probability with Applications and R", 2nd Edition, John Wiley & Sons, Inc., 2014.
7. Daniel WW, Cross CL. Biostatistics: A Foundation for Analysis in the Health Sciences, 11th Edition, Wiley Series in Probability and Statistics, 2019.

LEARNING OUTCOMES

Unit I	<ul style="list-style-type: none"> • Calculate probabilities and estimate parameters for various outcomes/events following different probability distributions. • Using data analysis to deduce properties of an underlying probability distribution
Unit II	<ul style="list-style-type: none"> • Calculate probabilities and estimate parameters for various

	<p>outcomes/events following different probability distributions.</p> <ul style="list-style-type: none"> Using data analysis to deduce properties of an underlying probability distribution
Unit III	<ul style="list-style-type: none"> Calculate multivariate probability and sampling distributions with different distributions. Calculate covariance, and correlation using R statistical packages.
Unit IV	<ul style="list-style-type: none"> Perform statistical hypothesis testing by selecting an appropriate testing procedure for the given analysis Using inferential statistical analysis infers properties of a population, for example by testing hypotheses and deriving estimates

L	T	P	C
3	1	0	4

Course Code: MATOL446

Semester: I

MATHEMATICS FOR DATA SCIENCE

Course Objectives: This course will help the learner to acquire knowledge on matrix theory, linear algebra and application to find the matrix function, present methods of computing using Eigen values and Eigen vectors and bridge the gap between Mathematics and Programming.

UNIT – I

12 Periods

Vector spaces: Vector spaces and subspaces - linear combination - span-linear independence and dependence - null space - column space - row space - basis and dimension of Vector Space

UNIT – II

15 Periods Change of

basis. Linear Transformation: Introduction to linear transformation - general linear transformations - Kernel and range - Rank and Nullity - Matrices of general linear transformation - Geometry linear operator - Eigenvalues and Eigenvectors - Diagonalization - Complex Vector Spaces.

UNIT – III

15 Periods

Inner-Product Vector Spaces: Inner-Product Spaces and Their Properties - The Norm in an Inner - Product Space - Distance Function Mutually Orthogonal Vectors - Orthogonal Projection-The Gram Schmidt Process - Unnormalized Gram Schmidt Algorithm -Modified Gram Schmidt Process. QR-decomposition- Linear Least-Squares Solution -Gram Matrix-Distance from a Point to a Hyper plane Mathematical Software.

UNIT – IV

18 Periods Vector Calculus -

Differentiation of Univariate Functions - Partial Differentiation and Gradients

Gradients of Vector-Valued Functions - Gradients of Matrices - Useful Identities for Computing Gradients - Backpropagation and Automatic Differentiation - Higher-Order Derivatives

Linearization and Multivariate Taylor Series - Bayesian Linear Regression - Maximum Likelihood as orthogonal Projection - Gaussian Mixture Model - Parameter Learning via Maximum Likelihood.

REFERENCES

1. Howard Anton, Chris Rorris. Elementary Linear Algebra, Wiley, 12th Edition, 2019.
2. Marc Peter Deisenroth, A. Aldo Faisal and Cheng Soon Ong. Mathematics for Machine Learning, 2020.
3. Ward Cheney, David Kincaid. *Linear Algebra: Theory and Applications*, Jones & Bartlett Learning: 2nd Edition, 2012.

LEARNING OUTCOMES

Unit I	Apply the concept of vector spaces, linear independence, basis and dimension to find rank.
Unit II	Apply the concept of linear transformation in matrices and geometry linear Operators.
Unit III	Apply the concepts of orthogonality to find linear least-squares solution and square-root matrix. Demonstrate orthogonality using inner product vector spaces. Apply the concept of Inner product spaces and projections to find QR decomposition.
Unit IV	Apply the concepts of gradients of vector to in backpropagation and automatic differentiation and higher-order Derivatives.

L	T	P	C
2	1	2	4

Course Code: BINOL522

Semester: I

PYTHON FOR DATA SCIENCE

Course Objectives: This course helps the learner to understand the concepts of computational problem-solving techniques and programming aspects of Python.

UNIT – I: Operations and functions

15

Periods

Introduction to Python: Introduction – First program - Arithmetic operators – Values and Types – Assignment statements – Variable names – Expressions and Statements – Script mode – Order of operations - **Functions:** Function calls – math functions – composition – adding new functions – definitions and uses – flow of execution – parameters and arguments – fruitful functions and void functions.

UNIT – II:Conditionals, recursion and iterations 15Periods Conditionals and

Recursion: Boolean expressions - logical operators – conditional execution – chained conditionals – nested conditionals – recursion – infinite recursion – keyboard input – return values – incremental development – composition – Boolean functions – checking types - **Iterations:** Iteration – Reassignment – updating variables – while statement – break – Strings: len – traversal with a for loop – string slices – searching, looping and counting – string methods – in operator – string comparison.

UNIT – III:Data structures 15 Periods

Lists: Traversing lists – list operations – list slices – list methods – map, filter and reduce – deleting elements – lists and strings – objects and values – aliasing – list arguments - **Dictionaries:** dictionary mapping – looping and dictionaries – reverse lookup - dictionaries and lists – memos – global variables – **Tuples:** Tuple assignment – tuples as return values – variable length argument tuples – lists and tuples – dictionaries and tuples – sequences of sequences. **Case Study: Data Structure Selection:** Word Frequency Analysis- Random Numbers- Word Histogram- Most Common Words- Optional Parameters- Dictionary Subtraction- Random Words- Markov Analysis-Data Structures.

UNIT – IV: Files, classes & objects, functions, methods and inheritance15Periods

Files: Reading and Writing – Format operator – filenames and paths – catching exceptions – databases – pickling – pipes – writing modules - **Classes and Objects** – programmer defined

types – attributes – instance as return values – copying - **Classes and functions:** Time – pure functions – modifiers – prototyping versus planning – **Classes and methods:** object-oriented features - printing objects – init method - `__str__` method – operator overloading – type-based dispatch – polymorphism. **Inheritance:** Card Objects-Class Attributes-Comparing Cards-Decks-Printing the Deck-Add, Remove, Shuffle and Sort- Inheritance-Class Diagrams-Data Encapsulation.

REFERENCES

1. Allen Downey, “Think Python”, Green Tea Press, 2nd Edition, 2015.
2. Mark Lutz, “Learning Python”, O’Reilly publications, 5th Edition, 2013.
3. J. V.Guttag, “Introduction to computation and programming using Python”, MIT Press, 2nd Edition, 2016.
4. E. Balagurusamy, “Problem Solving and Python Programming”, McGraw Hill Education, 2018.
5. Reema Thareja, “Python Programming using Problem solving Approach”, Oxford University Press, 2017

LEARNING OUTCOMES

Unit I	Write simple programs in Python using subset of data types, assignment, method calls
Unit II	Write programs by employing looping structures, and strings
Unit III	Write programs using lists, dictionaries, tuples and understand about the data structure
Unit IV	Write programs using files, classes, objects, functions, methods and the detail about Inheritance , Data encapsulation

Course Code: INTOL530
Semester: I

L	T	P	C
3	1	0	4

ARTIFICIAL INTELLIGENCE & REASONING

Course Objectives: This course will help the learner to acquire knowledge on intelligent agents, first order logic, quantifying uncertainty, probabilistic reasoning and theory of learning, solve problems, reasoning using appropriate technique and to build machine learning models

UNIT – I

18 Periods

Introduction– What is AI? - Foundations of Artificial Intelligence - The History of AI - The State of the Art - **Intelligent Agents** – Agents and Environments - Good Behaviour: The Concept of Rationality - The Nature - **Solving Problems by Searching:** Problem solving agents – Example problems – Searching for solutions - Uniformed search strategies – Heuristic Search Strategies – Heuristic Functions.

UNIT – II

18 Periods First-

Order Logic– Representation Revisited - Syntax and Semantics of First-Order Logic - Using First-Order Logic - Knowledge Engineering in First-Order Logic - **Quantifying Uncertainty** - Acting under Uncertainty - Basic Probability Notation - Inference Using Full Joint Distributions - Independence - Bayes' Rule and Its Use - The Wumpus World Revisited .

UNIT – III

12 Periods

Probabilistic Reasoning - Representing Knowledge in an Uncertain Domain - The Semantics of Bayesian Networks - Efficient Representation of Conditional Distributions - Exact Inference in Bayesian Networks - Approximate Inference in Bayesian Networks - Relational and First-Order Probability Models - Other Approaches to Uncertain Reasoning

UNIT – IV

12 Periods Knowledge in Learning

- A Logical Formulation of Learning - Knowledge in Learning – Explanation - Based Learning - Learning Using Relevance Information - Inductive Logic Programming - **Learning Probabilistic Models** - Statistical - Learning with Complete Data - Learning with Hidden Variables: The EM Algorithm .

REFERENCES

1. S. Russell, P. Norvig, Artificial Intelligence – A Modern Approach, Pearson Education / Prentice Hall of India, 4 th Edition, 2021.

2. G. F. Luger, Artificial Intelligence–Structures and Strategies for Complex Problem Solving. Pearson Education / Prentice Hall of India, 2008.

LEARNING OUTCOMES

Unit I	<ul style="list-style-type: none">• Searching for solutions• use various search strategies
Unit II	<ul style="list-style-type: none">• Use First-Order Logic• Work with Bayes' Rule and apply to quantify uncertainty
Unit III	<ul style="list-style-type: none">• Determine the exact inferences using Bayesian networks• Discuss the probability models to solve the problem in uncertainty
Unit IV	<ul style="list-style-type: none">• Use relevance information and inductive logic programming for learning• Use statistical learning and learning with hidden variables

L	T	P	C
4	0	0	4

Course Code: MATOL439

Semester: I

APPLIED MULTIVARIATE ANALYSIS

Course Objectives: The objective of this course is to introduce the students to multivariate analysis in statistical modelling for describing and exploring the data and for making formal inferences about them. Also, the computations involved in applying most multivariate techniques are considerable, and their routine use requires a suitable software package.

UNIT – I: The multivariate normal distribution

15

Periods

Random samples- Basic multivariate statistics -multivariate normal distribution and properties - multivariate distributions (categorical, multinomial, Dirichlet, Wishart) and applications of Distributions

UNIT – II: Comparison of several multivariate means

15Periods

Design of

experiments- Completely randomized design - Randomized block design and Latin square design experiments - Comparing several multivariate populations means (One-way Manova) – Univariate and Multivariate Two-Way Fixed-Effects Model with Interaction - Testing of equality of covariance matrices.

UNIT–III: Principal Components and Canonical Correlation Analysis 15 Periods

Variable transformations - location-scale transformation - Mahalanobis transformation- principal components Analysis (Eigen values, Eigen vectors, Orthogonality) - Factor Analysis - Canonical Correlation Analysis (CCA).

UNIT – IV: Discrimination and Classification 15Periods

Classification rules – Diagonal - Linear and Quadratic Discriminant Analysis (DDA, LDA, QDA) and regularised versions for high-dimensional data analysis - cross-validation, feature selection and variable importance - Naïve Bayes Classifier - Support Vector machines.

REFERENCES

1. RichnardA.Johnson, Dean W.Wichern, Applied Multivariate Statistical Analysis, Pearson, 6th edition, 2012.
2. Härdle and Simar, Applied multivariate statistical analysis. 4th edition, Springer,2015.

LEARNING OUTCOMES

Unit I	Study the basic techniques for analyzing multi-dimensional data, multivariate distributions and their applications
Unit II	Test the significance difference for multivariate population means and population variances
Unit III	Discuss various methods for dimension reduction
Unit IV	Classify the high-dimensional data analysis and select the appropriate multivariate method to analyze large datasets

L	T	P	C
3	1	0	4

Course Code: INTOL534

Semester: II

MACHINE LEARNING

Course Objectives: This course aims at introducing the learner to the basics of Machine Learning, its scope, and applications and it further helps the learners to understand and analyze the simplest algorithms such as linear regression to recent learning algorithms.

UNIT – I: Fundamentals of Machine Learning 15 Periods

Introduction, problems machine learning can solve, knowing your task and knowing your data. A first application: Classifying Iris species, meet the data, training and testing data, look at your data, K nearest neighbors, making predictions, evaluating the model, preprocessing and scaling- different kinds of preprocessing, applying data transformations, scaling training and test data, dimensionality reduction, feature extraction and manifold learning, PCA, Non negative matrix factorization, Manifold learning with t-SNE.

UNIT – II: Supervised Learning 15Periods Classification and Regression, Generalization, overfitting and underfitting, Relation of model complexity to data size. Supervised machine learning Algorithms- Some sample datasets, k-nearest neighbors, Linear models, Naïve Bayes Classifiers, Decision trees, Ensembles of decision trees, kernelized support vector machines, Neural networks(Deep learning), Uncertainty estimates classifiers, The decision function, predicting probabilities, Uncertainty in multiclass classification.

UNIT–III: Unsupervised Learning Techniques**15****Periods**

Types of unsupervised learning, challenges in unsupervised learning, Clustering- k-means clustering, Agglomerative clustering, DBSCAN, Comparing and evaluating clustering algorithms.

UNIT – IV: Feature Engineering and Model Evaluation 15 Periods

Categorical variables, One-Hot encoding, Numbers can encode categorical, Binning, discretization, linear models and trees. Interactions and Polynomials, Univariate Non linear transformations. Automatic feature selection, univariate statistics, model-based feature selection, iterative feature selection. Utilizing expert knowledge Model evaluation and improvement, cross validation, Grid search, Evaluation metrics and scoring.

REFERENCES

1. Andreas C. Muller , Sarah Guido, Introduction to Machine learning with Python O'Reilly Media, 1st Edition, 2016.
2. A. Géron, Hands–On Machine Learning with Scikit–Learn and TensorFlow (Concepts, Tools, and Techniques to Build Intelligent Systems), O'Reilly Media, 2nd Edition, 2019.
3. I. Goodfellow, Y. Bengio, A. Courville, Deep Learning, MIT Press, 2016.
4. N. Buduma, Fundamentals of Deep Learning, O'REILLY Media, 1st Edition, 2017.
5. M. Mohri, A. Rostamizadeh, A. Talwalkar, Foundations of Machine Learning, MIT Press, 2012.
6. K. P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
7. D. Barber, Bayesian Reasoning and Machine Learning, Cambridge University Press, 2012.

LEARNING OUTCOMES

Unit I	Explain the basics of machine learning concepts
Unit II	<ul style="list-style-type: none"> • Apply and analyse linear and non–linear learning algorithms • Differentiate various ensemble learning models
Unit III	<ul style="list-style-type: none"> • Demonstrate the use of a basic sequential data modelling technique • Apply the appropriate machine learning under different constraints
Unit IV	Experiment with different machine learning algorithms and deduce the inference for real world predictions

L	T	P	C
3	1	0	4

Course Code: CSEOL614

Semester: II

BIG DATA MINING & ANALYTICS

Course Objectives: This course aims to help the learner to know the concepts of Big Data analytics and apply algorithms for getting insights from data using Python and other open source analytical tools.

UNIT – I

15 Periods

MapReduce Basics: Introduction to big Data Mining – distributed system – Hadoop architecture – big data stack - Statistical Limits on Data Mining - Things Useful to Know. MapReduce - Algorithms Using MapReduce - Extensions to MapReduce - The Communication-Cost Model.

UNIT – II**15 Periods**

Link Analysis -PageRank - Efficient Computation of PageRank - Topic-Sensitive PageRank - Link Spam - Hubs and Authorities.**Frequent Itemsets:** The Market-Basket Model - Market Baskets and the A-Priori Algorithm - Handling Larger Datasets in Main Memory - Limited-Pass Algorithms - Counting Frequent Items in a Stream

UNIT – III**15 Periods**

Recommendation Systems: Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering. Dimensionality Reduction The Netflix Challenge.
Mining Social-Network Graphs: Social Networks as Graphs - Clustering of Social-Network Graphs - Direct Discovery of Communities - Partitioning of Graphs Finding Overlapping Communities, Simrank - Counting Triangles.

UNIT – IV**15 Periods**

Faster than Hadoop - Spark with R : Spark for Big Data analytics - Spark with R on a multi-node HDInsight cluster - Launching HDInsight with Spark and R/RStudio - Reading the data into HDFS and Hive - Getting the data into HDFS - Importing data from HDFS to Hive . **Machine Learning Methods for Big Data in R** - Supervised and unsupervised machine learning methods - Classification and clustering algorithms - Machine learning methods with R - Big Data machine learning tools - GLM example with Spark and R on the HDInsight cluster - Preparing the Spark cluster and reading the data from HDFS - Logistic regression in Spark with R - Running an H2O instance on Hadoop with R - Reading and exploring the data in H2O.

REFERENCES

1. J. Leskovec, A. Rajaraman, J. D. Ullman, Mining of Massive Data Sets, 3rd edition.
2. Simon Walkowiak, Big Data Analytics with R (Utilize R to uncover hidden patterns in your Big Data).

LEARNING OUTCOMES:

UNIT – I	<ul style="list-style-type: none"> • Explain the basic concepts of MapReduce and its framework • Comprehend the use of Hadoop in Big Data Analytics • Study the MapReduce algorithms applied in Big Data
UNIT – II	<ul style="list-style-type: none"> • Efficient Computation of PageRank • Market Baskets and the A-Priori Algorithm
UNIT – III	<ul style="list-style-type: none"> • Explain the concepts of Mining Advertising Data analytics • Apply the concepts of recommender system to Social network mining and

	provide interesting insights
UNIT – IV	<ul style="list-style-type: none">• Machine learning methods for big data using R.• Reading and exploring the data in H2O.

L	T	P	C
4	0	0	4

Course Code: INTOL 413

Semester: II

RDBMS, SQL & VISUALIZATION

Course Objectives: This course aims to enable the learner to understand the concepts, techniques, query languages in RDMS and to provide the foundation necessary for understanding data visualization.

UNIT – I

15 Periods

Databases and Database Users

Introduction– Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach - A Brief History of Database Applications

Database System Concepts and Architecture

Data Models, Schemas, and Instances -Three-Schema Architecture and Data Independence - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs 4-- Classification of Database Management Systems

UNIT – II

15 Periods

Data Modeling Using the Entity–Relationship (ER) Model

Using High-Level Conceptual Data Models for Database Design - A Sample Database Application - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types - ER Diagrams, Naming Conventions, and Design Issues - Relationship Types of Degree Higher than Two

The Relational Data Model and Relational Database Constraints

Relational Model Concepts - Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions, and Dealing with Constraint Violations

SQL

SQL Data Definition and Data Types - Specifying Constraints in SQL - Basic Retrieval Queries in SQL - INSERT, DELETE, and UPDATE Statements in SQL - Additional Features of SQL - More Complex SQL Retrieval Queries - Specifying Constraints as Assertions and Actions as Triggers - Views (Virtual Tables) in SQL - Schema Change Statements in SQL

UNIT – III

15 Periods

Introduction to SQL Programming Techniques

Database Programming with Function Calls and Class Libraries: SQL/CLI and JDBC - Database Stored Procedures and SQL/PSM

Database Design Theory and Normalization

Informal Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms - Boyce-Codd Normal Form - Multivalued Dependency and Fourth Normal Form - Join Dependencies and Fifth Normal Form

Transaction Processing, Concurrency Control

Introduction to Transaction Processing - Transaction and System Concepts - Characterizing Schedules Based on Recoverability - Characterizing Schedules Based on Serializability - Two-Phase Locking Techniques for Concurrency Control - Concurrency Control Based on Timestamp Ordering

UNIT – IV

15 Periods

Visualization

The Seven Stages of Visualizing Data - Iteration and Combination - Principles - Getting Started with Processing: Sketching with Processing - - Functions - Sketching and Scripting- Mapping : Drawing a Map - Locations on a Map - Data on a Map - Time Series - Scatterplot Maps - Networks and Graphs

REFERENCES

1. Ramez Elmasri, Shamkant B. Navathe “ Fundamental of Database Systems” Pearson Seventh Edition, Third impression -2018.
2. Ben Fry, Visualizing Data -, O'Reilly Media, 2008
3. Henry F.Korth, Abraham Silberschatz and Sudarshan, Database System concepts. McGraw hill: 6th Edition, 2010
4. S.K.Singh.Database Systems Concepts, Design and Applications. Prentice Hall of India: 1st Edition, 2009
5. E.Tufte, The Visual Display of quantitative Information (2nd Edition), Graphics press, 2001
6. E.Tufte, Envisioning Informaiton, Grapics Press, 1990

LEARNING OUTCOMES

Unit 1	Demonstrate an understanding of the fundamental concepts and data models of DBMS & RDBMS
Unit 2	Use Normalization techniques and perform object modelling and database design.

Unit 3	Acquire basic knowledge on structure query languages & PL/SQL
Unit 4	Demonstrate an understanding of the current state of the art in data visualization.

L	T	P	C
3	1	0	4

Course Code: INTOL531

Semester: II

DATA MINING TECHNIQUES

Course Objectives: This course will help the learner to understand the various types of Data and its transformation. The learner will construct a road map to Pattern Mining. Further, the learner knows about various Classifiers and Clustering methods

UNIT – I15 Periods

Introduction to Data Mining: Types of Data – Mining Patterns – Technologies Used – Types of Attributes – Data Visualization – Data Similarity and Dissimilarity – Data Cleaning – Data Integration – Data Reduction – Data Transformation – Data Discretization

UNIT – II 15 Periods

Pattern Mining: – Basic Concepts – Itemset Mining Methods – Pattern Evaluation Methods – A Road Map – Mining in Multilevel, Multidimensional Space – Constraint Pattern Mining – Colossal Patterns – Approximate Patterns

UNIT – III 15 Periods

Classification: Decision Tree Induction – Bayesian Classification – Rule based Classification – Model Evaluation and Selection – Accuracy improvement Techniques

UNIT – IV

15 Periods

Cluster Analysis: Basic Concepts – Partitioning Methods – Hierarchical Methods – Density based Methods – Grid based Methods – Clustering Evaluation –

Outlier Analysis: Types of Outliers – Detection Methods – Parametric Methods – Non parametric methods

REFERENCES

1. J. Han, M. Kamber, J. Pei, Data Mining: Concepts and Techniques, Morgan Kaufman, 3rd Edition, 2012
2. M. J. Zaki, W. Meira Jr., Data Mining and Analysis, Fundamental Concepts and Algorithms, Cambridge University Press, 2014.
3. C.C. Aggarwal, Data Mining: The Text Book, Springer International Publishing, Switzerland, 2015.
4. A. Berson, S. J. Smith, Data Warehousing, Data Mining and OLAP, Tata McGraw Hill, 2012.
5. I. H. Witten, E. Frank, M. A. Hall, Data Mining – Practical Machine Learning Tools and Techniques, Morgan Kaufman, 3rd Edition, 2011.
6. V. Pudi, P. Radhakrishna, Data Mining, Oxford University Press, 2009.
7. M. H. Dunham, Data Mining: Introductory and Advanced Topics, Pearson Education, 6th Edition, 2009.

LEARNING OUTCOMES:

UNIT – I	<ul style="list-style-type: none">• Describe the basics of the data mining process and data types• Analyze the different types of attributes associated with data• Discretize the data
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UNIT – II	<ul style="list-style-type: none">• Illustrate frequent patterns from data• Summarize the frequent patterns of data
UNIT – III	<ul style="list-style-type: none">• Analyze the Classification• Improve the accuracy• Apply the Backpropagation techniques
UNIT – IV	<ul style="list-style-type: none">• Analyze Clustering functionality• Evaluate the clustering model using different measures• Analyze the Outliers using parametric and non-parametric methods

L	T	P	C
0	0	2	1

Course Code: INTOL416

Semester: II

RDBMS, SQL AND VISUALIZATION LABORATORY

Course Objectives: The learner will be able to understand Data Manipulation and Data Definition Languages, learn the use of nested and join queries, understand functions, procedures and procedural extensions of data bases, understand key design principles and techniques for visualizing data.

List of Experiments:

1. Data Definition Commands, Data Manipulation Commands for Creating, Inserting, deleting, updating and retrieving Tables and Transaction Control statements with SimpleQueries.
2. Key Constraints, Arithmetic, Logical, Set Operations & Sorting.
3. Database Querying - Simple queries, Nested queries, Sub queries, Joins, Grouping and update Operations.
4. Index, Views, Sequences & Synonyms.
5. Database Programming - Simple PL/SQL Programs.
6. Procedures & Functions.
7. Implicit and Explicit Cursors.

8. Triggers.
9. Exception Handling.
10. Database Design using ER modelling, normalization and Implementation for any application.
11. Visualizing Multidimensional Data.
12. Graph Layout and Network Analysis.
13. Design a Linear Regression model to predict Bicycle Traffic using Python
14. Design a Decision Tree and Random Forests for classifying Digits using Python
15. Design ensemble method and compare the performance metric with Naïve–Bayes and SVM

LEARNING OUTCOMES:

Upon completion of the course, the learners will be able to:

- Use typical data definitions and manipulation commands
- Design applications to test Nested and Join Queries
- Develop simple applications that use Views
- Critically analyze the use of Tables, Views, Functions and Procedures
- Effectively implement the key principles of Data Visualization
- Analyze the networks and graphs

L	T	P	C
2	0	0	2

Course Code: MANOL106

Semester: II

RESEARCH METHODOLOGY & IPR

Course Objectives: This course will help the learner understand the essentials of research methodology and acquire awareness on the types of intellectual property.

UNIT – I

6 Periods

Meaning of research problem, Sources of research problem, Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentation.

UNIT – II

6 Periods

Effective literature studies approaches, analysis, Research ethics, Plagiarism, Effective technical writing, how to write a report/paper, Developing a Research Proposal, Format of research proposal, presentation and assessment by a review committee.

UNIT – III

9 Periods

Nature of Intellectual Property: Patents, Designs, Trade mark and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT – IV

9 Periods

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR – IPR of Biological Systems, Computer Software.

REFERENCES

1. S. Melville, W. Goddard, Research methodology: an introduction for Science & Engineering students, Juta & Co. Ltd., 2007.
2. R. P Merges, P. S. Menell, M. A. Lemley, Intellectual Property in New Technological Age, 2016.

3. T. Ramappa, Intellectual Property Rights Under WTO, S. Chand, 2008.

LEARNING OUTCOMES:

Upon completion of the course, the learner will be able to:

UNIT – I	<ul style="list-style-type: none">• Define a research problem• Prepare plan for data acquisition and analysis
UNIT – II	<ul style="list-style-type: none">• Perform literature survey and identify research gaps• Prepare a research proposal
UNIT – III	<ul style="list-style-type: none">• Classify intellectual property• Describe the process of filing a patent
UNIT – IV	<ul style="list-style-type: none">• Explain the rights of patentee• Carry out patent search

Course Code: INTOL424

L	T	P	C
2	1	0	3

ALGORITHMIC TRADING

Course Objectives:

This course aims to introduce the learners to concepts in Algorithmic and Quantitative Trading such as derivatives, quantitative trading, electronic market-making, trading related technology and risk management. It also provides the learners with insights into the world of Algorithms, financial technology, and changing market microstructure.

UNIT– I

12 Periods

Basics of Algorithmic Trading: Compound interest, Stocks, Bonds, Mutual funds, Market, and Quantitative finance – Python for quantitative finance: Installation, basic mathematical functions, data structures and functions, interactive coding at IDLE, JuPyter Note book, Introduction to key Python libraries NumPy and pandas – Calc / Excel: Intro to Open Office, importing data, sorting

data, using inbuilt maths/statistical functions – Basics of MATLAB: Relative strengths of MATLAB, matrix functions, tool boxes or quantitative finance – Data visualization: Types of plots– Plotting with matplotlib (Python), Charts in Excel / Calc, boxplots and advanced plotting in R.

UNIT– II

11 Periods

Probability Distributions with Python and R: Statistics and probability concepts (Bayesian and Frequentist methodologies), moments of data and Central Limit Theorem, Standard Normal Distribution– Related parameters like Z–score, confidence interval and their use, and Hypothesis Testing, Covariance, Correlation and Regression and their physical significance – Applications of statistics: Random Walk Model for predicting future stock prices using simulations and inferring outcomes – Machine Learning: relevance of Machine Learning for quantitative finance– types of ML algorithms– examples of applications in Python and R.

UNIT– III

11 Periods

Time series analysis and statistical functions: including autocorrelation function, partial autocorrelation function, maximum likelihood estimation, Akaike Information Criterion – Stationarity of time series, Autoregressive Process, Forecasting using ARIMA –Difference between ARCH and GARCH and Understanding volatility, Nonlinearity of volatility, Gaussian Mixture Models (GMM)

UNIT–IV

11 Periods

Capital Asset Pricing Model: Modern Portfolio Theory – statistical approximations of risk/reward – Python and R for writing functions to implement strategies, back testing trading strategies.

REFERENCES

1. E. P. Chan, Algorithmic Trading: Winning strategies and their rationale, Wiley Trading, 2013.
2. B. C. Johnson, Algorithmic Trading and DMA: An introduction to direct access trading strategies, Myeloma Press, 2009.
3. S. Janser, Hands – on Machine Learning for Algorithmic Trading: Design and implement investment strategies based on smart algorithms that learn from data using Python, Packt and Co., 2018.

ONLINE MATERIALS

1. <https://nptel.ac.in/courses/128/106/128106011/>
2. <https://youtu.be/XNZ7o3621FY>

LEARNING OUTCOMES:

Upon successful completion of each unit, the learner will be able to:

UNIT-I	<ul style="list-style-type: none">• Demonstrate an understanding of the concept of algorithmic trading
UNIT-II	<ul style="list-style-type: none">• Design models and perform world of trading
UNIT-III	<ul style="list-style-type: none">• Handle data and program their algorithms
UNIT- IV	<ul style="list-style-type: none">• Develop trading strategies/algorithms

Course Code: INTOL426

L	T	P	C
2	1	0	3

BAYESIAN DATA ANALYSIS

Course Objectives:

This course is designed to familiarize the learners with basic Bayesian models, followed by more complicated hierarchical and mixture models with nonstandard solutions to get an in-depth understanding of methods for monitoring adequacy of models and examining the sensitivity of conclusions to change in models.

UNIT- I

11 Periods

Probability and inference: The three steps of Bayesian data analysis – General notation for statistical inference – Bayesian inference.

Single-parameter models: Estimating a probability from binomial data – Posterior as compromise between data and prior information– Summarizing posterior inference – Informative prior distributions – Estimating a normal mean with known variance – Other standard single-parameter models.

Introduction to multi-parameter models: Averaging over ‘nuisance parameters’ – Normal data with a non-informative prior distribution – Normal data with a conjugate prior distribution – Multinomial model for categorical data – Multivariate normal model with known variance – Multivariate normal with unknown mean and variance.

UNIT- II

11 Periods

Asymptotics and connections to non-Bayesian approaches: Normal approximations to the posterior distribution – Large-sample theory – Counterexamples to the theorems – Frequency evaluations of Bayesian inferences – Bayesian interpretations of other statistical methods.

Hierarchical models: Constructing a parameterized prior distribution – Exchangeability and setting up hierarchical models – Fully Bayesian analysis of conjugate hierarchical models – Estimating exchangeable parameters from a normal model – Example: parallel experiments in eight schools – Hierarchical modelling applied to a meta-analysis – Weakly informative priors for hierarchical variance parameters.

UNIT– III

11 Periods

Model checking: The place of model checking in applied Bayesian statistics – Do the inferences from the model make sense? – Posterior predictive checking – Graphical posterior predictive checks – Model-checking for the educational testing example.

Evaluating, comparing, and expanding models: Measures of predictive accuracy – Information criteria and cross-validation – Model comparison based on predictive performance – Model comparison using Bayes factors – Continuous model expansion.

UNIT– IV

12 Periods

Modelling accounting for data collection: Bayesian inference requires a model for data collection – Data-collection models and ignorability– Sample surveys – Designed experiments– Sensitivity and the role of randomization – Observational studies – Censoring and truncation –

Decision analysis: Bayesian decision theory in different contexts – Using regression predictions: incentives for telephone surveys – Multistage decision making: medical screening– Hierarchical decision analysis for radon measurement – Personal vs. institutional decision analysis.

REFERENCES

1. A. Gelman, J. B. Carlin, H.S. Stern, and D.B. Rubin, Bayesian Data Analysis, Chapman & Hall / CRC, 3rd Edition, 2013.
2. R. Christensen, W. Johnson, A. Branscum, T. E. Hanson, Bayesian Ideas and Data Analysis, An Introduction for Scientists and Statisticians, CRC Press, 2011.
3. A. B. Downey, Think Bayes: Bayesian Statistics in Python, Green Tea Press, 2013.

ONLINE MATERIALS

1. <https://nptel.ac.in/courses/111/105/111105043/>
2. <https://youtu.be/GqxOwxwH1C8>
3. <https://youtu.be/E3l26bTdtxl>

LEARNING OUTCOMES:

Upon completion of each unit, the learner will be able to:

UNIT-I	<ul style="list-style-type: none">• Demonstrate an understanding of the steps and notation of Bayesian models and the types of parameter models
UNIT-II	<ul style="list-style-type: none">• Gain knowledge on the connections to non-Bayesian approaches and hierarchical models
UNIT-III	<ul style="list-style-type: none">• Perform model checking, evaluation, comparison, and expansion
UNIT-IV	<ul style="list-style-type: none">• Demonstrate an understanding of Bayesian decision theory and its different contexts

Course Code: INTOL428

L	T	P	C
2	1	0	3

Semester: II

FINANCIAL DATA ANALYSIS

Course Objectives:

This course aims to enable the learner to get an insight into the analysis of financial data from a managerial perspective and to gain familiarity in the process of capturing, recording, and communicating financial data.

UNIT – I

10 Periods

Income Statement Data analysis: Income statement – meaning – significance – Revenue – Cost of Sales – Operating Profit – Profitability ratio: Return on capital employed, return on equity and market information ratio analysis – earnings per share – Price–earnings ratio – Dividend yield – sustainable growth rate analysis.

UNIT – II

12 Periods

Balance Sheet Data Analysis: Balance sheet – meaning – significance – components of balance sheet – Solvency – Long–Term: Debt–Equity ratio and Short–Term solvency: current ratio, acid test ratio– Efficiency ratios: assets turnover ratio – debtors and creditors turnover ratio – working capital turnover ratio – Operating cycle analysis.

UNIT – III

13 Periods

Financial Statement Analysis: Inter and Intra Firm Comparison using comparative and common size Financial Statements, Trend analysis, and interpreting the financial statements of Manufacturing companies, Insurance companies, and Banks.

UNIT – IV

10 Periods

Cash Flow Statement Analysis: Cash Flow statement – purpose, use, and structure – cash flow from operating activities – cash flow from investing and financing activities – analysis of Cash Flow Statement – Profitability Vs Liquidity – contents of Cash Flow statement of Companies.

REFERENCES

1. A. Sehgal, D. Sehgal, Accounting for Management, Taxmann Publications (P) Ltd., 2015.
2. T. P. Ghosh, Financial Accounting for Managers, Taxmann Publications (P) Ltd., 4th Edition, 2012.
3. P. Shah, Basic Financial Accounting for Management, Oxford University Press, 2019.
4. R. Narayanaswamy, Financial Accounting – A Managerial Perspective, PHI Learning (P) Ltd., 2014.
5. S. Sharma, M. P. Vithal, Financial accounting for Management – Text and Cases, Macmillan India Ltd., 2008.
6. S. K. Bhattacharya, J. Dearden, Accounting for Management – Text & Cases, Vikas Publishing House (P) Ltd., 2012.

ONLINE MATERIALS

1. <https://nptel.ac.in/courses/110/107/110107073/>
2. <https://nptel.ac.in/courses/106/107/106107220/>

LEARNING OUTCOMES:

Upon completion of each unit, the learner will be able to:

UNIT-I	<ul style="list-style-type: none">• Analyze the income statement data
UNIT-II	<ul style="list-style-type: none">• Analyze balance sheet data
UNIT-III	<ul style="list-style-type: none">• Prepare common size and comparative financial statements for analysis
UNIT-IV	<ul style="list-style-type: none">• Evaluate the performance of a company by employing cash flow statement data analysis

Course code: BINOL533

Semester: II

L	T	P	C
3	0	0	3

HEALTHCARE DATA ANALYTICS

Course Objectives:

This course aims to help the learner understand the fundamental Big Data analysis techniques suitable for bioinformatics and health care applications and choose an appropriate method for the given problem and solve it using R in the Map–Reduce framework.

UNIT – I

15 Periods

Application of Big Data analytics methods in Genomics: Recap of Big Data frameworks, Challenges in Genomic era, Annotations and storing annotations in a searchable manner, Tracing and versioning using iRods, Data transfer: Bottlenecks in classical transfer methods, FASP and torrent seeding based methods to transfer genomic data. Distributed computing for genomics, application of Hadoop for efficient parallelization of genomics data analysis, Advanced data mining using RNA seq. data. Case studies: Electronic health records and reduced redundant tests.

UNIT – II

15 Periods

Big Data Applications in Health Care: Role of Big Data in radiation oncology, treatment and outcome prediction, Personalized disease phenotypes & OMICS data, High throughput techniques in molecular medicine, SOM portraying and data compression, Data integration in complex disease analysis. Big Data analytics based models, for clinical operations, R&D, public health and improved physician performance. Case studies in personal medicine: prediction of rare conditions. Patient safety in ICU: early warning of sepsis.

UNIT – III

15 Periods

R and Hadoop applications for biological data analysis: Integrating R and Hadoop for statistics and more: Comparing R and MapReduce integrations – R and Streaming – Rhive – Client–side R and Hadoop working together – Rhadoop – a simpler integration of client–side R and Hadoop– Large–Scale Machine Learning and their applications in Big Data, using Multi–Layer Perceptrons and Support Vector Machines. Case studies: Analysis of adverse reactions from medications. Predictive analytics for chronic illness.

REFERENCES

1. B. Wang, R. Li, W. Perrizo, Big Data Analytics in Bioinformatics and Healthcare, IGI Global, 2014.
2. J. Hurwitz, A. Nugent, F. Halper, M. Kaufman, Big Data for Dummies, John – Wiley and Sons, 2013.
3. A. Homes, Hadoop in Practice, Manning Publications, 2012.

ONLINE MATERIALS

1. <https://nptel.ac.in/courses/121/106/121106011/>
2. <https://youtu.be/VeMDQHyBSaA>

LEARNING OUTCOMES:

Upon completion of this course, the learner will be able to:

UNIT–I	<ul style="list-style-type: none"> • Comprehend the basic concepts behind big data and Hadoop – MapReduce framework • Distinguish between methods used for large scale genome data
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	handling <ul style="list-style-type: none">• Select and apply the suitable parallelization procedures as applicable to bioinformatics analysis
UNIT-II	<ul style="list-style-type: none">• Map certain aspects of Health care data analysis with Big Data applications• Execute integrative analysis towards personalized medicine
UNIT-III	<ul style="list-style-type: none">• Apply machine learning techniques to solve bioinformatics problems• Use the techniques learnt in R and Hadoop integrated environment

L	T	P	C
3	0	0	3

Course Code: BINOL529

Semester: II

DATA SCIENCE FOR STRUCTURAL BIOLOGY

Course Objectives:

This course aims to introduce the foundational concepts required for learners to embark on structural biology and data science components in high throughput crystallographic methods and structural data analysis.

UNIT – I

11 Periods

Structural biology and data science: What structural biology has to offer data science: Open science –Reproducibility –Workflows, high–performance computing –Visualization. What data science analytics has to offer structural biology: molecular dynamics simulation data analysis, molecular docking simulation data analysis, Natural language processing applied to biomolecular assemblies.

UNIT – II

11 Periods

Protein structure and Interaction prediction: Machine learning applied to biomolecular interactions. Introduction to Probabilistic models, Bayesian methods, Rotamer/Side chain prediction using Markov random fields, deep learning approaches to protein structure prediction.

UNIT – III

11 Periods

Data science in crystallization optimization: Introduction to protein crystallization: crystallization screening process. Scoring of protein crystals: Computational methods for protein crystallization screening (Neural networks, Genetic Algorithm, optimization of cocktails), crystal plate trial analysis (time–course analysis).

UNIT – IV

12 Periods

Algorithmic approaches in structure data analysis: Cloud computing and its use in 3D protein structure similarity searches, Hadoop and MapReduce and its use in protein structural alignment, functional assignment, and protein–ligand docking, prediction of intrinsically disordered proteins using cloud computing. Current challenges of big data analysis in the area of structural biology. Mass spectrometry data analysis, NMR data analysis using inferential structure determination, low resolution crystallographic data analysis using probabilistic, Bayesian methods from SAXS and SANS data.

REFERENCES

1. M. L. Pusey, R. S. Aygün, Data Analytics for protein crystallization, Springer Press, 2017.
2. D. Mrozek, Scalable Big Data Analytics for Protein Bioinformatics, Springer Press, 2018.
3. T. Hamelryck, K. Mardia, J. Ferkinghoff–Borg, Bayesian methods in structural bioinformatics. Springer Press, 2012.

ONLINE MATERIALS

1. https://onlinecourses.nptel.ac.in/noc21_bt14/preview
2. <https://nptel.ac.in/courses/102/107/102107086/>
3. <https://nptel.ac.in/courses/102/106/102106068/>

LEARNING OUTCOMES:

Upon completion of this course, the learner will be able to:

UNIT–I	Apply several methods used for structural big data
UNIT–II	Demonstrate macromolecular structure data analysis
UNIT–III	Perform structural big data
UNIT–IV	Employ automation in structural big data

L	T	P	C
3	0	0	3

Course code: MATOL548

Semester: III

EPIDEMIOLOGICAL MODELING

Course Objectives:

This course aims to enable the learner to understand the mathematical modelling of infectious diseases and provide an awareness of current challenges in infectious disease control, and their representation through modelling, including such issues as anti-microbial resistance, population mixing patterns and forecast the epidemiology trend.

UNIT- I

10 Periods

Introduction to Mathematical Modeling: Characteristics of Mathematical Models – Classification of Mathematical Models – Modeling Approaches (empirical– theoretical– stochastic or probabilistic– deterministic– statistical) – A Modeling Diagram – Compartment Models – Testing of Stability – Krasovskii's Method – Routh–Hurwitz Criterion – Global Asymptotic Stability. Dynamical System and Its Mathematical Model.

UNIT- II

12 Periods

Epidemic Modeling: Basic definitions of Epidemiology of Infectious Diseases– General Approach to Modeling–Kermack–McKendrick SIR Epidemic Model – Estimating Parameters from Data – Recovery rate estimation–SIS epidemic model –SIR Model with Demography – Analysis of Two–Dimensional Systems – Dimensionless SIR Model – Reproduction Number of the Disease.

UNIT- III

11 Periods

Control Strategies: Modeling Quarantine and Isolation – Vaccination – herd immunity– Model with Vaccination – A Model with Continuous Vaccination: An SIS Model with Vaccination – Reproduction Number and the Critical Vaccination Proportion – Challenges, Opportunities and Theoretical Epidemiology.

UNIT- IV

12 Periods

Forecasting methods for epidemiology: Curve fitting and Linear Least-Squares methods: Method of least squares– Fitting a second degree trend– exponential trend – Ratio to trend method – ratio to moving averages method – Link relative method – forecasting methods using time series.

REFERENCES

1. M. Martcheva, An introduction to mathematical epidemiology, Springer, 2015.
2. R. K. Upadhyay, S. R. Iyengar, Introduction to mathematical modeling and chaotic dynamics. Chapman and Hall/CRC Press, 2013.
3. R. Bonita, R. Beaglehole, T. Kjellström, Basic epidemiology, World Health Organization, 2006.
4. F. Brauer, C. C. Chavez, Z. Feng, Mathematical models in epidemiology, Springer, 2019.
5. S. P. Gupta, Statistical Methods, Sultan Chand & Sons, 2021.
6. D. C. Montgomery, G. C. Runger, Applied statistics and probability for engineers, Wiley, 2014.

ONLINE MATERIAL

<https://nptel.ac.in/courses/102/103/102103056/>

LEARNING OUTCOMES:

Upon completion of each UNIT, the learner will be able to:

UNIT-I	<ul style="list-style-type: none">• Test the stability of the dynamical systems
UNIT-II	<ul style="list-style-type: none">• Solve basic epidemiological models
UNIT-III	<ul style="list-style-type: none">• Model the hard immunity models
UNIT-IV	<ul style="list-style-type: none">• Forecast the epidemiological trend

Course Code: CSEOL542

Semester: III

L	T	P	C
4	0	0	4

SOCIAL NETWORKS & GRAPH ANALYSIS

Course Objectives:

The course aims to train the learner to understand the concept of semantic web and its related applications, learn knowledge representation using ontology, understand human behaviour in social web and related communities, and determine the matrix-based representations of node edge problems.

UNIT – I

15 Periods

Introduction to Semantic Web: Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis. Ontology and their role in the Semantic Web: Ontology-based knowledge Representation. Ontology languages for the Semantic Web: Resource Description Framework – Web Ontology Language

UNIT – II

15 Periods

Modelling and aggregating social network data: State-of-the-art in network data representation – Ontological representation of social individuals – Ontological representation of social relationships – Aggregating and reasoning with social network data – Advanced representations. Extracting evolution of Web Community from a Series of Web Archive – Detecting communities in social networks – Definition of community – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities social network infrastructures and communities

UNIT – III

15 Periods

Decentralized online social networks: Multi-Relational characterization of dynamic social network communities. Understanding and predicting human behaviour for social communities – User data management – Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness – Privacy in online social networks – Trust in online environment – Trust models based on subjective logic – Trust network analysis – Trust transitivity analysis – Combining trust and reputation – Trust derivation based on trust comparisons – Attack spectrum and countermeasures.

UNIT – IV

15 Periods

Graph theory: Centrality – Clustering – Node–Edge Diagrams – Matrix representation – Visualizing online social networks, visualizing social networks with matrix–based representations – Matrix and Node–Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare – Collaboration networks – Co–Citation networks.

TEXTBOOKS

1. P. Mika, Social Networks and the Semantic Web, Springer, 2007.
2. B. Furht, Handbook of Social Network Technologies and Applications, Springer, 2010.

REFERENCES

1. G. Xu, Y. Zhang, L. Li, Web Mining and Social Networking – Techniques and applications, Springer, 2011.
2. D. Goh, S. Foo, Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.
3. M. Chevalier, C. Julien, C. ISoulé–Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI Global Snippet, 2009.
4. J. G. Breslin, A. Passant, S. Decker, The Social Semantic Web, Springer, 2009.

ONLINE MATERIALS

1. <https://www.coursera.org/learn/social-network-analysis>
2. <https://nptel.ac.in/courses/106/106/106106169/>

LEARNING OUTCOMES:

Upon successful completion of this course, the learner will be able to:

UNIT–I	<ul style="list-style-type: none">• Develop semantic web related applications
UNIT– II	<ul style="list-style-type: none">• Use ontology to represent knowledge
UNIT–III	<ul style="list-style-type: none">• Predict human behaviour in social web and related communities
UNIT– IV	<ul style="list-style-type: none">• Visualize social networks

Course Code: INTOL419
Semester: III

L	T	P	C
3	1	0	4

SPATIAL DATA ANALYTICS

Course Objectives:

The course aims to train the learner to examine and practice the fundamental techniques of data science and data analytics suitable for spatial data, choose appropriate techniques to solve the given location-based/specific problems, construct the networks, identify the optimal path of networks, use the Bigdata analysis for future predictions and apply the spatial regression analysis.

UNIT – I

15 Periods

The context for spatial data Analysis: Nature of Spatial Data – Obtaining Spatial Data through Sampling – Data Quality: implications for spatial data analysis. (TB1)

Conceptual Frameworks for Spatial Analysis: Basic Primitives– Spatial Relationships, Spatial Data Infrastructure.

Spatial Data Implications for Data Analysis: Exploratory Data Analysis – Conceptual Models Visualization Methods – Numerical Methods. (TB1)

UNIT – II

15 Periods

Data Exploration and Spatial Statistics: Statistical Methods and Spatial Data – Exploratory Spatial Data Analysis – Grid–Based Statistics and Metrics – Point Sets and Distance Statistics.

Building Blocks of Spatial Analysis: Spatial and Spatio–Temporal Data Models and Methods – Geometric and Related Operations – Queries, Computations and Density– Distance Operations – Directional Operations– Grid Operations and Map Algebra.

UNIT –III

15 Periods

Methodological Context Analytical Methodologies: Spatial Analysis as a Process – Spatial Analysis and the PPDAC Model – Geospatial Analysis and Model Building – The Changing Context of GIS Science.

Surface and Field Analysis: Modelling Surfaces– Network and Location Analysis – Introduction to Network and Location Analysis – Key Problems in Network and Location Analysis – Network Construction, Optimal Routes and Optimal Tours – Location and Service Area Problems – Arc Routing.

UNIT – IV

15 Periods

Geo – Computational Methods and Modelling: Introduction to Geo–computation – Artificial Neural Networks (ANN) – Genetic Algorithms and Evolutionary Computing – Spatial Autocorrelation – Spatial Regression.

Big Data and Geospatial Analysis: Big Data and Research – Types of Big Data – Challenges of Big Data – Case Study: "Spatial Data Science Problems" – Practical Applications of Spatial Data Science – Six Solution Structures: The Solution Structures characteristics – Different Combinations of GIS, DBMS, Data Analytics, and Big Data Systems.

REFERENCES

1. R. Haining, Spatial Data Analysis: Theory and Practice, Cambridge University Press, 1st Edition, 2003.
2. M. J. Smith, M. F. Goodchild, P. A. Longley, Geospatial Analysis: A comprehensive Guide to Principles, Techniques, and Software Tools, Winchelsea, UK: Winchelsea Press, 6th Edition, 2018.
3. J. Hurwitz, A. Nugent, F. Halper, M. Kaufman, Big Data for Dummies, John–Wiley and Sons, 2013.

ONLINE MATERIAL

<https://nptel.ac.in/courses/106/105/106105219/>

LEARNING OUTCOMES:

Upon successful completion of this course, the learner will be able to:

UNIT–I	<ul style="list-style-type: none">• Analyze the nature of spatial data, spatial relationships and conceptualize data models
UNIT–II	<ul style="list-style-type: none">• Apply and analyze statistical methods in spatial data
UNIT–III	<ul style="list-style-type: none">• Implement spatial data in Geospatial analysis and Model building
UNIT–IV	<ul style="list-style-type: none">• Demonstrate the use of spatial data in computational modelling

L	T	P	C
3	0	0	3

Course Code: INTOL433

Semester: III

INFORMATION VISUALIZATION

Course Objectives:

This course aims to introduce the learners to the visual perception and core skills for visual analysis and enable the learners to understand the visualization for time series analysis, visualization for multivariate analysis and issues and best practices in information dashboard design.

UNIT- I 11 Periods

Introduction: Information visualization – effective data analysis – traits of meaningful data – visual perception – making abstract data visible – visualization of numerical data and non-numerical data – building blocks of information visualization – analytical interaction – analytical navigation– optimal quantitative scales– analytical patterns – pattern examples

UNIT- II 11 Periods

Time Analysis and Ranking Pattern: Time-series analysis – Components of Time series, Straight line method, Graphical Method, time-series patterns – time-series displays – time-series best practices – part-to-whole and ranking patterns – part-to-whole and ranking displays – best practices – deviation analysis – deviation analysis displays – deviation analysis best practices.

UNIT– III

12 Periods

Distribution and Correlation Analysis: Distribution analysis – describing distributions – distribution patterns – distribution displays – distribution analysis best practices – correlation analysis – describing correlations – correlation patterns – correlation displays – correlation analysis techniques and best practices – Regression Analysis–Linear models, least square method.

UNIT– IV 11 Periods

Introduction to Dashboard: Information dashboard – categorizing dashboards – typical dashboard data – dashboard design issues and best practices – visual perception – limits of short-term memory – visually encoding data – Gestalt principles – principles of visual perception for dashboard design.

REFERENCES

1. S. Few, Now you see it: Simple Visualization techniques for quantitative analysis, Analytics Press, 2009.
2. S. Few, Information dashboard design: The effective visual communication of data, O'Reilly, 2006.
3. E. R. Tufte, The visual display of quantitative information, Graphics Press, 2nd Edition, 2001.
4. N. Yau, Data Points: Visualization that means something, Wiley, 2013.

ONLINE MATERIAL

<https://nptel.ac.in/courses/106/106/106106179/>

LEARNING OUTCOMES:

Upon completion of this course, the learner will be able to:

UNIT - I	<ul style="list-style-type: none">• Explain principles of visual perception
UNIT – II	<ul style="list-style-type: none">• Apply core skills for visual analysis
UNIT – III	<ul style="list-style-type: none">• Apply visualization techniques for various data analysis tasks
UNIT – IV	<ul style="list-style-type: none">• Design information dashboard

Course Code: CSEOL608

Semester: III

L	T	P	C
4	0	0	4

IMAGE PROCESSING & ANALYSIS

Course Objectives:

This course aims to enable the learners to apply image processing techniques like transformation, enhancement, restoration and reconstruction of noisy images, understand the segmentation and boundary detection for analyzing and recognizing patterns in the acquired images and learn Object Recognition and Image analysis.

UNIT – I

15 Periods

Fundamentals of Image Processing and Analysis: Image Basics – Fundamentals of imaging – Image formation, Image Acquisitions, Imaging Modalities.

Point and Geometric Transformation: Simple, Gray Level Processing – Gray Level Histograms – Multi Spectral and Multi Image Transforms – Change Detection and Warping.

UNIT – II

15 Periods

Image Enhancement: Spatial domain Filters – Convolution – Smoothing by Convolution with Gaussian – Computing First and Second Derivatives – Non Linear Filters – Frequency domain Processing – Fourier Transform – One and Two Dimensional Discrete Fourier transform – Frequency Domain Filters – Discrete Wavelet Transform.

Image Restoration and reconstruction: Image restoration model – Restoration in spatial domain – Noise reduction in frequency domain.

UNIT – III

15 Periods

Image Segmentation: Edges Detection – Thresholding – Deformable Models – Image Segmentation.

Processing Binary Images: Morphological Operations – Region Properties – Region Description – Skeletonization – Boundary Representations.

UNIT – IV

15 Periods

Image Analysis– Model Fitting – Fitting Lines and Planes– Fitting Multiple Models.

Object Recognition: Patterns and pattern classes, recognition based on decision – theoretic methods, structural methods, Statistical Pattern Recognition.

Advanced Image Analysis: Correlations – Cross Correlations, Supervised Classification – Generative Methods – Discriminative Methods – Unsupervised learning Methods.

REFERENCES

1. S. Birchfield, Image Processing and Analysis, Cengage Learning, 1stEdition, 2016.
2. R. C. Gonzalez, R. E. Woods, Digital Image Processing, Prentice Hall, 4th Edition, 2018.
3. J. C. Russ, The Image Processing Handbook, CRC, 8th Edition, 2017.
4. W. K. Pratt, Digital Image Processing, John Wiley & Sons, 3rd Edition, 2001.

ONLINE MATERIALS

1. <http://nptel.ac.in/courses/106105032/1-41>
2. <http://nptel.ac.in/video.php?subjectId=117105079>

LEARNING OUTCOMES:

Upon successful completion of this course, the learner will be able to

UNIT – I	<ul style="list-style-type: none">• Discriminate the modalities in imaging• Apply basic operation to deal with image content
UNIT – II	<ul style="list-style-type: none">• Correct errors in the image by applying direct and Fourier space filters.
UNIT – III	<ul style="list-style-type: none">• Analyze image segmentation and feature extraction.
UNIT – IV	<ul style="list-style-type: none">• Examine various models to fit the image features• Apply algorithms for features characterization

Course Code: ICTOL529
Semester: III

L	T	P	C
4	0	0	4

SPEECH & VIDEO PROCESSING

Course Objectives:

This course aims to enable the learners to understand the basics of speech and video processing, learn the existing techniques for speech recognition and video recognition tasks, understand the fundamentals of Digital video to learn motion segmentation and motion tracking.

UNIT – I

15 Periods

Speech signal processing: Introduction to speech signal processing – digital models for speech signal – Digital processing of speech signals – Significance – short time analysis.

Time Domain Methods for Speech Processing: Time domain parameters of speech – methods for extracting the parameters – Zero crossings – Auto correlation function and pitch estimation.

Frequency Domain Methods for Speech Processing: Short time Fourier analysis – Filter bank analysis – Spectrographic analysis – Formant extraction – Pitch extraction – Analysis –by – Synthesis systems.

UNIT – II

15 Periods

Automatic Speech Recognition: Introduction, Basic ASR Formulation, Overall Speech Recognition Process, Building a Speech Recognition System, The Decision Processes in ASR, Step 3: The Search Problem, Simple ASR System: Isolated Digit Recognition, Performance Evaluation of Speech Recognizers

UNIT – III

15 Periods

Digital Video: Spatial resolution and frame rate, color, Dynamic range and Bit–depth, Color image processing, Digital video standards.

Motion Estimation: Image formation, Motion models, 2D apparent motion estimation. Matching methods, Nonlinear optimization methods.

UNIT – IV

15 Periods

Video Segmentation and Tracking: Image segmentation, Change detection, Motion segmentation, motion tracking, Image and Video matting.

REFERENCES

1. L.R. Rabiner, R.E Schafer, W. Ronald, Theory and application of Digital speech processing, Pearson Education, 2011.
2. A. M. Tekalp, Digital video Processing, Prentice Hall, 2nd Edition, 2015.
3. B. Gold, N. Morgan, Speech & Audio Signal Processing, Wiley, 2011
4. A. N. Ince, Digital speech processing: Speech coding, synthesis and recognition, Springer Science & Business Media, 2013.
5. M. Parker, S. Dhanan, Digital video processing for Engineers, Elsevier, 2013.

ONLINE MATERIALS

1. <https://freevidelectures.com/course/2504/elec9344-speech-and-audio-processing>
2. <https://web.stanford.edu/class/ee392j/>

LEARNING OUTCOMES:

Upon successful completion of this course, the learner will be able to:

UNIT– I	<ul style="list-style-type: none">• Explain the basics of speech signal processing• Evaluate time domain and frequency domain methods for speech
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L	T	P	C
4	0	0	4

	processing
UNIT– II	<ul style="list-style-type: none"> • Demonstrate an understanding of the fundamentals of speech recognition • Demonstrate automatic speech recognition
UNIT– III	<ul style="list-style-type: none"> • Analyze merits and demerits of various motion estimation techniques
UNIT– IV	<ul style="list-style-type: none"> • Compare video segmentation and tracking techniques and explore recent techniques for practical applications

Course Code: INTOL427

Semester: III

INFORMATION RETRIEVAL & NATURAL LANGUAGE PROCESSING

Course Objectives:

This course aims to help the learners to interpret the phases in natural language processing, employ machine translation, understand the fundamentals of Markov models and interpret Parsing models vs Language models.

UNIT – I

15 Periods

Introduction: Rationalist and Empiricist Approaches to Language, Scientific Content, The ambiguity of Language: Why NLP Is Difficult, Lexical resources, Word counts, Zipf's laws, collocations, Concordances.

Linguistic Essentials: Parts of Speech and Morphology, Phrase structure, Semantics and Pragmatics.

Collocations: Frequency, Mean and Variance, Hypothesis Testing, Mutual Information, The Notion of Collocation.

UNIT – II

15 Periods

Statistical Inference: Word Sense Disambiguation: Methodological Preliminaries, Supervised Disambiguation, Dictionary–Based Disambiguation, Unsupervised Disambiguation, Word Sense.

Lexical Acquisition: Evaluation Measures, Verb Sub–categorization, Attachment Ambiguity, selection Preferences, Semantic Similarity, Role of Lexical Acquisition in Statistical NLP.

UNIT– III

15 Periods

Markov Models: Markov Models, Hidden Markov Models, The Three Fundamental Questions for HMMs, HMMs: Implementation, Properties, and Variants.

Part–of–Speech Tagging: The Information Sources in Tagging, Markov Model Taggers, Hidden Markov Model Taggers, Transformation–Based Learning of Tags, Tagging Accuracy and Uses of Taggers.

UNIT– IV

15 Periods

Probabilistic Parsing: Parsing for disambiguation, Treebanks, Parsing models vs. Language models, Weakening the independence assumptions of PCFGs, Tree probabilities and derivational probabilities, Phrase structure grammars and dependency grammars, Evaluation, Equivalent models, Building Search methods, Use of the geometric mean, Non–lexicalized Treebank grammars, Lexicalized models using derivational histories, Dependency–based models.

REFERENCES

1. C. D. Manning, H. Schutze, Foundations of statistical natural language processing, MIT Press, 2000.
2. J. Dan, Speech & language processing, Pearson Education India, 2021.
3. A. James, Natural language understanding, Pearson Education, 1995.
4. B. Steven, E. Klein, E. Loper, Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit, O'Reilly Media Inc., 2009.

ONLINE MATERIALS

1. <https://nlp.stanford.edu/links/statnlp.html>
2. <http://nptel.ac.in/courses/106101007/>
3. <http://nptel.ac.in/courses/106105158/>

LEARNING OUTCOMES:

Upon successful completion of this course, the learner will be able to:

UNIT– I	<ul style="list-style-type: none">• Construct n–gram model using probability and information theory concepts
UNIT– II	<ul style="list-style-type: none">• Employ word sense disambiguation techniques and similarity measures for semantic analysis
UNIT– III	<ul style="list-style-type: none">• Employ Markov models and PCFG for PoS tagging
UNIT–IV	<ul style="list-style-type: none">• Use PCFG to parse sentences and how machine categorizes and translates text

Course Code: MATOL549
Semester: III

L	T	P	C
3	0	0	3

ENERGY SYSTEMS MODELLING & ANALYSIS FOR DATA SCIENCE

Course Objectives:

This course aims to help learners to understand the primary energy analysis and System simulation model, train the learners to solve unconstrained nonlinear optimization model and to enable learners understand economy models and transient analysis.

UNIT- I**11 Periods**

Energy Chain: Primary Energy Analysis– Modelling Overview – Levels of Analysis– Steps in Model Development– Examples of Models. Quantitative Techniques: Interpolation– Polynomial– Lagrangian– Curve–fitting– Regression Analysis– and Solution of Transcendental Equations.

UNIT- II**11 Periods**

Systems Simulation: Information Flow Diagram– Solution of Set of Nonlinear Algebraic Equations– Successive Substitution– Newton–Raphson– Examples of Energy Systems Simulation Optimization– Objectives/Constraints– Problem Formulation.

UNIT- III**11 Periods**

Unconstrained Problems: Necessary & Sufficiency Conditions– Constrained Optimization– Lagrange Multipliers– Constrained Variations– Kuhn–Tucker Conditions. Linear Programming: Simplex Tableau– Pivoting– and Sensitivity Analysis.

UNIT- IV**12 Periods**

Dynamic Programming: Search Techniques – Univariate/Multivariate– Case Studies of Optimization in Energy Systems Problems– Dealing with Uncertainty– Probabilistic Techniques– Trade–offs Between Capital & Energy Using Pinch Analysis– Energy: Economy Models– Scenario Generation– Input Output Model. Numerical Solution of Differential Equations – Overview– Convergence– Accuracy– Transient Analysis – Application Examples.

REFERENCES

1. W.F. Stoecker, Design of Thermal Systems, McGraw Hill, 1989.
2. S.S. Rao, Optimization Theory and Applications, Wiley Eastern, 1990.
3. S.S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall, 2012.
4. P. Meier, Energy Systems Analysis for Developing Countries, Springer Verlag, 1984.
5. R. Neufville, Applied Systems Analysis, McGraw Hill, International Edition, 1990.

ONLINE MATERIALS

1. <https://nptel.ac.in/courses/109/101/109101171/>
2. <https://www.youtube.com/watch?v=4aocvJkhLQI>

LEARNING OUTCOMES:

Upon successful completion of each unit, the learner will be able to:

UNIT– I	<ul style="list-style-type: none">Analyze the Energy Chain and apply Quantitative Techniques curve-fitting and Regression Analysis on models
UNIT– II	<ul style="list-style-type: none">Apply numerical methods and system simulation on Energy Systems
UNIT– III	<ul style="list-style-type: none">Implement unconstrained optimization and constrained optimization techniques on nonlinear programming model
UNIT– IV	<ul style="list-style-type: none">Demonstrate the use of Probabilistic Techniques, Trade-offs Between Capital & Energy using Pinch Analysis

NAME OF THE PROGRAMME: Master of Arts (Sanskrit)

DURATION : 2 Years

ELIGIBILITY FOR ENROLMENT: Any recognized bachelor's degree of minimum three years duration with Sanskrit as subject of study in +2 or qualifying degree course or a pass in Kovidā examination.

PROGRAMME FEE : Tuition fee of Rs.9000/- per annum.

M.A. SANSKRIT
Scheme of Study

I Year (30 credits)

Course Code	Course Name	Credits
SKT101	Poetry & Prose	6
SKT102	Drama & Champu	6
SKT103	Poetics & Prosody	6
SKT104	Scientific Literature	6
SKT105	Jyotir Vigyan	6

II Year (32 credits)

Course Code	Course Name	Credits
SKT201	Early Texts, Gita and Upanishads	6
SKT202	Introduction to Yoga Sutra	6
SKT203	Vyakaranam	6
SKT204	Advaita / Visishtadvaita / Dvaita	6
SKT205	Sriman Narayaneeyam	8

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SASTRA DEEMED TO BE UNIVERSITY, THANJAVUR

M.A. SANSKRIT - I YEAR

PAPER I : Core Course 1 - Poetry & Prose

UNIT 1 : POETRY: Sisupalavadham - Verses 1 -- 75 (Text/ Literary merits)

UNIT II : History of Poetry Literature:

**Mahakavyas – Panchamaha kavyas – Historical kavyas- Lyrics-
Gnaomic & Didactic Poems and Anthologies**

**UNIT III : Kadambari Sangraha - an abridged version of Kadambari
of Banabhatta**

**by Pandit R.V. Krishnamacharya From the beginning to the
description of**

Acchodalake (Text/ Literary merits)

UNIT IV : History of Prose Literature.

**Prose romances-- Popular Tales & Fables & their characteristics,
important Prose**

Works.

**UNIT V: Annotations and explanations of passages from the text
books.**

Books for Reference:

**1. Sisupalavadham : Published by Chowkhambha-Sanskrit Series
office, Varanasi**

2. History of Sanskrit literature by Macdonell .A.A.

3. History of Classical Sanskrit Literature by Dasgupta

PAPER II : Core Course II - Drama & Champu

UNIT I : Malavikagnimitra of Kalidasa (Acts 1, 2 & 3)

(Text/ Literary merits/ Appreciation of Characters)

UNIT II : History of Drama Literature

Drama—various types of Sanskrit dramas & their Characteristics.

UNIT III : Champu Ramayanam by Bhoja (Sundarakandam alone)

(Text/ Literary merits / Critical Appreciation of Characters)

UNIT IV : History of Champu Literature - various Champus, their Authors & dates

with Literary merits.

UNIT V : Annotations, Explanations of Passages from the text books.

Books for Reference :

1. Malavikagnimitra of Kalidasa, with translation by M.R.Kale, published by

Motilal Banarasidas, Mumbai.

2. Champu Ramayanam by Bhoja (Sundarakandam alone), Published by

Chowkhambha-Sanskrit Series office, Varanasi.

3. History of Sanskrit literature by Macdonell .A.A.

4. History of Classical Sanskrit Literature by Dasgupta.

2

PAPER III: Core Course III - Poetics & Prosody

UNIT I : Scanning Techniques of the Vrttas

UNIT II : 10 Select Vrttas (Upajati, Sragvini, Malini, Sardulavikridita, Indravamsa ,

Raharsini, Rathodhata, Manju bhasini, Sraghara, Totakam)

**UNIT III : Kuvalayanandam: Introduction to Sanskrit Poetics. -
Sabdalankara**

**UNIT IV : Kuvalayanandam - Upama, Rupakam, Apahnuti, Utpreksha,
Atisayokti.**

**UNIT V : Kuvalayanandam-
Vyatireka,Dipakam,Ullekha,Vyajastuti,Samasokti,
Nidarsana,Slesha**

Books for Reference:

**1 . Vrttaratnakara(10 select Vrttas), Published by Chowkhambha-
Sanskrit**

Series office, Varanasi.

**2. Kuvalayanandam of Appayya Dikshita with Commentary,
Published by**

Chowkhambha-Sanskrit Series office, Varanasi.

PAPER IV: Elective I -- Scientific Literature

UNIT I : Introduction to Scientific Literature in Sanskrit

**UNIT II : Mathematics in Sanskrit – Bijaganitam of Bhaskra –
Introduction – Simple**

**Arithmetic through verses – Solution of Simple equations – Solution
of**

**Indeterminate equations with two and three variables –
Illustrations.**

**UNIT III : Vedic Mathematics – 16 Sutras – Explanations – Simple
Applications**

**UNIT IV : Indian Astronomy – (Chapters 1,2,4,5 & 6) of the book `
Indian Astronomy`**

**by Dr.S.Balachandra Rao – Introduction – Celestial Sphere – Rasi
and**

Naksatra Systems – Time – Calendars and Indian Panchanga

UNIT V : Ayurveda – Basics in Sanskrit Works - Definition and lakshana of ayu,

composition of ayu; definition and lakshana of Ayurveda; definition and

types of siddhanta; introduction of basic principles of Ayurveda and their

significance.

Books for Reference:

1. History of Literature by T.K. Ramachandran – R.S. Vadyar and Sons, Palghat

2. Bijaganitam of Bhaskaracharya with commentary by Panickar – Jayalakshmi

Indological publications, Mylapore, Chennai.

3. Vedic Mathematics by Bharati Krishna Tirtha – Motilal Banarsidass, Delhi

4. Anuvada Chandrika – Chakradhara Hansa Nautiyal

5. Sansrita Ayurveda Sudha – Dr.B.L.gaur

6. Praudh Rachananuvada Kaumudi – Dr.Kapil Dev Dwivedi

7. Indian Astronomy - An Introduction by Dr.S.Balachandra Rao, Bangalore

3

PAPER V : Elective II - Jyotir Vigyan

UNIT I : Description of characteristic features of signs and houses - Parts of the body of

Kalapurusha, Abodes of signs -- Lords of the signs -- Moolatrtkona signs, exaltation and

debilitation points, own signs of planets- Biped, centiped, watery and quadruped,

Shirshodaya - Nocturnal and diurnal signs - Moveable, fixed and common signs -- Dwara,

Bahis and Oarbha signs - Dhatu, Mula and Jeeva signs -- Krura, Saumya, odd, even, male,

female signs - Twelve houses and subjects with which they are concerned

UNIT II : Characteristic features of the planets and the matters under their Jurisdiction -

Subjects to be determined from the Sun and other planets- temperament, form, colour, dress,

appearance, etc., of the planets, places belonging to the planets - Gunas, Satwa, Rajas and

Tamas of planets - relations signified by them-Grains, gems and substances ruled by the

planets

UNIT III : Divisions of a sign Rasi, Hora, Drekkana, Panchamsa, Saptamsa, Navamsa,

Dasmaina, Dwadasauisa, Shodasamsa and Shastyamsa -- Shadvargas - Matters to be

considered from various vargas and their significance -- meaning and significance of

Vargottama -Parlajatamsa, Uttamamsa, Gopuramsa, Simhasanamsa, etc. -- Effects of Planets

In various conditions.

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UNIT IV : Panchamahapurusha yogas viz., Ruchaka, Bhadra, Hansa, Malavya and Sasa .-

Sunapha, Anapha and Durudhara - Kemadruma - Papavasi and Papakartarli - Amala -

Mahabhagya - Kesari - Sakata - Vasumati - Pushkala - Shubhamala and Ashubhamala -

Lakshmi - Gouri - Saraswati - Srikanta - Srinatha - Varunchi - Parivartana, Kahala - Raja

yoga - Sankhya yogas - Adhiyoga - Chamar, Dhenu, Saurya, Jaladhi. Chhatra, Astra, Kama,

Asura, Bhagya, Khyati, - Partjata and Musala yogas - Avayoga, Nisswayoga. Mriti yoga,

Kuhu yoga, Sarala yoga, Nirbhagya yoga, Dartdrayoga and Vimala yoga.

UNIT V : Effect of the Sun and other planets in the twelve houses.

Books for Reference:

1. Fundamentals of Astrology by Padur .A. Subramania Sastrigal, Pub. SASTRA,

Thanjavur.

2. Phala Deepika Of Mantreswara, by Padur .A. Subramania Sastrigal, Pub. SASTRA,

Thanjavur.

3. Prasna Jotisha , by Padur .A. Subramania Sastrigal, Pub. SASTRA, Thanjavur.

4. Navagraha Worship in India – Power of positive thinking, by Padur .A. Subramania

Sastrigal, Pub. SASTRA, Thanjavur.

5. Study of different Horoscopes Part I&II, compiled by Padur .A. Subramania

Sastrigal, Pub. SASTRA, Thanjavur.

6. Phala Deepika Of Mantreswara, English Translation, Commentary and annotation by

Dr. G. S. Kapoor, Ranjan Publications, New Delhi 1996.

Chapters: 1, 2, 3, 6 and 8 only.

4

SASTRA DEEMED UNIVERSITY, Thanjavur

Department of Oriental Studies and Research

M.A. SANSKRIT – II YEAR

PAPER VI : Core Course IV - Early Text/ Upanishads/ Gita Credit : 6

UNIT I : Vedic Reader for Students.

Study of hymns—Agni, Indra, Varuna

UNIT II : Study of hymns—Rudra, Vishnu, Purusha

UNIT III : Isavasya Upanishad (Full Text)

UNIT IV : Srimad Bhagavad Gita (Chapter 12 with any commentary)

UNIT V : History of Vedic Literature

Rigveda—Yajur veda- Sama veda ---- Athava Veda-- Brahamanas—

Upanishads, their Dates & Contents , Merits of Gita

Books for Reference :

1. Vedic Reader A.A.Macdonell.

2. Isavasya Upanishad (Any Publication)

3. Srimad Bhagavad Gita (Any Publication)

4. History of Sanskrit literature by Macdonell .A.A.

5. History of Classical Sanskrit Literature by Dasgupta.

**Copies can be had from Chowkhambha-Sanskrit Series office,
Varanasi.**

PAPER VII : Core Course V - Introduction to Yoga Credit : 6

UNIT I : Yoga Sutra - Chapter 1 - Sutras 1 to 40

**UNIT II : Yoga Sutra - Chapter 1 - Sutras 41 to 51 & Chapter 2 -
Sutras 1 to 30**

**UNIT III : Yoga Sutra - Chapter 2 - Sutras 31 to 55 & Chapter 3 -
Sutras 1 to 15**

UNIT IV : Yoga Sutra - Chapter 3 - Sutras 16 to 55

UNIT V : Yoga Sutra - Chapter 4 - Sutras 1 to 34

Book for Reference:

**1. Yogasutra of Patanjali, Sri Ramakrishna Math, Mylapore, Chennai-
600004.**

**2. Yogasutra of Patanjali, M/s. Motilal Banarsidass, Indological
Book-Sellers**

**and Publishers, Delhi - 110007, Branch :120 Royapettah High Road,
Mylapore, Chennai.**

PAPER VIII: Core Course VI - Vyakarana Credit : 6

UNIT I : First 16 lessons of the first book of Sanskrit by Bhandarkar

**UNIT II : Basics of Siddhanta Koumudi - Prakarana - Samjna &
Paribhasha**

UNIT III : Ac Sandhi & Hal Sandhi

5

UNIT IV : Visarga Sandhi and Svadi Sandhi

UNIT V : Panini and Computer Languages

Books for Reference:

1. First book of Sanskrit by Bhandarkar (First 16 lessons) - Nirnaya Sagar Press,

Mumbai

2. Siddhanta Koumudi (Published by Chowkhamba Sanskrit Series Office, Varanasi)

3. Naur to Panini by Dr.V.Gopalakrishnan - Journal of National Conference on Vedic and Ancient Indian Mathematics - 2010, (pages 84-90),

SASTRA University.

PAPER IX: ELECTIVE III (a) – VEDANTA- ADVAITA Credit : 6

UNIT I : Introduction to Vedanta and Adi Shankaracarya – The qualifications for the

study of Vedantha – the necessity of a guru

UNIT II : Superimposition – the individual and collective aspects – The nature of

Turiya –

The extensions of Ignorance – The nature of Subtle Bodies – The nature of

Gross Bodies – The Limit of Superimposition

UNIT III : The jiva and Superimposition – The Carvakas – The Bhuddhists –

Mimamsaka

views – The Sunyavadins – Establishment of the true nature of the Self

UNIT IV : De-Superimposition – Going back to the final cause – The meaning of

“Thou

art That” – The meaning of “I am Brahman”

UNIT V : The steps to Self-Realization – Study of Vedantic texts – Reflection and

Meditation – Samadhi: Its Nature and varieties – Samadhi and Sleep – The

Eightfold practice – The obstacles to Samadhi and their removal –

Characteristics of the Jivanmuktha – The Attainment of Kaivalya or Absoluteness

Book for reference:

1. Chatussutri, SASTRA Publication

PAPER IX: ELECTIVE III (b) – VEDANTA-VISISHTADVAITA Credit : 6

UNIT I : Introduction to Vedanta and Sri Ramanujacarya

UNIT II : Nature of Jeeva and Dharmabhutajnana

UNIT III : Nature of Brahman

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UNIT IV : Causality of Brahman

UNIT V : Brahmasutra and its contents

Book for reference:

Sri Ramanujamata Sangraha by Srinivasapattaracarya with English Translation, Published by Sri Krishna Sabha, Mumbai. 2003

PAPER IX: ELECTIVE III (c) – VEDANTA-DVAITA Credit : 6

UNIT I : Introduction to Vedanta and Sri Madhvacharya

UNIT II : Chapters 1 & 2 – Dravya & Guna Nirupanam

UNIT III : Chapter 3 & 4 – Pramanani & Srishtyadi Kartrutva Nirupanam

UNIT IV : Chapter 5 – Moksha Sadhana Nirupanam

UNIT V : Chapter 6 – Moksha Swarupa Nirupanam

Book for reference:

Padartha Sangraha (or Madhvasiddhantasara) by Sri Padmanabha Suri,

Edited by Dr. Ramacharya Malagi, Published by Dvaita Vedanta Studies and

Research Foundation, Bangalore.

PAPER X: DEVOTIONAL LITERATURE Credit : 8

External : 50 Marks (Written Examination) Internal : 50 Marks (Oral).

Memory Portion for Oral Test : Dasakas - 1, 98 and 100 are Compulsory. The

Candidates have to memorize Seven more Dasakas of his/her choice from the

remaining.

UNIT I Dasakas 1 - 21

UNIT II Dasakas 22 - 39

UNIT III Dasakas 40 - 64

UNIT IV Dasakas 65 - 80

UNIT V Dasakas 81 – 100

Text book : Sriman Narayaneeyam by SrimanNarayana Bhattatri with any

Commentary.

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NAME OF THE PROGRAMME: Master of Arts (Divya Prabhandam)

DURATION : 2 Years

ELIGIBILITY FOR ENROLMENT: Any recognized bachelor's degree of minimum three years duration with Tamil as subject of study in +2 or qualifying degree course.

PROGRAMME FEE : Tuition fee of Rs.9000/- per annum.

**M.A. DIVYA PRABANDHAM
Scheme of Study**

I Year (32 credits)

Course Code	Course Name	Credits
NDP101	Thiruvaimozhi I	6
NDP102	Thiruvaimozhi II	6
NDP103	Thiruvaimozhi III	6
NDP104	Songs of Thirumangai Azhwars	6
NDP105	Songs of Early Azhwars	8

II Year (32 credits)

Course Code	Course Name	Credits
NDP201	Thiruvaimozhi IV	6
NDP202	Thiruvaimozhi V	6
NDP203	Songs of Satagopar	6
NDP204	Songs of Later Azhwars	6
NDP205	Later Prabandhams	8

M.A. DIVYA PRABANDHAM

Course of Study

The Masters Degree Course on Divya Prabandham (offered through Distance Education) is slated for TWO Academic years. The first year will consist of 32 Credits with Three core papers and 2 elective papers. The second year will consist of 32 credits with Three core papers and 2 elective papers. (30 credits for external valuation and 2 credits for internal assessment in each year.)

Eligibility

Any Bachelor Degree holder is eligible to join M.A.Divya Prabandham course.

Syllabus for the First Year

Paper I	CORE COURSE I	<u>Tiruvaimozhi I (6 Credits)</u>	<u>80 Marks</u>
Unit I	Tiruvaimozhi 1 to 3 Dasakas in the First Centum		
Unit II	Tiruvaimozhi 4 to 6 Dasakas in the First Centum		
Unit III	Tiruvaimozhi 7 to 10 Dasakas in the First Centum		
Unit IV	Tiruvaimozhi 1 to 5 Dasakas in the Second Centum		
Unit V	Tiruvaimozhi 6 to 10 Dasakas in the Second Centum		

Books for reference

Divyārtha Deepkai Volumes by P.B.Annangaracharya Swami, Granthamala Publications, Kanchipuram, 1961 (Books now available at www.dravidaveda.org. Also available in pdf from at Geethacharyan 7, South Mada Street, Triplicane, Chennai 600 005.)

Also available at dravidaveda.org

Prabandha Rakshai Volumes by Uttamur T.Veeraraghavacharya Swami, Sri Uttamur Veeraraghavachariar Centenary Trust, No. 7 Nathamuni Street, T.Nagar Chennai. 1982

Tiruvaimozhi with commentary of V.K.Ramanujachariar, published by Vainavan Kural Trust, L42L, Bharathi Dasan Colony, K.K.Nagar, Chennai 600 078. 2012

Tiruvaimozhi with the commentary of V.N.Vedanta Desikan, published by Sri Visishtadvaita Pracharini Sabha, 30, Venkatesa Agraharam, Mylapore, Chennai 600004.

Paper II CORE COURSE II Tiruvaimozhi II (6 Credits) 80 Marks

Unit I	Tiruvaimozhi 1 to 3 Dasakas in the Third Centum		
Unit II	Tiruvaimozhi 4 to 6 Dasakas in the Third Centum		
Unit III	Tiruvaimozhi 7 to 10 Dasakas in the Third Centum		
Unit IV	Tiruvaimozhi 1 to 5 Dasakas in the Fourth Centum		
Unit V	Tiruvaimozhi 6 to 10 Dasakas in the Fourth Centum		

Books for reference

Divyārtha Deepkai Volumes by P.B.Annangaracharya Swami, Granthamala Publications, Kanchipuram, 1961 (Books now available at www.dravidaveda.org. Also available in pdf from at Geethacharyan 7, South Mada Street, Triplicane, Chennai 600 005.)

Also available at dravidaveda.org

Prabandha Rakshai Volumes by Uttamur T.Veeraraghavacharya Swami, Sri Uttamur Veeraraghavachariar

Centenary Trust, No. 7 Nathamuni Street, T.Nagar Chennai. 1982

Tiruvaimozhi with commentary of V.K.Ramanujachariar, published by Vainavan Kural Trust, L42L, Bharathi Dasan Colony, K.K.Nagar, Chennai 600 078. 2012

Tiruvaimozhi with the commentary of V.N.Vedanta Desikan, published by Sri Visishtadvaita Pracharini Sabha, 30, Venkatesa Agraharam, Mylapore, Chennai 600004.

Paper III CORE COURSE III Tiruvaimozhi III (6 Credits) (80 Marks)

Unit I Tiruvaimozhi 1 to 3 Dasakas in the Fifth Centum

Unit II Tiruvaimozhi 4 to 6 Dasakas in the Fifth Centum

Unit III Tiruvaimozhi 7 to 10 Dasakas in the Fifth Centum

Unit IV Tiruvaimozhi 1 to 5 Dasakas in the Sixth Centum

Unit V Tiruvaimozhi 6 to 10 Dasakas in the Sixth Centum

Books for reference

Divyārtha Deepkai Volumes by P.B.Annangaracharya Swami, Granthamala Publications, Kanchipuram, 1961 (Books now available at www.dravidaveda.org. Also available in pdf from at Geethacharyan 7, South Mada Street, Triplicane, Chennai 600 005.)

Also available at dravidaveda.org

Prabandha Rakshai Volumes by Uttamur T.Veeraraghavacharya Swami, Sri Uttamur Veeraraghavachariar Centenary Trust, No. 7 Nathamuni Street, T.Nagar Chennai. 1982

Tiruvaimozhi with commentary of V.K.Ramanujachariar, published by Vainavan Kural Trust, L42L, Bharathi Dasan Colony, K.K.Nagar, Chennai 600 078. 2012

Tiruvaimozhi with the commentary of V.N.Vedanta Desikan, published by Sri Visishtadvaita Pracharini Sabha, 30, Venkatesa Agraharam, Mylapore, Chennai 600004.

Paper IV ELECTIVE COURSE I Songs of Tirumangai Alvar (6 credits) (80 Marks)

Unit I Periya Tirumozhi decades 1-1, 2-3, 3-6, 5-8, 6-6

Unit II Periya Tirumozhi decades 7-4, 8-8, 8-10, 10-7, 11-8

Unit III Tirukkurunthandakam and Tirunedunthandakam (full)

Unit III Tiruvezhukootrirukkai, Sิริya Tirumadal (First half)

Unit IV Sิริya Tirumadal (Second half)

Books for reference

Divyārtha Deepkai Volumes by P.B.Annangaracharya Swami, Granthamala Publications, Kanchipuram, 1961 (Books now available at www.dravidaveda.org. Also available in pdf from at Geethacharyan 7, South Mada Street, Triplicane, Chennai 600 005.)

Also available at dravidaveda.org

Prabandha Rakshai Volumes by Uttamur T.Veeraraghavacharya Swami, Sri Uttamur Veeraraghavachariar Centenary Trust, No. 7 Nathamuni Street, T.Nagar Chennai. 1982

Iyarpa with the commentary of V.N.Vedanta Desikan, published by Sri Visishtadvaita Pracharini Sabha, 30, Venkatesa Agraharam, Mylapore, Chennai 4.

Paper V ELECTIVE COURSE II Songs of Early Azhvars (8 Credits)

Unit I Verses 1 - 40, and 99-100 of Mudal Tiruvandadi of Poigai Azhvar

Unit II Verses 1 - 40, and 99-100 of Irandam Tiruvandadi of Buthathazhvar

- Unit III Verses 1 - 40, and 99-100 of Mundram Tiruvandadi of Peyazhvar
Unit IV Verses 1 - 40, and 95-96 of Nanmugan Tiruvandadi of Tirumazhisai Azhvar
Unit V Verses 1, 81 to 120 of Tiruchandaviruttam of Tirumazhisai Alvar.

(First ten verses of each unit is prescribed for memory.) 20 marks

Books for reference

Divyārtha Deepkai Volumes by P.B.Annangaracharya Swami, Granthamala Publications, Kanchipuram, 1961 (Books now available at www.dravidaveda.org. Also available in pdf from at Geethacharyan 7, South Mada Street, Triplicane, Chennai 600 005.)

Also available at dravidaveda.org

Prabandha Rakshai Volumes by Uttamur T.Veeraraghavacharya Swami, Sri Uttamur Veeraraghavachariar Centenary Trust, No. 7 Nathamuni Street, T.Nagar Chennai. 1982

Iyarpa with the commentary of V.N.Vedanta Desikan, published by Sri Visishtadvaita Pracharini Sabha, 30, Venkatesa Agraharam, Mylapore, Chennai 4.

Syllabus for the II Year

Paper VI CORE COURSE IV Tiruvaimozhi IV 6 Credits (80 Marks)

- Unit I Tiruvaimozhi 1 to 3 Dasakas in the Seventh Centum
Unit II Tiruvaimozhi 4 to 6 Dasakas in the Seventh Centum
Unit III Tiruvaimozhi 7 to 10 Dasakas in the Seventh Centum
Unit IV Tiruvaimozhi 1 to 5 Dasakas in the Eighth Centum
Unit V Tiruvaimozhi 6 to 10 Dasakas in the Eighth Centum

Books for reference

Divyārtha Deepkai Volumes by P.B.Annangaracharya Swami, Granthamala Publications, Kanchipuram, 1961 (Books now available at www.dravidaveda.org. Also available in pdf from at Geethacharyan 7, South Mada Street, Triplicane, Chennai 600 005.)

Also available at dravidaveda.org

Prabandha Rakshai Volumes by Uttamur T.Veeraraghavacharya Swami, Sri Uttamur Veeraraghavachariar Centenary Trust, No. 7 Nathamuni Street, T.Nagar Chennai. 1982

Tiruvaimozhi with commentary of V.K.Ramanujachariar, published by Vainavan Kural Trust, L42L, Bharathi Dasan Colony, K.K.Nagar, Chennai 600 078. 2012

Tiruvaimozhi with the commentary of V.N.Vedanta Desikan, published by Sri Visishtadvaita Pracharini Sabha, 30, Venkatesa Agraharam, Mylapore, Chennai 600004.

Paper VII CORE COURSE V Tiruvaimozhi V 6 Credits (80 Marks)

- Unit I Tiruvaimozhi 1 to 5 Dasakas in the Ninth Centum
Unit II Tiruvaimozhi 6 to 10 Dasakas in the Ninth Centum
Unit III Tiruvaimozhi 1 to 3 Dasakas in the Tenth Centum
Unit IV Tiruvaimozhi 4 to 6 Dasakas in the Tenth Centum
Unit V Tiruvaimozhi 7 to 10 Dasakas in the Tenth Centum

Books for reference

Divyārtha Deepkai Volumes by P.B.Annangaracharya Swami, Granthamala Publications, Kanchipuram, 1961 (Books now available at www.dravidaveda.org. Also available in pdf from at Geethacharyan 7,

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Also available at dravidaveda.org

Prabandha Rakshai Volumes by Uttamur T.Veeraraghavacharya Swami, Sri Uttamur Veeraraghavachariar Centenary Trust, No. 7 Nathamuni Street, T.Nagar Chennai. 1982

Tiruvaimozhi with commentary of V.K.Ramanujachariar, published by Vainavan Kural Trust, L42L, Bharathi Dasan Colony, K.K.Nagar, Chennai 600 078. 2012

Tiruvaimozhi with the commentary of V.N.Vedanta Desikan, published by Sri Visishtadvaita Pracharini Sabha, 30, Venkatesa Agraharam, Mylapore, Chennai 600004.

Paper VIII CORE COURSE VI Songs of Satakopa 6 Credits (80 Marks)

Unit I Verses 1 to 30 of Tiruviruttam

Unit II Verses 31 to 60 of Tiruviruttam

Unit III Verses 61 to 100 of Tiruviruttam

Unit IV Tiruvasiriyam (full) and verses 1 to 40 of Periya Tiruvandadi

Unit V Verses 41 to 87 of Periya Tiruvandadi

Books for reference

Divyārtha Deepkai Volumes by P.B.Annangaracharya Swami, Granthamala Publications, Kanchipuram, 1961 (Books now available at www.dravidaveda.org. Also available in pdf from at Geethacharyan 7, South Mada Street, Triplicane, Chennai 600 005.)

Also available at dravidaveda.org

Prabandha Rakshai Volumes by Uttamur T.Veeraraghavacharya Swami, Sri Uttamur Veeraraghavachariar Centenary Trust, No. 7 Nathamuni Street, T.Nagar Chennai. 1982

Iyarpa with the commentary of V.N.Vedanta Desikan, published by Sri Visishtadvaita Pracharini Sabha, 30, Venkatesa Agraharam, Mylapore, Chennai 600004.

Paper IX ELECTIVE COURSE III Songs of Later Alvars 6 credits (80 Marks)

Unit I Tiruppalandu, Peiryazhvar Tirumozhi 2-4, 2-7, 2-9

Unit II Periyazhvar Tirumozhi 3-6, 3-10, 4-4, 5-4

Unit II Tiruppavai, Nachiyar Tirumozhi decades 6, 12.

Unit III Perumal Tirumozhi decades 4, 5, 7, 10

Unit IV Tirumalai 1-20, Amalanadhipiran, Kanninun Siruttambu

Books for reference

Divyārtha Deepkai Volumes by P.B.Annangaracharya Swami, Granthamala Publications, Kanchipuram, 1961 (Books now available at www.dravidaveda.org. Also available in pdf from at Geethacharyan 7, South Mada Street, Triplicane, Chennai 600 005.)

Prabandha Rakshai Volumes by Uttamur T.Veeraraghavacharya Swami, Sri Uttamur Veeraraghavachariar Centenary Trust, No. 7 Nathamuni Street, T.Nagar Chennai. 1982

Paper X ELECTIVE COURSE IV Later Prabhandams 8 credits

Unit I Satakopar Andadi by Kambar Verses 1-30

Unit II Iramanusa Nottrandadi Verses 1-35, 106, 107 and 108

Unit III Jnana Saram Prameya Saram of Arulalapperumal Emberumanar

Unit IV Adaikkala Pattu, Prabandha Saram, and Arthapanchakam of Vedanata Desika.

Unit V Upadesa Rathinamalai of Manavala Mamuni Verses 1, 34-73

(First ten verses of each unit is prescribed for memory.) 20 marks

Books for reference:

Satakopar Andadi with the commentary of V.M.Gopalakrishnamachariar. (Book available in pdf from at Geethacharyan 7, South Mada Street, Triplicane, Chennai 600 005.)

Nithyanusandhanam with the commentary of P.B.Annangaracharya Swami. (Book available in pdf from at Geethacharyan 7, South Mada Street, Triplicane, Chennai 600 005.)

Also available at dravidaveda.org

Desika Prabandham with the commentary of Uttamur Veeraraghavacharirar Swami, Pub. by Sri Uttamur Veeraraghavachariar Centenary Trust, No. 7 Nathamuni Street, T.Nagar Chennai.