GeeksforGeeks

CLASSROOM PROGRAM

Detailed
Course Syllabus

CONTENTS

Week	Day	Topics	Sub Topics	Practice Problems
Week 1	Day 1	• Analysis of Algorithm • Mathematics • Bit Manipulation	• Asymptotic analysis • Time and Space Complexity • Master Theorem • Bitwise Operators (Bitwise AND, Bitwise OR, Bitwise XOR, Left Shift, Right Shift, etc)	• GCD and LCM • Iterative Power • Genarate Power Set • Factorial • Computing Power • Prime factorization • Prime Numbers (Sieve Algorithms)
	Day 2	• ARRAYS	• Arrays - Introduction & Advantages • Types of Arrays • Operations of Arrays - Searching, Insertion, Deletion, • Sliding Window Technique	• Largest Element in an Array • Leaders in an Array problem • Reverse an Array • Maximum subarray sum
Week 2	Day 1	• RECURSION • BACKTRACKING	• Introduction to Recursion • Writing Base Cases in Recursion • Tail Recursion • Introduction to Backtracking • Rat in a Maze Problem	• Print 1 to N Using Recursion • Rope Cutting Problem • Sum of Digits Using Recursion • Generate Subsets • Tower of Hanoi • Subset Sum Problems • Josephus Problem
	Day 2	• SEARCHING	• Linear Search • Binary Search - Iterative & Recursive Approach • Analysis of Binary Search • Two Pointer Approach	• Index of first Occurrence in Sorted • Count 1s in a Sorted Binary Array • Square root of a number • Search in an Infinite sized array • Triplet in a Sorted Array

CONTENTS

Week	Day	Topics	Sub Topics	Practice Problems
Week 3	Day 1	• SORTING	• Overview of sorting algorithm • Sorting Algorithms like Insetion, Bubble, Selection, Merge and Quick Sort • Stability of Sorting Algorithms	• Minimum Difference in an Array • Chocolate Distribution Problem • Union of two Sorted Arrays • Kth Smallest Element • Sort an Array with two/three types of element
	Day 2	• MATRIX • HASHING	• Multidimensional Array • Passing 2D arrays as argument • Hashing Introduction and Application, Time Complexity Analysis • Collision Handling • Hashing Function	• Transpose of a Matrix • Matrix in Snake Pattern • Count Distinct Elements • Frequencies of Array Elements • Spiral Traversal of Matrix • Subarray with given Sum • Count Distinct Elements in Every Window
Week 4	Day 1	• STRINGS	• Introduction to Strings • Overview of Pattern Searching Algortihm • Naive and Improved Naive Pattern Searching • Rabin Karp Algorithm • KMP Algorithm (Constructing LPS Array and Complete Algorithms)	• Palindrome Check • Reverse words in a string • Check if a String is Subsequence of Other • Check for Anagram • Check if Strings are Rotations • Anagram Search • Lexicographic Rank of a String
	Day 2	• LINKED LIST	• Introduction to Linked List • Traversing a Linked List • Insertion of Node in Singly Linked List • Reverse a Linked List • Deletion of Node in Linked List • Doubly Linked List & Circular Linked List	• Middle of Linked List • Deleting a node without accessing head pointer of Linked List • Nth Node from end of Linked List • Segregating Even and Odd Nodes of LL • Detect Loop using Floyd Cycle Detection

CONTENTS

Week	Day	Topics	Sub Topics	Practice Problems
Week 5	Day 1	• STACK	• Stack - Introduction and Applications • Stack Operations (e.g. push, pop, etc) • Array Implementation of Stack • Linked List Implementation of Stack	• Balanced Parenthesis • Next Greater Element • Implement two Stacks in an Array • Previous Greater Element
	Day 2	• QUEUE • DEQUE	• Queue- Introduction and Application • Implementation of Queue using Array • Implementation of Queue using Linked List • Deque - Introduction and Application	• Generate numbers with given digits • First Circular Tour • Maximums of all subarrays of size k • Reversing a Queue
Week 6	Day 1	• TREE	• Tree - Introduction and Application • Binary Tree • Tree Traversal - Inorder, Preorder and Postorder with Implementation • Level Order Traversal • LCA of a Binary Tree • Serialize and Deserialize a Binary Tree	• Height of Binary Tree • Diameter of a Binary Tree • Check for Balanced Binary Tree • Maximum in a Binary Tree
	Day 2	• BINARY SEARCH TREE	• BST - Introduction and Application • Search in BST with Implementation • Insert in BST with Implementation • Deletion in BST with Implementation • Self Balancing BST - AVL Tree, Red Black Tree	• Find Kth Smallest in BST • Vertical Sum in Binary Tree • Floor in BST • Check for BST • Top View of Binary Tree

CONTENTS

Week	Day	Topics	Sub Topics	Practice Problems
Week 7	Day 1	• GREEDY • HEAP	• Introduction to Greedy Algorithm • Binary Heap - Introduction • Binary Heap - Insertion, Heapify and Extract • Binary Heap - Decrease, Delete and Build Heap • Heap Sort • Priority Queue	• Activity Selection Problem • Job Sequencing Problem • Sort K Sorted Arrays • Fractional Knapsack Problem • K Largest Element • Median of a Stream
	Day 2	• GRAPH	• Introduction to Graph • Graph Representation (Adjacency List and Matrix) • Adjacency Matrix and List Comparison • Breadth First Search - Introduction and Implementation • Depth First Search - Introduction and Implementation • Prims Algorithm - Introduction and Implementation • Dijkstra Algorithm - Introduction and Implementation	• Bridges in Graph • Detect Cycle in a Directed Graph • Articulation Point
Week 8	Day 1	• Graph - Advanced	• Kruskal's Algorithm • Bellman-Ford Algorithm • Ford-Fulkerson Algorithm	• Strongly Connected Components • Find the no. of islands
	Day 2	• Dynamic Programming	• Introduction to Dynamic Programming • DP vs Greedy Approach • How to approach a DP Problem • Memoization and Tabulation methods	• Coin Change Problem • Longest Common Subsequence • Subset Sum Problem • Longest Increasing Subsequence • 0-1 Knapsack Problem • Matrix Chain Multiplication