

Pattern-Based

Interview-Oriented

Teaching-Ready

Course Structure : 30 Hours (15 Sessions × 2 Hours)

Each Session :

- 3 In-class Problems (guided solving)
- 2 Homework Problems (independent practice)

Session 1 – Arrays & Hashing I

Focus : Frequency & Fast Lookups

Brief Notes :

- HashMap / HashSet usage for $O(1)$ average lookup
- Frequency counting pattern
- Complement lookup technique
- Time–space trade-offs

In-class (3) :

#1 Two Sum, #217 Contains Duplicate, #242 Valid Anagram

Homework (2) :

#219 Contains Duplicate II, #128 Longest Consecutive Sequence

Session 2 – Arrays & Hashing II

Focus : Prefix Sum & Subarray Counting

Brief Notes :

- Prefix sum concept and construction
- HashMap to store prefix frequencies
- Handling negative numbers in subarrays
- Transforming subarray problems into prefix problems

In-class (3) :

#560 Subarray Sum Equals K, #974 Subarray Sums Divisible by K, #525 Contiguous Array

Homework (2) :

#49 Group Anagrams, #347 Top K Frequent Elements

Session 3 – Two Pointers

Focus : Sorted Arrays & Pair/Triplet Logic

Brief Notes :

- Sorting as a preprocessing step
- Left–right pointer movement strategy
- Duplicate skipping logic
- Maintaining invariants during traversal

In-class (3) :

#125 Valid Palindrome, #11 Container With Most Water, #15 3Sum

Homework (2) :

#16 3Sum Closest, #42 Trapping Rain Water



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Data Structures and Algorithms (DSA) for Placement

(course with Certification)

Session 4 – Sliding Window

Focus : Variable & Fixed Window Techniques

- Brief Notes :**
- Expand–shrink window mechanism
 - Fixed vs variable window distinction
 - Maintaining window state using HashMap
 - Optimization over brute force

In-class (3) :

#3 Longest Substring Without Repeating Characters, #567 Permutation in String, #424 Longest Repeating Character Replacement.

Homework (2) :

#438 Find All Anagrams in a String, #76 Minimum Window Substring

Session 5 – Stack

Focus : Parsing, Matching & Monotonic Stack

- Brief Notes :**
- LIFO discipline and stack invariants
 - Monotonic increasing/decreasing stacks
 - Expression evaluation using stack
 - Stack-based problem reduction

In-class (3) :

#20 Valid Parentheses, #155 Min Stack, #150 Evaluate Reverse Polish Notation

Homework (2) :

#739 Daily Temperatures, #84 Largest Rectangle in Histogram

Session 6 – Binary Search

Focus : Search on Monotonic Space

- Brief Notes :**
- Binary search invariants
 - Binary search on answer space
 - Mid calculation and overflow handling
 - Rotated sorted array logic

In-class (3) :

#704 Binary Search, #33 Search in Rotated Sorted Array, #153 Find Minimum in Rotated Sorted Array

Homework (2) :

#74 Search a 2D Matrix, #875 Koko Eating Bananas

Session 7 – Linked List

Focus : Pointer Manipulation

- Brief Notes :**
- Single vs multiple pointer techniques
 - Dummy nodes for simplification
 - Slow–fast pointer pattern
 - Cycle detection logic

In-class (3) :

#206 Reverse Linked List, #21 Merge Two Sorted Lists, #141 Linked List Cycle

Homework (2) :

#19 Remove Nth Node From End, #143 Reorder List

Session 8 – Trees I (DFS)

Focus : Recursive DFS Patterns

Brief Notes :

- Tree recursion templates
- Bottom-up vs top-down recursion
- Height-based DFS
- Returning values from recursive calls

In-class (3) :

#104 Maximum Depth, #543 Diameter of Binary Tree, #110 Balanced Binary Tree

Homework (2) :

#226 Invert Binary Tree, #236 Lowest Common Ancestor

Session 9 – Trees II (BFS & BST)

Focus : Level Order & BST Properties

Brief Notes :

- BFS using queues
- BST invariants and ordering
- Level-by-level traversal
- Using inorder traversal properties

In-class (3) :

#102 Level Order Traversal, #98 Validate BST, #230 Kth Smallest in BST

Homework (2) :

#199 Right Side View, #235 LCA of BST

Session 10 – Heaps / Priority Queue

Focus : Top-K & Streaming Data

Brief Notes :

- Min-heap Vs max-heap usage
- Maintaining heap size
- Comparator logic
- Heap for real-time data processing

In-class (3) :

#215 Kth Largest Element, #973 K Closest Points, #295 Find Median from Data Stream

Homework (2) :

#347 Top K Frequent Elements, #621 Task Scheduler

Session 11 – Tries

Focus : Prefix Trees

Brief Notes :

- Trie node structure
- Use-cases in autocomplete and dictionaries
- Insert, search, prefix operations
- Time complexity benefits over hashing

In-class (3) :

#208 Implement Trie, #211 Add and Search Word, #677 Map Sum Pairs

Homework (2) :

#212 Word Search II, #648 Replace Words

Session 12 – Graphs I (BFS / DFS)

Focus : Traversal & Components

Brief Notes :

- Graph representation (adj list, grid)
- BFS vs DFS trade-offs
- Visited set usage
- Connected components

In-class (3) :

#200 Number of Islands, #695 Max Area of Island, #994 Rotting Oranges

Homework (2) :

#133 Clone Graph, #547 Number of Provinces

Session 13 – Graphs II (Topological Sort)

Focus : DAG & Dependency Resolution

Brief Notes :

- Directed acyclic graphs
- Queue-based topological sort
- Indegree calculation
- Cycle detection in directed graphs

In-class (3) :

#207 Course Schedule, #210 Course Schedule II, #802 Eventual Safe States

Homework (2) :

#269 Alien Dictionary, #329 Longest Increasing Path

Session 14 – Graphs III (Shortest Path & MST)

Focus : Weighted Graphs

Brief Notes :

- Dijkstra's algorithm (greedy + heap)
- Minimum Spanning Tree concept
- Difference between BFS and Dijkstra
- Prim's algorithm intuition

In-class (3) :

- Dijkstra (concept + code)
- Prim's Algorithm walkthrough
- #743 Network Delay Time

Homework (2) :

#1584 Min Cost to Connect All Points, #1631 Path With Minimum Effort

Session 15 – Dynamic Programming (Multiple Patterns)

Focus : Pattern Recognition in DP

Brief Notes :

- Identifying overlapping subproblems
- Memoization vs tabulation
- State definition & transition
- Common DP patterns

In-class (3) :

#70 Climbing Stairs (1D DP), #322 Coin Change (Unbounded Knapsack), #198 House Robber (Decision DP)

Homework (2) :

#139 Word Break (String DP), #416 Partition Equal Subset Sum (Subset DP)