8 weeks DSA course plan

Week 1:

Day 1: Introduction- Analysis of Algorithms, Asymptotic Notation, Time Complexity, Space Complexity.

Day 2,3,4: Mathematics- Prime Numbers and Sieve of Eratosthenes, Multiples and Numbers (GCD, LCM, Factorials), Combinatorics, Modular Arithmetic, Practice Questions.

Day 5,6: Bit Manipulation- Bitwise operators, Set Bits, Count Bits, Power of 2 and Power sets, One odd occurring, 2 odd occurring, Practice Questions.

Day 7: Recursion- Application, Tail Recursion, Base Conditions, Classic Recursion Problems including Tower of Hanoi and Josephus Problem, Practice Questions.

Week 2:

Day 1: Continuation of Week 1 Day 7 topics.

Day 2,3,4: Arrays- Introduction and simple problems, Shifting and Rotation, Stock buy and sell, Trapping Rainwater, Kadane’s Algo, Prefix Sum, Sliding window, Practice Questions.

Day 5,6: Searching- Linear, Binary, Ternary Search, Modified Binary Search to find floor, ceil, index of 1st and last occurrence, 2 pointers, median in sorted array, Find Square/Cube root, Search in rotated Sorted Array, Allocate Minimum pages, Practice Questions.

Day 7: Sorting- All types of sorting with best, avg, worst time complexity, Problems using merge sort and Quick Sort implementation, Comparator Function in Cpp/Java inbuilt sort function, Practice Questions.

Week 3:

Day 1,2: Continuation of Week 2 Day 7 topics.

Day 3,4: Matrix- Terminologies and Properties, Transpose, Rotation, Spiral, Multiplication of matrices, Search in Sorted matrix, Median in row sorted matrix, Practice Questions.

Day 5,6: Hashing- Concept of hashing, Separate chaining and open addressing, implementation of hashing in Cpp/Java, Practice Questions.

Day 7: Strings- Introduction and basic questions, String Matching Algorithms, Lexicographic rank of string, Longest substring with distant characters, Practice Questions.

Week 4:

Day 1,2: Continuation of Week 3 Day 7 topics.

Day 3,4,5: Linked List- Types (Single LL, Double LL, XOR LL, Circular LL), Advantages, implementation and operations, Practice questions.

Day 6,7: Stacks- Introduction, implementation and operations using array and linked list, Practice Questions.

Week 5:

Day 1: Continuation of Week 4 Day 7 topics.

Day 2,3: Queue and Deque- - Introduction, implementation and operations using array and linked list, few Questions, implement stack using queues and vice versa, Practice Questions.

Day 4,5,6: Trees- Introduction and types of trees, Creation, Deletion, Insertion in a tree, Binary trees and Practice Questions.

Day 7: Binary Search Trees- Trees- Introduction and properties of BST, Creation, Searching, Deletion, Insertion in a BST, implementation of BST and Practice Questions.

Week 6:

Day 1,: Continuation of Week 5 Day 7 topics.

Day 2,3: Heaps- Introduction to Heap, Creation, Insertion, Deletion, Heapify, Priority Queues and related application in questions. Practice Questions.

Day 4,5,6,7: Graphs- Introduction to Graphs, properties, and representations, traverse the graphs using BFS and DFS, detect cycles, find shortest paths, find strongly connected components, etc. in a graph. Practice Questions on BFS, DFS and all given algorithms.

Week 7:

Day 1,2: Greedy - Practice Questions related to different Greedy approaches given.

Day 3,4: Backtracking- Introduction, Rat in a maze, N Queen Problem, Suduko Problem. Practice questions.

Day 5,6,7: Dynamic Programming- Introduction to Dynamic Programming, overlapping subproblems, and optimal substructures, Top-down and bottom-up approaches to solving a DP problem, All different types of DP problems and their variations. Practice Questions.

Week 8:

Day 1: Continuation of Week 7 Day 7 topics.

Day 2,3: Tries- Introduction to Tries, insert, search, delete, and updating in Tries, Practice Questions.

Day 4,5: Segment Trees (Basic Level)- Introduction to Segment Trees and when to use them, applying segment-trees in questions, Practice Questions.

Day 6,7: Disjoint Set- Introduction to DSU, Union by Rank and Path Compression, Kruskal's algorithm, Practice Questions.