

Data Structures and Algorithms (DSA) Syllabus

1. Introduction to Data Structures

- Basics of Data Structures
- Types of Data Structures: Linear and Non-Linear
- Time and Space Complexity Analysis (Big O notation)

2. Arrays

- Array Representation
- Array Operations (Traversal, Insertion, Deletion, Searching, Sorting)
- Multi-dimensional Arrays

3. Linked Lists

- Singly Linked List
- Doubly Linked List
- Circular Linked List
- Linked List Operations (Insertion, Deletion, Traversal)

4. Stacks

- Stack Representation
- Stack Operations (Push, Pop, Peek)
- Applications of Stacks (Expression Evaluation, Balanced Parentheses)

5. Queues

- Queue Representation
- Queue Operations (Enqueue, Dequeue, Front, Rear)
- Circular Queue
- Deque (Double Ended Queue)
- Priority Queue

6. Trees

- Binary Tree and Binary Search Tree (BST)
- Tree Traversals (In-order, Pre-order, Post-order)
- AVL Tree (Self-Balancing Binary Search Tree)
- Heaps (Max-Heap, Min-Heap)
- Trie

7. Graphs

- Graph Representation (Adjacency Matrix, Adjacency List)
- Graph Traversal (Breadth-First Search, Depth-First Search)
- Dijkstra's Algorithm (Shortest Path)
- Bellman-Ford Algorithm
- Floyd-Warshall Algorithm

8. Hashing

- Hash Functions
- Collision Resolution Techniques (Linear Probing, Chaining, Double Hashing)

9. Sorting Algorithms

- Bubble Sort, Selection Sort, Insertion Sort
- Merge Sort
- Quick Sort
- Heap Sort
- Radix Sort

10. Searching Algorithms

- Linear Search
- Binary Search
- Jump Search
- Interpolation Search

11. Dynamic Programming

- Principles of Dynamic Programming
- Memoization and Tabulation
- Knapsack Problem
- Longest Common Subsequence

12. Greedy Algorithms

- Greedy Methodology
- Activity Selection Problem
- Huffman Coding

13. Advanced Data Structures

- Segment Trees
- Fenwick Trees (Binary Indexed Tree)

- Disjoint Set Union (Union-Find)