

24MCAH104: ADVANCED DATA STRUCTURES AND ALGORITHMS

Hours/Week: 4

Credits: 4

I.A. Marks: 30

Exam. Marks: 70

Course Learning Objectives:

- Understand and remember algorithms and its analysis procedure.
- Design and implement various data structures algorithms.
- To introduce various techniques for representation of the data in the real world
- Compute the complexity of various algorithms.

Course Outcomes: After completing the course, the students will be able to,

- Ensure that the student evolves as a competent programmer capable of design, analyze and implement algorithms and data structures for different kinds of problems.
- Expose the student to the algorithm analysis techniques, to the theory of reductions, and to the classification of problems into complexity classes like NP.
- Design and analyze programming problem statements, choose appropriate data structures and algorithms for a specific problem.
- Understand the necessary mathematical abstraction to solve problems, Come up with analysis of efficiency and proofs of correctness.
- Comprehend and select algorithm design approaches in a problem specific manner.
- Come across the importance of graphs and their features for the applications uses.
- Gathering the real strategies searching and sorting techniques.

UNIT-I

12Hrs.

Review of Basic Data Structures: Arrays, Stack, Queue, Circular Queue, Linked List-Singly Linked List, Doubly Linked List, Circular Linked List. Introduction to Algorithms: Algorithms, Performance Analysis – time complexity and space complexity, O-notation, Omega notation and Theta notation.

UNIT-II

12Hrs.

Introduction to Nonlinear Data Structures, Search Trees: Trees, Binary trees, Binary Tree Traversal, Applications of Binary Trees, Binary Search Trees- Searching, Insertion and Deletion on Binary Search Trees, Balanced Search Trees- AVL Trees- Insertion and deletion on AVL Trees, Red –Black Trees- Representation, Insertion and Deletion on Red –Black Trees, Splay Trees - Representation, Insertion and deletion on Splay Trees, Heaps: Representation, Insertion and Deletion on Heaps.

UNIT-III

12Hrs.

Graphs: Introduction to Graphs, digraphs, Sub-graphs, Paths, Walks, Graphs Representation, Graph Traversals - Depth-first and breadth-first traversal, Applications of graphs - Minimum Spanning Tree – Prim's and Kruskal's algorithms. Hashing: Introduction to hashing, Hash Table Representation, Hash Functions, Collision Resolution-Separate Chaining, Open Addressing-Linear Probing, Quadratic Probing, Double Hashing.

UNIT-IV

12Hrs.

Design Strategies: Divide and Conquer- Binary Search, Merge Sort, Greedy method - Job sequencing with deadlines, Dynamic Programming – Optimal Binary Search Tree, Backtracking- 8 Queens problem, Introduction to NP-Hard and NP-Completeness.

REFERENCE BOOKS:

1. Mark A. Weiss, "Data structures and Algorithm analysis in C++ (Java)", Fourth Edition, PHI ,2013.
2. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms" Pearson Education, 2015.
3. E. Horowitz, S.Sahni and Dinesh Mehta, "Fundamentals of Data structures in C++", University Press, 2007.

