

Data Structure And Algorithm

Course Duration: 45 Days

Topics & Details

Introduction to Data Structure And Algorithm:

★ Introduction to Data Structures and Algorithms

- What are data structures and algorithms?
- Importance and applications in programming.

★ Basics of Algorithms

- Analysis of algorithms (time complexity and space complexity).
- Asymptotic notations (Big-O, Big-Theta, Big-Omega).

★ Arrays and Strings

- Introduction to arrays and strings.
- Operations, advantages, and disadvantages.
- String manipulation algorithms.

★ Linked Lists

- Singly linked lists, doubly linked lists, circular linked lists.
- Operations (insertion, deletion, traversal).
- Applications and advantages.

★ Stacks and Queues

- Concepts and operations.
- Implementations using arrays and linked lists.
- Applications (e.g., expression evaluation, reversing strings)

★ Trees

- Binary trees, binary search trees (BST).
- Traversal techniques (inorder, preorder, postorder).
- AVL trees and balancing

★ Graphs

- Representation (adjacency matrix, adjacency list).
- Traversal techniques (BFS, DFS).
- Shortest path algorithms (Dijkstra's, Bellman-Ford)
- ★ Hashing
 - Hash functions and collision handling (chaining, open addressing).







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- Hash maps and hash sets.



★ Sorting Algorithms

- Comparison-based sorting (bubble sort, insertion sort, selection sort).
- Efficient sorting algorithms (merge sort, quick sort, heap sort).
- Stability and complexity analysis

★ Dynamic Programming

- Concept and principles.
- Examples (fibonacci sequence, knapsack problem).
- Memoization and tabulation techniques.

★ Greedy Algorithms

- Principles and characteristics.
- Examples (minimum spanning tree, Dijkstra's algorithm).
- Comparison with dynamic programming.

★ Advanced Topics (optional)

- Segment trees
- Trie (pre<mark>fix tr</mark>ee)
- Red-black trees
- B-trees

★ Practice and Problem Solving

- Solving problems on platforms like LeetCode, Codeforces, or HackerRank.
- Analysis of common algorithmic problems and their solutions





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