

# Data Structures

## **UNIT 1: Introduction to Data Structures & Algorithms**

Introduction of Data structures, Abstract Data Types, Performance Analysis: Space Complexity, Time Complexity, Asymptotic Notations (Big O, Omega, Theta), Performance measurement, Divide and Conquer, Back Tracking Method, Dynamic programming

## **UNIT 2: Sorting and searching algorithms**

Bubble sort, Insertion sort, Radix Sort, Quick sort, Merge sort, Heap sort, Selection sort, shell Sort, Linear Search, Sequential search, Binary search

## **UNIT 3: Hashing**

Different Hashing Techniques, Address calculation Techniques, Common hashing functions, Collision resolution techniques: Linear probe, Quadratic probe, Key offset. Rehashing, Double hashing, Link list addressing.

## **UNIT 4: Linear Data Structures**

Stack Definition, Operations, Implementation of Stacks (Array and Linked list) and applications-Evaluation of postfix expression, Balancing of parenthesis Queue: Definition, Operations, Implementation of simple queue (Array and Linked list) and applications of queue-BFS Types of queues: Circular, Double ended, Priority, Implementation using linked list Types of Linked List: Singly, Doubly and Circular Linked list Definition, Operations (Insert, delete, traverse, count, search ) Applications of Linked List: Polynomial Addition and Subtraction

## **UNIT 5: Non-linear Data Structures**

Tree Definition and concepts, General Tree- Definition, Insertion and Deletion into general tree, Binary Tree- Definition, Insertion and Deletion into binary tree, Traversal of a binary tree, Reconstruction of a binary tree from traversal, Conversion of general tree into binary tree, Huffman tree, Expression tree, Binary threaded tree Binary Search Tree- Definition, Operation, Implementation AVL tree- Definition, AVL tree rotation with examples, Heaps-Definition, Operations (insertion, delete, build) M way Tree- Introduction, B tree-definition and examples and B \*

## **UNIT 6: Graphs**

Definition, Types, Operations, Representation, Networks, Traversals of graph, Minimum spanning tree, Kruskal's Algorithm, Prim's Algorithm, Warshall's Algorithm, Shortest path algorithm- dijsktra's algorithm

# Operating System

## **UNIT 1: Introduction to System Software & operating System**

Introduction to System Software & operating System Overview of all system softwares: Compiler, Assembler, Linker, Loader, Operating system, OS services and Components, Types of OS- Batch, multiprocessing, multitasking, timesharing, Distributed OS ,Real time OS, virtual machines, System Calls ,types of System calls, Buffering, Spooling

## **UNIT 2: Process and Thread Management**

Process and Thread Management: - Concept of process and threads, Process states, Process management, Context switching, Interaction between processes and OS, Multithreading, CPU scheduling algorithms, multiprocessor scheduling algorithms, Real time scheduling algorithms

## **UNIT 3: Concurrency Control**

Concurrency Control: Concurrency and Race Conditions, Mutual exclusion requirements, Software and hardware solutions, Semaphores, Monitors, Classical IPC problems and solutions, Deadlock, Characterization, Detection, Recovery, Avoidance and Prevention

## **UNIT 4: Memory Management**

Memory Management: Memory partitioning, Swapping, Paging, Segmentation, Virtual memory, Overlays, Demand paging, Performance of Demand paging, Virtual memory concepts, Page replacement algorithms, Allocation algorithms

## **UNIT 5: Mass Storage Structure**

Mass Storage Structure: Secondary-Storage Structure, Disk structure, Disk scheduling, Disk management, Swap-space management, Disk reliability, Stable storage implementation, Introduction to clock, Clock hardware, Clock software

## **UNIT 6: File systems**

File systems: File concept, File support, Access methods, Allocation methods, Directory systems, File protection, Free space management

## **UNIT 7: Protection & Security**

Protection & Security: Protection- Goals of protection, Domain of protection, Access matrix, Implementation of access matrix, Revocation of access rights Security- The security problem, Authentication, One-Time passwords, Threats

## **UNIT 8: Case Study**

Case Study : Study of different Operating, Systems(Linux, Windows, Android OS, Ios

# Computer Networks

## **UNIT 1: Basics of Digital Communication**

Introduction to digital communication, Signal propagation, Signal types, Signal parameters , Switching & forwarding, Transmission impairments, Attenuation, Delay distortion, Noise, Effects of limited bandwidth, Data rate limits-Nyquist's theorem and Shannon's theorem

## **UNIT 2: Network Organization and Models**

Basics of computer Network, topology & types of topologies, types of networks(LAN, MAN, WAN), Concept of Intranet & Extranet, Ad-Hoc Networks, types of communications (Asynchronous and synchronous) , modes of communications (simplex, half duplex, full duplex), Protocols, Networking models, ISO-OSI Reference Model, Design issues of the layer ,Internet Model (TCP/IP), Comparison of ISO-OSI & TCP/IP Model

## **UNIT 3: Networking Devices**

Connectivity Devices : Passive & Active Hubs, Repeaters, , Switches (2-Layer Switch, 3-Layer switch(Router), Bridges (Transparent Bridges, Spanning Tree, Bridges, Source Routing Bridges) , Routers, Gateways

## **UNIT 4: Application, Presentation & Session Layer**

Principles of Application Layer Protocols, The Web and HTTP, FTP, Telnet, Electronic Mail in the Internet (SMTP, MIME, POP3, IMAP), DNS, Introduction to SNMP.

## **UNIT 5: Transport layer**

Transport-Layer Services, port addressing, Multiplexing and Demultiplexing, Principles of Reliable Data Transfer, Congestion Control, TCP's Congestion Control. Quality of Service : Introduction, Queue Analysis, QoS Mechanisms, Queue management Algorithms, Feedback, Resource, Reservation.

## **UNIT 6: Network layer**

Network Service Model, Data gram & Virtual Circuit , Routing Principles, The Internet Protocol,(ipv4 & ipv6) , IP addressing and subnetting, Routing Algorithms., Hierarchical Routing, Routing in the Internet: Intra and inter domain routing; Unicast Routing Protocols RIP, OSPF, BGP, Multicast Routing Protocols : MOSPF, DVMRP. ATM Networks: Need for ATM, ATM Layers, ATM adaptation Layers, IP over ATM, Multi protocol Label switching (MPLS), Drawbacks of traditional routing methods, Idea of TE, TE and Different Traffic classes

## **UNIT 7: Data Link Layer**

Data Link Layer, Error Detection and Correction Techniques, Multiple Access Protocols, LAN Addresses and ARP & RARP , PPP: The Point-to-Point Protocol , Ethernet standards – IEEE 802.3, 802.5, FDDI, 802.6

## **UNIT 8: Physical layer**

Physical Layer, Types of media wired and wireless media

# **Financial Accounting and Management**

## **UNIT 1: Introduction to Accounting**

Introduction to Accounting:- Principles, Concepts, Double entry system of accounting, introduction to journal, voucher, ledger; preparation of trial balance, final accounts, trading and profit and loss account and balance sheet.(theory and numerical) Accounting Standards - AS1, AS2, AS3,AS9(only Theory), IFRS (International Financial Reporting Standards)

## **UNIT 2: BEA and Budgeting**

Break-even Analysis:-Concept of Break Even Point, CostVolume-Profit Analysis, Determination of Break Even Point, Margin of Safety and PV ratio, Impact of changes in Cost or selling price on BEP - Practical applications of Break-even Analysis. Budgeting: Budgeting-cash budget (theory and numerical), sales budget - flexible Budgets and master budgets (theory).

## **UNIT 3: Financial Management Concepts**

Financial Management:-Meaning and scope, Objectives of time value of money, goals of FM, profit vs. value maximization. Leverages - operating, financial, composite.; cost of equity, preference and equity shares, bonds and debentures, weighted average cost of capital, capital gearing fundamentals.

## **UNIT 4: Tools and Techniques of FM**

Tools and Techniques for Financial Statement Analysis:- Ratio Analysis - Classification of Ratios - Short term solvency and long term solvency - Profitability ratios - Analysis and Interpretation of Financial Statements through ratios of Liquidity, Solvency and Profitability. Fund Flow Statement - Meaning, Importance, Statement of changes in working capital and statement of Sources and application of funds. Cash flow Analysis:- cash flow Statements: Preparation,

## **UNIT 5: Capital Budgeting Concepts**

Capital Budgeting:- Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital. Capital Budgeting: features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method; purpose of capital budgeting, capital budgeting process, and types of capital investment decisions. Accounting Rate of Return (ARR) and Net Present Value Method (simple numerical problems on these).

# **Decision Making and Mathematical Modelling**

## **UNIT 1: Mathematical logic**

Propositions and logical operations, Conditional Statements , Methods of Proof , Mathematical Induction, Mathematical Statements , Logic and Problem Solving, Normal Forms

## **UNIT 2: Sets and Relations**

Set operations and functions, Product sets and partitions, Relations and digraphs, Paths in Relations and Digraphs, Properties of Relations , Equivalence Relations, Operations on Relations, Partially Orders Sets, Hasse diagram

## **UNIT 3: Graphs**

Graph, Representation of Graph, Adjacency matrix, Adjacency list, Euler paths and Circuits, Hamiltonian Paths and Circuits

## **UNIT 4: Mathematical Models**

Mathematical Models - Vehicular Stopping Distance Modeling using decision theory : Probability and Expected Value (e.g. Rolling the Dice, Life Insurance, Roulette etc) Decision Trees , Classification problems using Bay"s theorem

## **UNIT 5: Modelling using difference equation**

Recurrence relation - Fibonacci series, Tower of Hanoi ,Lines in a plane Homogenous linear equations with constant coefficients, Particular Solution, Total Solution, Divide and Conquer Recurrence Relations (Fast Multiplication of Integers, Fast matrix Multiplication)

## **UNIT 6: Characteristics of Complex Business Problems**

Number of Possible Solutions, Time-Changing Environment, Problem-Specific Constraints, Multi-objective Problems, Modeling the Problem A Real-World Examples,

## **UNIT 7: MADM & MCDM**

Introduction to Multiple Attribute Decision-making (MADM) Multiple Attribute Decision-making Methods, Simple Additive Weighting (SAW) Method, Weighted Product Method (WPM), Analytic Hierarchy Process (AHP) Method, Entropy Method, Compromise Ranking Method (VIKOR), Weighted Average Method (WAM) Introduction to Multiple Criteria Decision Making (MCDM)