DESIGN AND ANALYSIS OF ALGORITHMS SYLLABUS

Module 1: Design Paradigms: Greedy, Divide and Conquer Techniques

- Overview and Importance of Algorithms
- Stages of Algorithm Development: Problem Description, Identifying Techniques, Algorithm Design, Time Complexity, Proof of Correctness, and Illustration
- Greedy Techniques: Fractional Knapsack Problem, Huffman Coding
- Divide and Conquer: Maximum Subarray, Karatsuba Faster Integer Multiplication Algorithm

Module 2: Design Paradigms: Dynamic Programming, Backtracking, and Branch & Bound Techniques

- Dynamic Programming: Assembly Line Scheduling, Matrix Chain Multiplication, Longest Common Subsequence, 0-1 Knapsack, Travelling Salesman Problem
- Backtracking: N-Queens Problem, Subset Sum, Graph Coloring
- Branch & Bound: LIFO-BB and FIFO-BB Methods, Job Selection Problem, 0-1 Knapsack Problem

Module 3: String Matching Algorithms

- Naïve String-matching Algorithms
- Knuth-Morris-Pratt (KMP) Algorithm
- Rabin-Karp Algorithm
- Suffix Trees

Module 4: Graph Algorithms

- All-Pairs Shortest Path: Bellman-Ford Algorithm, Floyd-Warshall Algorithm
- Network Flows: Flow Networks, Maximum Flows: Ford-Fulkerson Algorithm, Edmond-Karp Algorithm, Push Relabel Algorithm
- Application of Max Flow to Maximum Matching Problem

Module 5: Geometric Algorithms

- Properties and Intersection of Line Segments
- Sweeping Lines
- Convex Hull Finding Algorithms: Graham's Scan, Jarvis' March Algorithm

Module 6: Randomized Algorithms

- Randomized Quick Sort
- The Hiring Problem
- Finding the Global Minimum Cut

Module 7: Classes of Complexity and Approximation Algorithms

- The Class P and The Class NP
- Reducibility and NP-Completeness
- SAT, 3-SAT, Independent Set, Clique
- Approximation Algorithms: Vertex Cover, Set Cover, Travelling Salesman Problem