Top-Tier DSA Syllabus

- **Array**
  - Algorithms
    - Kadane's Algorithm
    - Moore's Voting Algorithm
    - Dutch National Flag Algorithm
  - Binary Search
    - Vanilla Binary Search
    - Binary Search on Answer Space
  - Two Pointers
  - Sliding Window
    - Fixed Size sliding window
    - Variable Size sliding window
  - Prefix Sum
  - Sorting
    - Bubble Sort
    - Selection Sort
    - Insertion Sort
    - Merge Sort (Divide & Conquer)
    - Quick Sort (Divide & Conquer)
  - Mathematical Algorithms
    - Euclidean Algorithm
    - Sieve of Eratosthenes
- **Stack**
  - Basic Stack Operations
  - Monotonic Stack
- **Queue**
  - Basic Queue Operations
  - Applications of Queue
- **Linked List**
  - Basic Operations
  - Linked List Cycle
    - Floyd's Cycle Finding Algorithm
- **Hash Table**
  - Basics of Hash Table
  - HashMap & HashSet
- **String**
  - String Manipulation
  - Pattern Matching

- Naive String Matching
- Knuth-Morris-Pratt (KMP) Algorithm

Trie

- Insertion & Search
- Auto-complete Feature

Bit Manipulation

- Basics of Bits & Binary Representation
- Bitwise Operators
- Extracting & Modifying Bits
- Properties of XOR

Heap

- Heap Fundamentals
- Priority Queue Implementation using Heap

Greedy

- Greedy Choice & Optimal Substructure
- Classic Greedy Problems
- Greedy with Combinations
  - Greedy + Two Pointers
  - Greedy + Sliding Window
  - Greedy + Priority Queue (Heap)
  - Greedy + Sorting
  - Greedy + Graph Algorithms

Design Data Structure

- Eg. Design LRU Cache

Recursion

- Basics of Recursion
- P & SP

BackTracking

- Basics of Backtracking
- Classic Backtracking Problems
  - Subsets
  - Combinations
  - Permutations

Tree

- Basics of Trees
- Tree Traversals
- Binary Search Tree
- Morris Traversal

Dynamic Programming

- Basics of DP
- Fibonacci

- DP on Grids
- DP on Strings
- DP on Subsequences
- Knapsack

Graph

- Graph Representation
- Graph Traversal
- Shortest Path Algorithms
  - Dijkstra’s Algorithm
  - Floyd-Warshall Algorithm
  - Bellman-Ford Algorithm (Handles negative weights)
- Disjoint Set Union (Union-Find)
- Cycle Detection in Graphs
- DAG - Directed Acyclic Graph
  - Topological Sorting
- Graph Coloring
  - Bipartite Graph
- Eulerian & Hamiltonian Paths
  - Eulerian Path & Circuit (All edges exactly once)
  - Hamiltonian Path & Circuit (All vertices exactly once)
- Minimum Spanning Tree (MST)
  - Prim's Algorithms
  - Kruskal's Algorithms