

Syllabus

Course Name: Data structures and Algorithms

Theory

Module 1: Fundamentals of Algorithms

Algorithm definitions, Asymptotic notations, O-notation, Omega notation and theta notation. Time complexity and space complexity, Average and worst case analysis, Analysing control statements, Recursion.

Module 2: Types of algorithms

Sorting and searching algorithms, Divide and conquer algorithms, Greedy algorithms, Dynamic programming, Graph Algorithms, String matching, The class P and NP problems.

Module 3: Linear Data Structures

Arrays and operations. Stacks: LIFO structure, create, POP, PUSH, delete stack. Queues: FIFO structure Priority Queues, Circular Queues, operations on Queues.

Linked Lists: Nodes, Linked List operations: Create List, Insert Node (empty list, beginning, Middle, end), Delete node (First, general case), Search list, Retrieve Node, add node, Remove node, Print List.

Module 4: Trees

Introduction to Trees, Binary Trees :Travesals (breadth-first, depth-first), Expression Trees: Infix, Prefix, Postfix Traversals. Search Trees, Binary Search Trees, B Trees, AVL trees. Heaps: Structure, Basic algorithms – Reheap Up, Reheap Down, Build heap, Insert, Delete.

Module 5: Graphs:

Terminology,

Operations: Add vertex, Delete vertex, Add Edge, Delete Edge, Find vertex, Traverse Graph: Depth-First, Breadth-First.

Graph Storage Structures :Adjacency Matrix, Adjacency List.

Text Books:

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, “Data structures using C and C++”, Pearson Education.
2. Lipschutz: Schaum’s outline series Data structures Tata McGraw-Hill

Reference Books:

1. Bandyopadhyay, Data Structures Using C Pearson Education
2. Introduction to Algorithms, TH Cormen, CE Leiserson, RL Rivest, C Stein, PHI
3. Data Structures - A Pseudocode Approach with C, Richard. F. Gilberg and Behrouz. A. Forouzan, Thomson Course Technology
4. Fundamentals of Data Structures, Ellis Horowitz and Sartaz Sahni