Detailed Syllabus

Sr. No	Topic
1	**Fundamentals of Algorithms and mathematics** • Algorithm definitions and examples • Mathematics for algorithmic sets • Functions and relations • Combinations • Vectors and matrices • Linear inequalities and linear equations
2	**Analysis of Algorithms** • Orders of Magnitude (Asymptotic notations) • Growth rates, some common bounds (constant, logarithmic, linear, polynomial, exponential) • Time and space complexity • Average and worst case analysis • Analysing control statements • Sorting Algorithms and analysis: Bubble sort, Selection sort
3	**Divide and conquer algorithms** • Introduction • Recurrence Relations and methods to solve recurrence(substitution, change of variables, master's method, Recurrence tree) • Sorting (Merge sort) • Matrix multiplication • Binary search tree
4	**Greedy algorithms** • General Characteristics of greedy algorithms • Problem solving using Greedy Algorithm- Graphs: : Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), Making Change Problem, 0-1 Knapsack problem
5	**Dynamic programming** • Introduction • The Principle of Optimality • Problem Solving using Dynamic Programming- Making Change Problem, Longest Common Subsequence, shortest path, Knapsack problem, Matrix chain multiplication
6	**Graph Algorithms:** • An introduction using graphs and games • Traversing Trees– Preconditioning, Depth First Search (DFS), Undirected Graph, Directed Graph, Breath First Search (BFS), Applications of BFS and DFS

7	**String Matching Algorithms** • The naive string-matching algorithm • The Rabin-Karp algorithm • String matching with finite automata • The Knuth-Morris-Pratt algorithm
8	**Introduction to Complexity Theory** • The class P and NP • Polynomial reduction • NP- Complete Problems • NP-Hard Problems • Travelling Salesman problem