BCAXXXX - Data Structures and Algorithms with C and C++

Syllabus

Unit – I

INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS ANALYSIS

Data Structures: Introduction, Abstract Data Types, Types of Data Structures - Linear & Non-Linear Data Structures.

Algorithms Analysis: Introduction, Priori Analysis and Posteriori Testing, Characteristics of Algorithms, Performance Analysis and Measurement (Time and space Analysis of algorithms-Average, Best- and Worst-case Analysis), Time-Space Tradeoff, Asymptotic Notations, Algorithm Design Techniques.

ARRAYS AND LINKED LISTS

Array: Introduction, Representation of arrays, Applications of arrays, sparse matrix and its representation, Introduction to Two Dimensional (2D) Arrays and their Implementation, Operations of Arrays

Linked List: Introduction, Types, Singly Linked List, Doubly Linked list, Circular linked list, Doubly Circular Linked List, Operations of Linked List, Applications of Linkedlist

Unit - II

STACKS AND QUEUES

Stack: Stack-Definitions & Concepts, Operations on Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression, Postfix Expression Evaluation using Stack, Conversions - Prefix to Infix, Postfix to Infix, Infix to Postfix, Infix to Prefix etc., Expression Trees, Binary Expression Tree, Applications of Stacks, Recursion, Tower of Hanoi

Queue: Introduction, Representation of Queue, Operations on Queue, Circular Queue, Priority Queue, Array Representation of Priority Queue, Double Ended Queue, Applications of Queue

Array and Linked List implementation of Stack and Queue

Unit - III

TREES AND GRAPHS

Trees: Binary Trees, Representation of Trees, Binary Tree Traversal Method, Threaded Binary Trees, Binary Search Trees, Construct BST from Preorder/Postorder Traversal, AVL Trees, Red-Black Trees, Applications of Trees – Huffman Coding,

B-Trees and B+ Trees.

Heap, Max and Min Heap, Heapify, Priority Queue.

Graphs: Graph Representations – Adjacency Matrix, Adjacency List, and Adjacency Multi-lists. Traversal Schemes – DFS, BFS, Application of Graph Traversals- Connected Components, Spanning Trees, Minimum Spanning Trees and Algorithms, Shortest Path Algorithms

SEARCHING, SORTING AND HASHING

Searching: Linear and Binary Search

Sorting: Insertion Sort, Selection Sort, Bubble Sort, Merge Sort, Quick Sort, Heap Sort, Bucket Sort, Radix Sort, Count Sort, Shell Sort, Tim Sort.

Hashing: Hash Tables, Hashing Algorithms, Open Hashing and Closed Hashing. Collision-Resolution Techniques.

Reference Books

- Fundamentals of Data Structures in C++, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta
- Data Structures and Algorithm Analysis in C++, Weiss Mark Allen
- Data Structures Through C in Depth, S. K. Srivastava, Deepali Srivastava
- Data Structures Using C and C++, Yedidyah Langsam, Moshe Augenstein, Aaron M. Tenenbaum, Pearson Education India, 2nd edition
- Data Structures Using C++, D. S. Malik
- Data Structures and Algorithms in C++, Michael T. Goodrich, Roberto Tamassia, David M. Mount
- Data Structures and Algorithms in C++, Adam Drozdek
- Algorithms and Data Structures in C++, Alan Parker
- C++ Plus Data Structures, Nell B. Dale
- Data Structure Through C, Kanetkar, Yashavant P.

Practical

Implementation of Data Structures and Algorithms in C and C++ with their applications in real-world problem solving.

- Arrays
- Linked Lists
- Stacks and Queues Using Array and Linked Lists & their applications
- Various Types of Trees and Graphs, Their Traversal Techniques and applications
- Various Types of Searching, Sorting and Hashing Algorithms and their applications.