

MCA SEMESTER – I**CS-11 : Information Technology****Credit:4**

Unit-I. Introduction to computers: Computer system concept, characteristics of computer, generations and types of computer, components of computer system, Booting process, classification of digital computer system. organization of computers.

Unit-2. Computer software and hardware: Software-System Software, application software, firmware, Programming languages classification: machine language, assembly language & high-level language. Evolution of programming languages: first generation, second generation, third generation & fourth generation Language, Language translator Compiler, Interpreter, Assembler. Hardware-Input and Output devices, Storage devices.

Unit-3. Operating System: Definition, Job, objective and evolution of operating system, Types of operating system, Network Operating System (NOS) .

Unit-4. Network Communication and Internet: Definition, Criteria, advantages and limitations of computer networking. Communication process, Communication types, Electronic data interchange (EDI), Types of computer network. Network topology. LAN and other network related protocols, OSI model. TCP/IP model, Networking Hardware & Software. Internet: Introduction, Internet basic. Internet protocols. Internet addressing. Browser WWW, E-mail, telnet, ftp, application, benefits and limitation of Internet, electronic conferencing. and teleconferencing.

Unit-5. Latest IT Trends and Role of IT: IT Trends - E-commerce, M-Commerce, Artificial Intelligence, computational Intelligence, Geographic Information System (GIS), Data Mining. Role of IT: Role of IT in different Area - Education, Industry, Banking. Marketing, Public Services and others.

Reference Books:

1. Reema Thareja, Information Technology and its Applications in Business, OUP.
2. V. Rajaraman, Fundamental of Computers, PHI.
3. Ray & Acharya, IT Principles & Application. PHI.
4. Leon & M. Leon, Fundamental of IT. Vikas Publication'

CS-12: Programming and Data Structure with C++**Credit: 4**

Unit-1 Introduction: Basic Terminology, Elementary Data Organization, Data Structure Operations, Algorithms Complexity, Time-Space Trade off. Arrays: Array Definition and Analysis, Representation of Linear Arrays in Memory, Traversing of Linear Arrays, Insertion And Deletion, Single Dimensional Arrays, Two Dimensional Arrays, Implementation of 1-D arrays, Row and Column Major implementations of 2-D.

Unit-II Stacks: Definition, operations on stacks, stack implementation using array and linked list, Applications of stacks: Infix, Postfix & Prefix expressions, Converting an expression from infix to postfix. Queues: Definition and concepts, Operations on queue, Types of queues: Linear queue, Circular queue, Priority queue, Double Ended queue, Implementations of queue.

Unit-III Linked List: Singly linked lists: Representation of linked lists in memory, Traversing, Searching, Insertion into, Deletion from linked list, Polynomial Addition and other operations on linked list, Header nodes, Doubly linked lists, Generalized lists.

Unit-IV Trees: Definition of trees and Binary trees. Properties of Binary trees and their implementation. Tree Traversal techniques such as pre-order, post-order, in-order traversal. Binary Search Trees, AVL trees, Threaded trees, Balanced multi way search trees, B-trees.

Unit-V Sorting Techniques: Basic concepts, Insertion Sort, Quick sort, two-way Merge sort, Heap sort, Sorting on different keys, External sorting. Searching Techniques: Linear Search and Binary Search. Hashing Techniques. Graphs: Basic concept and Representation of graphs. Traversal algorithms: Breadth first & Depth first search. Spanning tree algorithms, Shortest path algorithms.

Text Books

1. Tananbaum, "Data Structure Using C & C++"
2. Shahni,"Fundamentals of data structure with C++"
3. University Press Reference Books Data Structures & Program Design in C++ by Kruse & Ryba
4. Data Structures and Other Objects Using C++ by Michael Main, Walter Savitch Data
5. Structures via C++: Objects by Evolution by A. Michael Berman

CS-13: Discrete Mathematical Structure**Credit:4****Unit-1. Sets, Relations & Functions:**

Property of binary relations, equivalence, compatibility, partial ordering relations, hasse diagram, functions, inverse functions, composition of functions, recursive functions.

Unit-2. Mathematical Logic: Logic operators, Truth tables, Theory of inference and deduction, mathematical calculus, predicate calculus, predicates and quantifiers. Groups & Subgroup: Group axioms, Monoids, semi groups, Isomorphism, homomorphism, automorphism.

Unit-3. Lattices & Boolean Algebra: Truth values and truth tables, the algebra of propositional functions, Boolean algebra of truth values.

Unit-4. Combinatorics & Recurrence Relations: Permutation, Combination, Principle of Inclusion and Exclusion, Recurrence Relations. Generating Functions.

Unit-5. Graph Theory: Basic Concepts of Graphs and Trees, Adjacency and Incidence Matrices. Spanning Tree, Transitive Closure, Shortest Path, Planar Graphs, Graph coloring. Eulerian and Hamiltonian graphs, Applications of Graph Theoretic Concepts to Computer Science.

Reference Books:

1. Chakrabony & Sarkar, Discrete Mathematics' OUP'
2. Kolman & Rehman. Discrete Mathematical Structures' PE'
3. C.L. Liu, Elements of Discrete Mathematics' TMH
4. Iyenger, Discrete Mathematics' Vikas Pub'

CS-14: Digital Logic & Computer Design**Credit: 4**

Unit-1. Digital logic fundamentals: Number systems, Boolean algebra, gates, simplification of Boolean expressions. Combinational logic: adders, subtractors, Decoders, encoders multiplexer / demultiplexers. Sequential logic: Flip-flops, Counters.

Unit-2. Introduction to Intel 8086/88: Register model, Bus interface Unit, Execution unit, Control Unit: hardwired and microprogrammed control. Memory organization: Basic memory cell RAM. ROM and DRAM associative, cache and virtual memory organizations.

Unit-3. Assembly language Programming: Instruction formats, addressing modes, Intel 8086/88 instruction mnemonics, timing. data transfer, arithmetic and machine control instructions - Introduction to Macro assembler.

Unit4. Input/Output organization: Input interface, Data transfer techniques: synchronous, asynchronous, Interrupt driven, Intel 8086/88 interrupt organization, types, DMA, I/O processors. serial communication.

Unit-5. Processor organization: General register organization, stack organization. IBM PC architecture: Mother board, display adapters. add on cards, power supply. Architectural overview of Pentium, P-II, P-III and P-4.

Reference Books:

- 1 . Mano, Computer Systems Architecture. PE.
2. Gibson, Microcomputer Systems the 8086/88 family, PHI.
3. Ray and Bhurchandi. Advanced Microprocessors and Peripherals, TMH.
4. Abel. IBM PC Assembly language and Programming, PHI.

CS-15(I): Elective-I: Principles of Management**Credit:4**

Unit-1. Overview of management: Definition, Management, Role of managers, Evolution of Management thought, Organization and the environmental factors, Trends and Challenges of Management in Global Scenario.

Unit-2. Planning: Nature and purpose of planning. Planning process, Types of plans, Objectives, Managing by objective (MBO) Strategies, Types of strategies, Policies, Decision Making, Types of decision, Decision Making process, Rational Decision Making.

Unit-3. Organizing: Nature and purpose of organizing, Organization structure, Formal and informal groups organization, Line and Staff authority, Departmentation, Span of control, Centralization and Decentralization, Delegation of authority, Staffing, Selection and Recruitment. Orientation. Career Development. Career stages, Training, Performance Appraisal.

Unit-4. Directing: Creativity and Innovation. Motivation and Satisfaction, Motivation Theories, Leadership Styles. Leadership theories, Communication, Barriers to effective communication, Organization Culture. Elements and types of culture, Managing cultural diversity.

Unit 5. Controlling: Process of controlling. Types of control. Budgetary and non-budgetary control. Q-techniques. Managing Productivity, cost control. purchase control, Maintenance Control. Quality Control. Planning operations.

Reference Books:

1. Bhatt. Principle of Management. OUP.
2. Massie. Organization and Management. PHI.
3. Robbins and Coulter, Management, PHI.
4. Hill and McShane, Principles of Management, TMH.

CS-15(II): Elective-1 : Organizational Behavior**Credit:4**

Unit-1. Introduction to organization Behavior:. Historical roots of organizational Behavior, Fundamental concepts, Nature, Emerging trends in the organizational behavior, Limitation of Organization Behavior, Challenges & Opportunities for Organization Behavior.

Unit-2. Motivation: Importance of motivation at work, approaches to motivation, content theories, process theories, motivation and its effects, McGreoger theory X and y, Maslow's need hierarchy, Herzberg's two factor theory, Vroom expectancy theory, OB modification.

Unit-3. Power and Politics: Definition and nature of Power, Types of power, contingencies of Power, organizational Politics, where does it occur, Types of political activity, political strategies political power acquisition in modern organization, coping with organizational politics, Empowerment, Organizational politics and its effects, organizational politics and ethics.

Unit-4. Conflicts and negotiation: Conflict, Historical perspective behind conflict or approaches to conflict, Nature and type of conflict, conflict Processes, Interpersonal conflict Management Styles, Levels of conflict, Perceptual Errors Responsible For conflict, Consequences of conflict. coping strategies, Negotiation, strategies, processes, issues on negotiation.

Unit-5. Communication, feedback, Stress and Leadership: Transactional analysis, Johari window, job analysis and.lob design: issues, techniques and methodology. Stress: Nature of stress, causes. and consequences, Individual differences in resistance to stress; techniques of managing stress. Leadership: Concept and style, Fiedler's contingency mode, path-goal theory, leadership effectiveness.

Reference Books:

1. Chadha, Perspectives in Organizational Behavior, Galgotia Publications.
2. Luthans, Organizational Behavior, TMH.
3. Greenberg, Behavior in Organizations, PE.
4. McShane and VanGlinow, Organizational Behavior, TMH.

CS-16: Practical based on Paper CS-12**Credit: 4**

MCA SEMESTER – II

CS21 Object oriented programming in JAVA

Credit: 4

Unit-1. Introduction to OOP and JAVA fundamentals

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File - Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

Unit-2. Inheritance and interfaces

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, ArrayLists - Strings

Unit-3. Exception handling and I/O

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

Unit-4. Multithreading and generic programming

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

Unit-5. Event driven programming

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management -

Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

Reference Books:

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.
3. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015.
4. Steven Holzner, “Java 2 Black book”, Dreamtech press, 2011.
5. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.

CS-22: Statistical & Numerical Computing**Credit:4**

Unit-1. Basic statistics: measure of central tendency, dispersion. Probability, distribution, introduction to mass function, density function, distribution function, estimation of parameter Regression Analysis: Linear and Non linear regression Multiple regression, testing of Hypothesis: Test of Significance, Chi-square test, t-test, ANOVA, F-test.

Unit-2. Interpolation: Newton's Forward, Backward, Sterling & Bessel's Interpolation formula. Lagrange's Interpolation.

Unit-3.Integration:Trapezoidal,simpson's 1/3rd,Weddel's Rule, Romberg integration, Gauss Legendre two & three point formula, Newton cotes Formula. Gram-Schmidt orthogonalisation, Tchebycheff Polynomial.

Unit-4. Solution of transcendental and system of linear equations: Method of Iteration, Method of Bisection. Newton - Raphson Method, Regula-Falsi method. Secant Method; Gauss Elimination Method, Gauss-Jacobi, Gauss-Seidel LU factorization' Tridiagonalisation, Inverse Interpolation. Least Square curve fitting: linear & non-linear.

Unit 5. Solution of Differential Equations: Picard's method, Euler-modified method, Taylor's Series method, Runge-Kutta method, Milne's Predictor-Corrector method.

Reference Books:

1. Pal. Numerical Methods. OUP.
2. Balaguruswamy, Numerical and Statistical methods, TMIH
3. V. Rajaraman, Introductory methods of Numerical Analysis, PHI.
4. A.M. Goon, M.K, Gupta and T.S. Dasgupta, Fundamentals of Statistics, The World Press Pvt. Ltd.

CS-23: Operating System & Shell Programming**Credit:4**

Unit-I. Introduction: Definition, Design Goals, Evolution; Concept of User, job and Resources; Batch processing, Multi-programming, Time sharing Structure and Functions of Operating System.

Unit-2. Process Management: Process states, State Transitions, Process Control block, Context Switching, Process Scheduling. Scheduling algorithm, Threads, Inter process synchronization and communication-need, Mutual exclusion, semaphore, Monitors, Messages, Deadlock, Deadlocks Prevention, Deadlocks Avoidance, Deadlocks Detection.

Unit-3. Memory Management: Address Binding, Dynamic Loading and Linking Concepts, Logical and Physical Addresses, Contiguous Allocation. Fragmentation, Paging, Segmentation, Combined Systems, Virtual Memory, Demand Paging, Page fault, Page replacement algorithms, Global Vs Local Allocation, Thrashing, Working Set Model, Paging.

Unit-4. File and Secondary Storage Management: File Attributes, File Types, File Access Methods, Directory Structure, File System Organization and Mounting, Allocation Methods, Free Space management; Disk Structure, Logical and Physical View, Disk Head Scheduling, Formatting, Swap Management, Operating System Security, Case Study of UNIX/ LINUX and WINDOWS Operating systems.

Unit-5. Shell programming: Need of Shell programming, types of Shells in Linux/Unix, Shell variables: User Defined Variables, environment variables, predefined variables, reading values into user defined variables, command substitution computation on shell variable , handing shell variables, passing arguments to the shell, shift command, conditional execution operators, conditional statements, test command, Iterative statements : for, while, until, break, continue statements , practical examples on shell programming, Exercises on shell programming.

Reference Books:

1. Chauhan, Principles of Operating System, OUP.
2. A. Tanenbaum, Operating System, PE. 3. W. Stalling, Operating System, PHI.
4. YashwantKanitkar'. Unix Shell Programming, BPB.
5. Silberschatz and Galvin, Operating System Concepts, Addison Wesley.

CS-24: Formal Language and Automata Theory**Credit:4**

Unit-I. Theory of Automata: Definition of an automaton, Transition system, Acceptability of a string by FA, Nondeterministic finite state machine, equivalence of DFA and NFA, Mealy and Moore models. Minimization of Finite Automata.

Unit-2. Formal Languages, Regular Sets and Regular Grammars: Definition, Languages and their relation, Chomsky classification of language, Recursive and recursive enumerable sets, Regular expression. and Finite automaton, Pumping Lemma for regular sets, Application of Pumping lemma, Closure property of regular sets, Regular sets and regular grammar.

Unit-3. Context-free Language: context free language and derivation trees, ambiguity in context free languages. Simplification of context free languages: (left recursion, unit production elimination, eliminating null values), Normal forms of context free languages, Pumping lemma.

Unit-4. Pushdown Automation: Definition, Acceptance by PDA, Push down automation and Context free languages. Parsing and Pushdown automata.

Unit-5. Turing Machine: Turing Machines model, Representation of TM, Languages acceptability by TM, design of TM. Universal Turing Machines (UTM). Turing machine and type, grammars, Halting problem, Linear bounded automata and languages.

Reference Books:

1. Hopcraft, Motwani and Ullman. introduction to Automata Theory. Languages and Computation, PE.
2. Cohen, Introduction to Computer Theory, John Wiley.
3. Martin, Theory of Computation, TMH.
4. Papadimitrou, Elements of the Theory of Computation, PH I.

CS-25(I): Elective-II: Financial Accounting**Credit: 4**

Unit 1. Introduction: Definition and objectives of Accounting. Accounting Equation, Basic Accounting Terms Theory Base of Accounting- GAAP Dual Aspect of Accounting' account process, drafting of financial statement- Journal, Ledger, Book.

Unit 2. Financial Statements: Trial Balance, Types of Errors. Rectification of Errors, Suspense Account, Financial Statements- Preparation of Trading A/C, Profit & Loss A/C and Balance sheet.

Unit 3. Cost Accounting: Costing, Marginal and Absorption Costing, Cost, Volume and Profit (C-V-P) Analysis. Break-Even Analysis, Determination of Break-Even Point, Profit Volume (PV) Ratio, Margin of Safety.

Unit 4. Financial Management: Concept of Funds and relevant Inflow & Out flow, Capital Budgeting, Traditional Techniques, Discounted Cash-Flow or Time-Adjusted Techniques, Present Value Concept. Payback Period, Average Rate of Return (ARR), Present Value (PV), Net Present Value (NPV), internal Rate of Return (IRR), Methods, Profitability Index.

Unit-5. Introduction to Computerized Accounting System: Coding logic and codes required, master files, transaction files; introduction to documents used for data collection, processing of different files and outputs obtained (The concepts may be explained using available accounting package).

Reference Books:

1. Ambrish Gupta. Financial Accounting, PE.
2. Bhattacharyya, Financial Accounting for Business Managers, PHI.
3. Khan & Jain, Financial Management, TMH.
4. I.M. Pandey, Financial Management. Vikas Pub.

CS-25(II): Elective-II: E-Commerce**Credit: 4**

Unit-1. Introduction: Definition, objectives, Advantages and disadvantages, Forces driving E-commerce, Traditional commerce vs. E-commerce, E-commerce opportunities for industries, Growth of E-Commerce.

Unit-2. E-Commerce Models: Business to consumer, Business to Business, consumer to other models - Brokerage Community Model, Aggregator Model, Info-mediary Model, community Model and value chain Model.

Unit-3. Electronic payment Systems: Special features required in payment systems, Types of E-payment systems. E cash, E-cheque, credit card, Smart Card, Electronic purses.

Unit-4. E-Marketing: E-customer Relationship Management, E-supply chain Management.

Unit-5. Security Issues in E-Commerce: Security risk of E-commerce, Types of threats, tools and risk management approach, Cyber laws, Business Ethics, IT Acts.

Reference Books:

1. Bhaskar, Electronic commerce
2. Kalakota & Whinston, Framework technologies and Applications. TMH.
3. Kamlesh, and Deeksha. Business on the Net introduction to the E-Com, Macmillan India.
4. Joseph, E-Commerce: A Managerial perspective, PHI.

CS-26: Practical based on paper CS 21**Credit:4****CS-27: AECC-1 (Qualifying & non CGPA)****Credit:4**

MCA SEMESTER-III

CS-31: Advance Java Programming using J2EE

Credit:4

Unit-I. Introduction to Java: Review of Java Basic Features, Applets, AWT Controls, Event Handling, Multithreading, I/O files. Swing: Features, components, swing vs AWT, swing containers, controls, using Dialogs, sliders, progress bars, tables, creating user interface using swing.

Unit-2. Java Database Connectivity: Connectivity model, Java.SQL package, JDBC Exception classes, Database connectivity, Data manipulation and navigation, creating database applications. Java RMI: Distributed object technologies, RMI architecture, creating RMI applications.

Unit-3. Java Networking: Java Servlets: Servlets vs CGI, Servlet lifecycle, creating and running simple servlets. Networking: Networking basics, Client / server model. Java and the Net, TCP/IP client sockets, TCP/IP server sockets, Inet Address, URL, Data grams, creating simple networking applications.

Unit-4. Java Beans: Component architecture, Advantages of Beans, Bean Developer kit (BDK). JAR files, introspection, developing Beans, Using Bound properties. The Java Beans API, Introduction to EJB (Enterprise Java Beans), Types of EJB, Uses of EJB.

Unit-5. Java Server Pages: Introduction. JSP Architecture, JSP objects, developing simple Web Applications.

Reference Books:

1. Roy, Advance .java Programming, OUP.
2. H. Schildt, Java 2: The Complete Reference, TMH.
3. Deitel, Java- How to Program, PHI.
4. Seth & Juneja, java, OUP.

CS-32: Data Communication and Computer Network**Credit:4**

Unit-1. introduction: Data Transmission concepts, transmission impairments, switching, modulation, multiplexing; Network Hardware-LAN, MAN, WAN, Wireless networks, Internet-works; Network Software- Layer, Protocols, interfaces and services; Reference Models-OSI, TCP/IP and their comparison. Physical Layer: Transmission Media : Magnetic, twisted pair, coaxial cable, fiber optics. wireless transmission (radio, microwave, infrared), ATM. ISDN, Cellular radio and communication satellites.

Unit-2. Data Link Layer: Framing, Error control, Sliding window protocols (one bit, Go back n. selective repeat), Examples of DLL Protocols-HDLC, PPP, Medium Access Sub layer : Channel Allocation, MAC protocols - ALOHA, CSMA protocols, Collision free protocols, Limited contention Protocols. wireless LAN protocols, IEEE 802.3,802.4, 802.5 standards and their comparison.

Unit-3. Network Layer: Design issues. Routing algorithms (shortest path. flooding, flow based, distance vector. hierarchical, broadcast, multicast, for mobile hosts), Congestion control algorithms (Leaky bucket, Token bucket, Choke Packet, Load shedding), Internetworking, IP Protocol, ARP, RARP.

Unit-4, Transport Layer: Addressing. establishing and releasing connection, flow control, buffering. Internet Transport Protocol (TC P and UDP).

Unit-5. Application Layer: Domain name system, E-mail, File transfer protocol' HTTP, HTTPS. World Wide Web.

Reference Books:

1. Trivedi, Computer Network, OUP.
2. Tanenbaum. Computer Networks. PH[.
3. Stallings, Data and Computer Communications, PHI.
4. Forouzan, Data Communications and Networks, TMH.

CS-33: Database Management System**Credit:4**

Unit-1. Basic Concept: Database Systems, Characteristics, Data Models. Database Languages. DBMS Architecture. Database Users and Data Independence.

Unit-2. Database Design using ER Model: ER Modeling, relation types, role and Structural Constraints. Extended ER Modeling Features, Design of an ER Database Schema. Reduction of ER Schema to Tables. Relational Model: Codd's rules, Relational Model Concepts, Relational Algebra, Relational Calculus.

Unit-3. Introduction to SQL: SQL data types and literals, Types of SQL commands. SQL operators. Tables, views and indexes, Queries and sub queries, Aggregate functions, Cursors in SQL.

Unit-4. Relational Database Design: Functional and multi-valued Dependencies. Desirable Properties of Decomposition, Normalization up to 5 NF.

Unit-5. Selected Database Issues: Security, Transaction Management, Basic Algorithms to Query Processing and Query Optimization, Concurrency Control, Recovery Techniques, Case Study: Oracle/MS-SQL.

Reference Books:

1. Silberschatz, Database System Concepts, TMH.
2. Raghuram Ramakrishnan, Database Management Systems, TMH.
3. Elmasri and Navathe, Fundamentals of Database Systems, PE.

CS-34: Optimization Technique**Credit:4**

Unit-1. Introduction: Nature and Meaning, History, Management Applications, Modeling. Principles. Characteristics, Solution, Development of OR In India, Role of Computers in OR.

Unit-2. Linear Programming: Introduction and Applications of LP, Limitations of LP Formulation of a LP Model, Graphical Solution of a LPP, Simplex Method, Two Phase Method, Big-M Method.

Unit-3. Transportation, Assignment and Replacement Problem: Introduction to Transportation Problem. Mathematical Formulation, Feasible Solution and Optimum Solution: Introduction to Assignment Problem, Mathematical Formulation. Traveling Salesman Problem; Introduction to Replacement Problem, Capital Equipment, Discounted Cost. Replacement in Anticipation of Failure.

Unit-4. Queuing Problems: Classification of self problems, processing of n jobs through two machines. three machines, processing of two jobs through m machines.

Unit-5. Project Management by PERT-CPM: Introduction, History & Applications, Basic Steps. Network Diagram Representation, Rules, Time Estimates and Critical Path in Network Analysis, Uses and Applications of PERT/CPM.

Reference Books:

1. Pai. Operation Research, OUP.
2. Panerselvam, Operation Research. PHI.
3. Hillier & Liebernan, Operations Research, TMH.

CS-35(1): Elective-III : Parallel & Distributed Computing**Credit:4**

Unit-1. Introduction: Need for Computational speed; Applications of parallel computers in various fields including Mathematics, Physics, Chemistry and Computer Science; Configuration of some existing Mainframe and Super Computers for parallel processing; issues in parallel processing.

Unit-2. Parallel Processing Architectures: Parallelism in Sequential Machines, Abstract model of parallel computer, multiprocessor architecture, programmability issues.

Unit-3. Data Dependency Analysis: Introduction, Types of Dependencies, Loop and Array Dependence, Loop Dependence Analysis, Solving Diophantine Equations.

Unit-4. Shared Memory Programming: General Model, Process Model under UNIX, Thread Management, Thread Implementation.

Unit-5. Distributed Computing: Message passing model, Parallel Virtual Machine (PVM), Remote procedure call. Algorithms for Parallel Machines: Speedup, Complexity and Cost, Parallel Reduction. Quadrature Problem, Matrix Multiplication, Parallel Sorting Algorithms and Solving Linear System.

Reference Books:

1. Sasikumar, Shikhara, Dinesh and Prakash, Introduction to Parallel Processing, PHI.
2. Rajaraman, Elements of parallel Computing, PHI.
3. Susann, Parallel Programrning, TMH.

CS-35(II): Elective-I I I : Managerial Economics**Credit:4**

Unit-1. Demand and Supply: Concept of demand , determinants of individual and market demand functions, elasticity of demand price, income and cross elasticity- concept of supply, determinants of individual and market supply functions, elasticity of supply, Equilibrium price.

Unit-2. Production: Production function in short run - law of variable proportion, production function in the long run - isoquants, isocosts, ridge lines, returns to scale; producer's equilibrium - optimum combination, cost function - short run costs, long run average cost, long run marginal cost. Reasons of 'U' shape of short and long run cost curves, economies and diseconomies of scale.

Unit-3. Market structure: Price and output determination under perfect competition and monopoly, Comparison between perfect competition and monopoly with respect to Efficiency.

Unit-4. Pricing: Demand and supply of factors of production, pricing of a single variable factor under perfect competition and monopoly; modern theory of rent, quasi-rent.

Unit-5. Macroeconomics: Meaning of macroeconomics, Keynesian theory of determination of income and employment in the three sector economy, multiplier analysis, IS-LM model of equilibrium income and interest rate, Meaning and objectives of fiscal and monetary policies.

Reference Books:

1. Damodaran, Managerial Economics, OUP.
2. Petersen, Managerial Economics, PHI.
3. Mote, Managerial Economics-Concepts and Cases, TMH.
4. Pindyck, Rubinfeld and Mehta, Microeconomics, PE.

CS-36: Practical based on Paper CS-31 & CS-33**Credit: 4****CS – 37 : AECC-2 (Qualifying & non CGPA)****Credit: 4**

MCA SEMESTER – IV**CS-41: Web Technologies****Credit:4****Unit .1. Internet concept:** Fundamental of web, History of web, web development

overview, Domain Name System (DNS), DHCP and SMTP and other servers, Internet service provider (ISP), concept of IP Address, Internet protocol, TCP/IP Architecture and protocol (IP), Web Browser and Web Server.

Unit-2. HTML & CSS: HTML Tag, Rules of HTML, Text Formatting & style, List, Adding Graphics to Html Document, Tables and Layout, Linking Documents, Frame, forms, Project in HTML, Style sheet, types of style sheets- Inline, External, Embedded CSS; text formatting properties, CSS Border, margin properties, positioning, color properties, Use of classes in CSS.

Unit-3. Scripting Language: Java Script, Advantage of Java Script, JS object model and hierarchy, Handling event, operators and syntax of JS, Function, Client side JS Vs Server side JS, JS security.

Unit-4. XML: Introduction to XML, XML in Action, commercial Benefits of XML, Gaining competitive advantage with XML, programming in XML, XML schema, XSLT, DOM structure model, XML queries and transformation.

Unit-5. PHP: Overview of PHP, capabilities PHP, HTML embedding tags & syntax, PHP Language Core Variables, constants, data type, operators, flow control & loops Arrays, string, functions, Include & require statements, simple File & Directory access operations Error. handling Processing HTML form using GET, POST SESSION, COOKIE variables. Sending E-mail, Introduction of object-oriented PHP, Database operations with PHP, Built in functions, Connecting to My-SQL, Selecting a database, building & Sending query, retrieving, updating & inserting data.

Reference Books:

1. Roy, Web Technologies, OUP.
2. Sabesta, Programming the World Wide Web, PE.
3. Godbole&Kahate, Web Technologies, TMH

CS-42: Software Engineering**Credit: 4**

Unit-I. Introduction to Software Engineering: Definition, Software development and life cycle models, CMM, Software quality, role of metrics and measurement, Requirements Analysis and Specification: SRS Building process, Specification Languages Validation of SRS, metrics, monitoring and control, Object Oriented analysis.

Unit-2. Software Project planning: Software cost Estimation Techniques, project Scheduling & Tracking, project Team Standards, software configuration management, management.

Unit-3. System Design and Implementation: Design concepts and Notations, Functional & Object Oriented Design concepts, Design Strategies, Design specification and verification, Metrics, Design Translation process.

Unit-4. Software Testing: Testing Strategies & Techniques, Debugging, Software Maintenance,

Unit-5. Software Quality Assurance : Quality Concepts, Matrix for Software Quality, Quality Movement, Software Quality Assurance, Software Review, Formal Technical Reviews, Formal Approaches to Software Quality Assurance, Software Reliability, ISO 9000 quality Standards, IEEE Standards.

Reference Book:

1. Jain, Software Engineering, OUP.
2. Pressman, Software Engineering, TMH.
3. Rajib Mall, Fundamentals of Software Engineering, PHI.
4. Sommerville, Software Engineering, PE.

CS-43: Computer Graphics**Credit:4**

Unit-1. Introduction: Fundamentals, classification of computer Graphics, Advantages and representative uses of computer Graphics; Raster scan and Random Scan, graphics storages, displays processors and character generators, colour display techniques, interactive input/output devices.

Unit-2. Graphics Primitives: points and lines, Line drawing algorithms, Simple DDA and Symmetric DDA; Bresenham algorithm; Generation of other Curves, circle generators.

Unit-3. 2D viewing and clipping: point clipping, line clipping, Cohen Sutherland line clipping algorithm, polygon clipping algorithm of Sutherland and Hodgman viewing transformations.

Unit-4. 2D Transformations: Translation, Rotation and Scaling, Matrix Formulation of transformations and concatenation.

Unit-5. 3D concepts: 3D representation, transformations, perspective and parallel projections, spline curves and surfaces, Quad tree and Octree data model for solid objects.

Reference Books:

1. Bhattachary, Computer Graphics, OUP.
2. Hearn and Baker, Computer Graphics, PHI.
3. Foley, Computer Graphics: principals and practices, Addison-Wesley.
4. Harrington. Computer Graphics. TMH.

CS-44: Big Data Analysis & Cloud Computing**Credit:4**

Unit-1. Introduction To Big Data: Challenges of Big Data, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting, Modern Data Analytic Tools, Statistical Concepts.

Unit-2. Mining Data streams: Stream Data Model and Architecture, Stream computing, Sampling Data in a Stream, Filtering streams, Counting Distinct Elements in a Stream, Estimating, Moments, Counting Oneness in a Window, Decaying Window.

Unit-3. Hadoop: The Hadoop Distributed File System, Components of Hadoop, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Map Reduce: Map Reduce Features, How Map Reduce Works, Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort, Task execution, Map Reduce Types and Formats.

Unit-4. Cloud Computing Fundamentals: Private, Public and hybrid cloud, Evolution of Cloud Computing; Characteristics of Cloud, Cloud Types, Cloud Computing Benefits and Limitations, Cloud Architecture; Cloud computing vs. Cluster computing vs. Grid computing; Applications: Technologies and Process required when deploying Web services; Deploying a web service from inside and Outside of a Cloud.

Unit-5. Cloud Computing service models and Vendors: SaaS, IaaS, PaaS; Storage as a Service, Communication as a Service; Cloud-based big data/real time analytics, Understanding SOA; Improving Performance through Load Balancing. Virtualization Basics: Enterprise, VMware, Server Virtualization, Data Storage Virtualization. Cloud vendors: Amazon cloud, AWS Overview, Installation of AWS, Google app engine, azure cloud, salesforce.

Reference Books:

1. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", TMH.

2. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons.
3. Pete Warden, "Big Data Glossary", O'Reilly.
4. Cloud Computing : A Practical Approach by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, TMH.
5. Cloud Computing Bible, Barrie Sosinsky, Wiley-India.
6. Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Wiley-India.

MCA SYLLABUS(CBCS)

CS-45(I): Elective-IV: Compiler Design**Credit: 4**

Unit-1. Introduction to Compilation: Compilers and phases of compilation, analysis synthesis model of translation, compiler construction tools.

Unit-2. Lexical & Syntax Analysis: Process of lexical analysis, finite state automata, DFA and NFA, recognition of regular expressions, LEX; Process of syntax analysis, types of grammar, top-down and bottom-up parsing techniques, parser generator. Overview of syntax directed translation scheme LR parser concepts.

Unit-3. Intermediate Code Generation: Intermediate languages, generating intermediate code for declarative statement, assignment statement, Boolean expression, and case statement, Type checking and Symbol table

Unit-4. Code Optimization: Introduction to code optimization, potential cases of code optimization, optimization of basic blocks, loops in flow graphs, code improving transformation.

Unit-5. Code Generation : Issues in the design of a code generator, the target machine, dynamic storage management, translating basic blocks, a simple code generator, peephole optimization, directed acyclic graphs and basic blocks, code generation from directed acyclic graphs.

Reference Book:

1. Muneeswaran, Compiler Design, OUP.
2. Aho, Ullman, &Sethi, Compilers : Principles, Techniques & Tools, Addison Wesley.
3. HenkAlblas et al., Practice & Principles of Compiler Building with C, pHI.
4. Trembley& Sorenson, Principles of Compiler Design, TMH.

CS-45(II): Elective-IV: Digital Image Processing & Multimedia**Credit:4**

Unit-1. Introduction and Fundamental to Digital Image Processing: what is Digital Image Processing, Origin of Digital Image Processing, Examples that use Digital Image Processing, Fundamental steps in Digital Image Processing, components of Digital Image Processing System, Image sensing and acquisition, Image sampling, quantization and representation, Basic relationship between pixels.

Unit-2. Image Enhancement: Image Enhancement in the Spatial Domain & Frequency domain: Background, Basic gray level transformation, Histogram processing, Basics of spatial filtering, Smoothing and Sharpening Spatial filters, Introduction to Fourier Transform and the Frequency Domain, Discrete Fourier Transform. Smoothing and Sharpening Frequency-Domain filters.

Unit-3. Image Restoration: Image Degradation/Restoration process, Noise models, Restoration in presence of noise, Inverse Filtering, Minimum Mean Square Filtering, Geometric mean filter, Geometric transformations. color Image processing: color Fundamentals, color models, Basis of full color image processing, color transformations.

Unit-4. Image compression: Fundamentals, Image compression models, Error free compression. Lossy compression.

Unit-5. Image Segmentation and Representation: Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation. Representation, Description and Recognition: Representation-chain codes, polygonal approximation and skeletons, Boundary descriptors-simple descriptors, shape numbers, Regional descriptors simple, topological descriptors, Pattern and Pattern classes-Recognition based on marching techniques.

Reference Books:

1. Sridhar, Digital Image Processing, OUP.
2. Gonzalez & Wood, Digital Image Processing, PE.
3. Jain, Digital Image Processing, PHI.
4. William K Pratt, Digital Image Processing, John Willey.

CS-45(III): Elective-IV: Information security**Credit: 4****Unit-1. Overview of Information Security:** Basic Concepts, Cryptosystems,

Cryptanalysis, Ciphers & Cipher modes, Symmetric Key Cryptography- DES, AES.

Asymmetric Key cryptography- RSA algorithm, Key management protocols, Diffie Hellman Algorithm, Digital Signature, Digital Signatures, public Key Infrastructure.

Unit-2 System Security: Program Security-security problems in Coding, Malicious Logic, Protection. Database Security-Access controls, security & Integrity Threats, Defense Mechanisms. OS Security- Protection of System Resources, Models for OS security. Net Security-User based security, Code access security, Form authentication.**Unit-3. Network Security:** LAN security-Threats, Authentication & access control, Secured communication Mechanisms (IPSec, Kerberos, Biometric, PKI), Secured Design for LAN.**Unit-4. Internet Security:** Firewall & IDS Firewall Techniques, Firewall Architecture, Types of IDS, IDS Tools. Email & Transaction Security Mechanisms privacy Enhanced Mail (PEM), S/MIME, SET protocol, Client-Server Security on web.**Unit-5. Wireless Security:** Wi-Fi & IEEE 802.1 Security -Protocol architecture, WEP, Access controls, Wireless Transport Layer- Security Transport Layer Security, SSL, IPSEC, WAP security, Bluetooth Security- Protocol architecture, Attacks, Security architecture.***Reference Books:***

1. Charles P. Pfleeger, Security in Computing, PHI.
2. Merkow & Breithaupt, Information Security: Principles and Practices, PE.
3. D. Gollmann, Computer Security, John Wiley and Sons.
4. W. Stallings, Cryptography and Network Security Principles and practices, PHI.

CS-46: Practical based on paper CS-41**Credit: 4**

MCA SEMESTER- V**CS-51: Design and Analysis of Algorithm****Credit: 4**

Unit-1. Algorithms and Analysis: Introduction, Algorithms specification, Recursive algorithms, space and time complexity, Asymptotic Notation (O , ω , and Θ , θ) practical complexities, Best, average and worst case performance of algorithms, examples, Introduction to recurrence relations.

Unit-2. Divide and Conquer Methods: Selection sort, Merge sort, Quick sort. Binary search, Strassen's Matrix Multiplication and analysis of these problems.

Unit-3. Dynamic Programming: Elements of Dynamic Programming, Assembly Line Scheduling, Matrix Chain Multiplication, Shortest paths, optimal search trees, etc.

Unit-4. Greedy Techniques and Randomized algorithms: Elements of Greedy Algorithms, Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees, Randomized Algorithms.

Unit-5. Complexity Theory and Approximation algorithms: Introduction, P, NP, NPHard, NPComplete and Associated Problems, Approximation Algorithm- Vertex Cover and Travelling Salesman-Problem.

Reference Books:

5. Sridhar, Design and Analysis of Algorithms, OUP.
6. Aho, The Design and Analysis of Computer Algorithms, Addison-Wesley.
7. Paneerselvam, Design and Analysis of Algorithm, PHI.
8. Dave, Design and Analysis of Algorithm, PE.
9. Goodman, Introduction to the Design and Analysis of Algorithms, TMH.

CS-52: Data Mining & Data Warehousing**Credit:4**

Unit-1. Data Mining Concepts & Architecture: Data Mining Definitions, Tools, Applications, Anatomy of Data Mining, Types of Knowledge, Knowledge Discovery Process Introduction, Evaluation, Stages, Operations and Architecture of Data Mining.

Unit-2. Data Mining Techniques: Visualization Techniques, Likelihood & distance, Neural Networks, Decision Tree technique, Constructing decision trees, ID3 algorithm, Genetic algorithms: Crossover & mutation, Clustering: Distance function, K-means algorithm Hierarchical Clustering, Association rules: Apriori algorithm, Real Time Applications and Future Scope.

Unit-3. Data Warehousing Concepts & Architecture: Goals, Process Architecture, Load Manager, Warehouse Manager, Query Manager, DWH Objects, Fact table & Dimension table, DWH Users, Data Warehouse Schemas: Star schemas, Snowflake Schemas.

Unit-4. Data Warehouse Partitioning & Aggregation: Horizontal Partitioning, Vertical Partitioning, Hardware Partitioning, Software partitioning, Methods, Aggregation, Designing Summary tables.

Unit-5. Data Marts, Meta Data, Backup & Recovery: Data Marts-Introduction, Estimating Design, Cost, Meta Data; Backup- Types of backup, Backup the data warehouse, Surewest online Backup; Recovery: Strategies, various Testing Strategies, Various Recovery models, Disaster Recovery procedure.

Reference Books:

1. Prabhuand Venkatesan, Data Mining & Warehousing, New Age International.
2. Anahory and Murray, Data warehousing in real world, PE.
3. Berson and Smith, Data Warehousing, Data mining & OLAP, TMH.

CS-53: Artificial Intelligence**Credit: 4**

Unit-I. Introduction: Definitions and approaches, Foundations of A.I., History of AI, Areas and state of the art in AI, AI Programming languages, concept of Intelligent agents.

Unit-2. Problem solving: Problem solving as state space search, production system, control strategies and problem characteristics; search techniques - Breadth First and Depth-first, Hill-climbing, Heuristics, Best-First Search, A* algorithm, problem reduction and AO* algorithm, Constraints satisfaction, Means Ends Analysis, Game playing.

Unit-3. Knowledge Representation and Reasoning: syntactic and Semantic representation, Predicate and propositional logic, Resolution, Unification, Deduction and theorem proving, Question answering; Forward versus backward reasoning, Matching, Indexing; ontological Engineering, Formal theory of Beliefs, Semantic Net, Frames, conceptual Dependencies and Scripts, Truth Maintenance Systems.

Unit-4. Selected tropics and Applications: philosophical issues, Introduction to Natural Language Processing, Expert Systems and Multiagent Systems, Learning.

Unit-5. Introduction to AI programming: LISP/PROLOG: Introduction to LISP programming: Syntax and numeric functions, Basic list manipulation functions, predicates and conditionals, input output and local variables, iterative and recursion, prop.rti lists and arrays.

Reference Books:

1. Padhy, Artificial Intelligence and Intelligent Sysrems, OUP.
2. Russel and Norvig, Artificial Intelligence: A Modem Approach, PE.
3. Rich and Knight, Artificial Intelligence, TMH.
4. Winston and Horn, LISP, PE.

CS-54: Advanced Computer Architecture**Credit: 4**

Unit-1. Parallel computer Models: The state of computing, multiprocessors and multicomputer, multivector and SIMD computers, architectural development tracks.

Unit-2. Program and Network Properties: Conditions of parallelism, program partitioning and scheduling, program flow mechanisms.

Unit-3. system Interconnect Architectures: Network properties and routing, Static interconnection network and dynamic interconnection networks

Unit-4. Processors and Memory Hierachy: Advanced processor technology-CISE, RISC, superscalar, vector VLIW and symbolic processors, memory technology. Bus, cache and Shared Memory.

Unit-5. Pipeline and vector Processing: Linear Pipeline Processors, Nonlinear Pipeline, processors Instruction pipeline Design Multiprocessors System Interconnects Vector Processing Principles, Multivector Multiprocessors.

Reference Books:

1. D. Sima, T. Fountain, P. Kacsuk, Advanced Computer Architectures: A Design Space Approach, Addison Wesley.
2. Kai Hwang, Advanced Computer Architecture, TMH.
3. Kain, Richard Y., Advanced Computer Architecture, PHI.

CS-55(I): Elective-V : Cryptography**Credit: 4**

Unit-1. Foundations of cryptography and security: Security trends, The OSI Security architecture, Security attack, services and mechanism, Ciphers and secret messages, Mathematical tools for cryptography: substitution techniques, modular arithmetic, Euclid's algorithm, finite fields, polynomial arithmetic.

Unit-2. Symmetric cipher: Symmetric cipher model, Design Principles of Block Ciphers, Theory of Block Cipher Design, Feistel cipher network structure, Data Encryption Standard (DES), Strength of DES, Triple DES, Modes of operation. Advance encryption Standard (AES)- Evaluation criteria of AES, AES cipher, key distribution.

Unit-3. Public Key cryptography: Prime numbers and testing for primality, factoring large numbers, Principles of public key cryptosystem, RSA algorithm Key management: Diffi-Helman Key exchange elliptic curve arithmetic, elliptic curve cryptography.

Unit-4: Hash function: Hash and Message authentication code (MAC), Hash and MAC algorithms, Digital signature and Authentication protocol.

Unit-5. IP and Web security protocols: Authentication application 400, E-mail security, IP security and virtual private networks, secure socket layer and transport layer security. System security, Firewall and Intrusion Detection system (IDS).

Reference Books:

1. William Stallings, Cryptography and Network Security, PE'
2. Forouzan and Mukhopadhyay, Cryptography and Network Security, TMH.
3. Rhee, Network Security, John Wiley and Sons.

CS-55(II): Elective-V: Quantum Computing**Credit: 4**

Unit-1. Introduction to Quantum Mechanics: Hilbert space, Unitary and stochastic dynamics, Probabilities and measurements, Entanglement, Density operators and correlations.

Unit-2. Introduction to Quantum Information: classical information theory, Quantum information types and quantum channels, Dense coding, Teleportation, No cloning, Quantum cryptography.

Unit-3. Quantum algorithms: Classical computation, Shor factorization, Grover search, Measurement-based computation.

Unit-4. Physical Realizations: Optical lattices.

Unit-5. Noise and Error Correction: Quantum operations, Graph states and codes, Quantum error correction, Fault-tolerant computation.

Reference Books:

1. Philtip Kaye, Raymond Laflamme, and Michele Mosca, An Introduction to Quantum Computing. Oxford University Press.
2. McMahon, Quantum Computing Explained. John Wiley & Sons.
3. Sakurai, Modern Quantum Mechanics, Addison Wesley.

CS-55(III): Elective-V: Visual Programming**Credit: 4**

Unit-1. Introduction: Development in a visual programming environment to develop interactive programs using a graphical user interface, iconic systems and their specifications, message and message passing/events and event-handling in visual programming environment. Introduction to .NET Technology, Software development using Visual Basic .NET.

Unit-2. Programming: Programming with graphics devices, interaction with the user in event based graphical environment, implementation of visual systems, different components and controls of visual system, Elementary data base usage. Visual Basic Fundamentals: The Visual Basic .NET Development Environment, The element of VB.NET, VB.NET operators, Software Design, Conditional Structure and Control Flow, Methods.

Unit-3. Classes and Objects: Types, Structure and Enumeration, Classes, Interfaces, Exception handling and Classes, Collections, Arrays and other Data Structure. Advance design concepts, Patterns, Roles and Relationships, Advanced Interface Patterns: Adapters and Delegates and Events Data Processing and I/O.

Unit4. Writing Software with Visual Basic .NET: interfacing with the End User, Introduction to ASP.NET and C#.NET and their features.

Unit-5. Project: A programming project involving object oriented design, user interface design and implementation, and coding to support the interface and database linkages, it can be an Internet application in a visual programming environment.

Reference Books:

1. Rox, Beginner and Professional Edition VB.NET, TMH.
2. Alex Homer, Dave Sussman, Professional ASP.NET I .1 , Wiley Dreamtech.
3. T. Willis, J. Crossland and R. Blair, Beginning VB.NET, Wrox Publication.
4. Chris Ullman, Kauffman, Beg. ASP.NET I .1 with VC#.NET, Wiley Dreamtech.

Unit-1. Introduction: Introduction to soft computing, introduction to biological and artificial neural network; introduction to fuzzy sets and fuzzy logic systems.

Unit-2. Introduction to Genetic Algorithm: Genetic operators and parameters, Genetic Algorithms in Problem Solving, Theoretical Foundations of Genetic Algorithms, Implementation Issues.

Unit-3. Artificial neural networks and applications: Different artificial neural network models; learning in artificial neural networks; neural network applications in control systems, Neural Nets and applications of Neural Network.

Unit-4. Fuzzy systems and applications: fuzzy sets; fuzzy reasoning; fuzzy inference systems; fuzzy control; fuzzy clustering; applications of fuzzy systems. Neuro-fuzzy systems: neuro-fuzzy modeling; neuro-fuzzy control.

Unit-5. Applications: Pattern Recognitions, Image processing, Biological Sequence Alignment and Drug Design, Robotics and sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing.

Reference Books:

1. Padhy, Soft Computing, OUP.
2. M. Mitchell, An Introduction to Genetic Algorithms, PHI.
3. S.N. Sivanandam and S.N. Deepa: Principles of Soft Computing, Second Edition, John Wiley.
4. Karray and Silva, Soft Computing and Intelligent Systems Design, PE.
5. Timothy J. Ross, Fuzzy Logic with Engineering Applications, TMH.

6. Davis E. Goldberg, Genetic Algorithms: Search, Optimization and Machine Learning
Addison Wesley.

7. S. Rajasekaran and G.A.V.Pai, Neural Networks, Fuzzy Logic and Genetic
Algorithms, PHI.

8. D. E. Goldberg: Genetic Algorithms in Search, Optimization, and Machine Learning.
Addison-Wesley.

C5-56: Practical based on Paper CS-53

Credit:4

MCA SYLLABUS (CBCS)

MCA SEMESTER – VI

CS-61: Project & Dissertation

Credit: 4

This course consists of the development of a realistic application, representative of a typical real-life software system or to carry a research based project in an area related to CS & IT

1. The students are expected to propose, analyze, design, develop, test and implement a real life software system using recent technologies.
2. In case of a research based project, the students are required to follow a proper research methodology to propose a solution (in terms of a model/framework/algorithm, etc.) of a research problem related to computer science and IT.
3. The student will deliver oral presentations, progress reports, and a final report.

A. Depending on the topic of the project and the chosen software development methodology, the following themes may be addressed to some extent:

- Software development methodologies, static (products) and dynamic aspects
- Requirement analysis (goals, use cases), software architectures, architectural styles and patterns, model-driven engineering (MDE);
- Programming techniques, software development environments, refactoring;
- Software validation through unit tests, integration tests, functional and structural tests, and code reviews.
- Project management, planning, resource estimation, reporting
- Version management by using a version management tool.
- Examples of kinds of systems to be developed are distributed systems, Client/server systems, web based systems, secure systems, mobile systems, adaptable systems, optimizations of existing systems or data-intensive systems, etc.

B. Typical process of research based problems may include selection of a research topic followed by an extensive literature survey with an aim to find the research gap.

Proposing a solution based on the findings (i.e., research gap) and publishing the research work.

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