1. Sorting Algorithms

Bubble Sort

Selection Sort

Insertion Sort

Merge Sort (Divide and Conquer)

Quick Sort (Divide and Conquer)

Heap Sort

Counting Sort

Radix Sort

Bucket Sort

2. Searching Algorithms

Linear Search

Binary Search (Iterative & Recursive)

Jump Search

Interpolation Search

Exponential Search

3. Recursion & Backtracking

Basic Recursion Examples (Factorial, Fibonacci, Sum of Digits)

Backtracking Approach (Concept & Examples)

N-Queens Problem

Rat in a Maze

Sudoku Solver

Word Search in a Grid

4. Divide and Conquer Algorithms

Binary Search

Merge Sort

Quick Sort

Closest Pair of Points Problem

Strassen’s Matrix Multiplication

5. Dynamic Programming (DP)

Fibonacci Number (Top-down & Bottom-up)

0/1 Knapsack Problem

Longest Common Subsequence (LCS)

Longest Increasing Subsequence (LIS)

Matrix Chain Multiplication

Coin Change Problem

Rod Cutting Problem

Edit Distance Problem

Subset Sum Problem

Palindrome Partitioning

6. Greedy Algorithms

Activity Selection Problem

Huffman Coding

Job Sequencing Problem

Fractional Knapsack Problem

Prim’s Algorithm (Minimum Spanning Tree - MST)

Kruskal’s Algorithm (MST)

Dijkstra’s Algorithm (Shortest Path)

7. Graph Algorithms

Graph Representation (Adjacency Matrix & List)

Breadth-First Search (BFS)

Depth-First Search (DFS)

Topological Sorting (Kahn’s Algorithm)

Dijkstra’s Shortest Path Algorithm

Bellman-Ford Algorithm

Floyd Warshall Algorithm

A Algorithm\* (Shortest Path - Advanced)

Minimum Spanning Tree (Prim’s & Kruskal’s)

Strongly Connected Components (Kosaraju’s Algorithm)

Graph Flow Algorithms (Ford-Fulkerson Algorithm, Edmonds-Karp Algorithm - Max Flow Problems)

8. String Algorithms

Naive Pattern Searching

KMP Algorithm (Knuth-Morris-Pratt)

Rabin-Karp Algorithm

Z Algorithm

Suffix Array & Suffix Tree

Trie (Prefix Tree) Basics (Autocomplete, Longest Common Prefix, etc.)

9. Bit Manipulation Algorithms

Checking if a Number is Power of 2

Counting Set Bits (Brian Kernighan’s Algorithm)

XOR Properties & Applications

Bitwise AND, OR, XOR Operations

Find Missing Number in an Array (XOR Approach)

10. Mathematical & Number Theory Algorithms

Greatest Common Divisor (GCD) - Euclidean Algorithm

Least Common Multiple (LCM)

Sieve of Eratosthenes (Finding Prime Numbers efficiently up to N)

Modular Exponentiation (Fast Exponentiation for Large Powers - Modulo Arithmetic)

Fast Exponentiation (Power Function Optimization)

Fibonacci Using Matrix Exponentiation

11. Tree Algorithms

Binary Tree Traversals (Inorder, Preorder, Postorder)

Lowest Common Ancestor (LCA)

Diameter of a Tree

Binary Search Tree (BST) Insertion & Deletion

AVL Tree (Self-Balancing BST)

Segment Tree (Range Queries)

Fenwick Tree (Binary Indexed Tree - BIT)

12. Heap Algorithms

Heapify Algorithm

Insert/Delete in Heap

Heap Sort

Kth Largest/Smallest Element in an Array

Merge K Sorted Lists

13. Advanced Algorithms (Optional but Good to Learn)

Disjoint Set Union (Union-Find Algorithm)

Tarjan’s Algorithm (Strongly Connected Components in a Graph)

Floyd’s Cycle Detection Algorithm (Linked List Cycle Detection)

KMP Algorithm for Pattern Matching

Boyer-Moore Algorithm (String Matching)

Sliding Window & Two Pointer Techniques (Useful for problems involving arrays & strings.)

Graph Flow Algorithms (Ford-Fulkerson Algorithm - Max Flow Problems)