

Detailed Syllabus

Sr. No	Topic
1	Basics of Algorithms and mathematics <ul style="list-style-type: none">• Algorithm definitions and examples• Mathematics for algorithmic sets• Functions and relations• Combinations• Vectors and matrices• Linear inequalities and linear equations
2	Analysis of Algorithms <ul style="list-style-type: none">• 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: Insertion sort, Radix sort
3	Divide and conquer algorithms <ul style="list-style-type: none">• Introduction• Recurrence Relations and methods to solve recurrence(substitution, change of variables, master's method, Recurrence tree)• Sorting (Quick sort)• Matrix multiplication• Binary search
4	Greedy algorithms <ul style="list-style-type: none">• General Characteristics of greedy algorithms• Problem solving using Greedy Algorithm- Graphs: Minimum Spanning trees (Kruskal's algorithm, Prim's algorithm), 0-1 Knapsack problem, Activity selection problem, Making Change Problem
5	Dynamic programming <ul style="list-style-type: none">• Introduction• The Principle of Optimality• Problem Solving using Dynamic Programming- Assembly Line Scheduling, Fractional Knapsack problem, Matrix chain multiplication, shortest path, Longest Common Subsequence

6	<p>Graph Algorithms:</p> <ul style="list-style-type: none"> • 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	<p>Backtracking and Branch and Bound</p> <ul style="list-style-type: none"> • Backtracking –The Knapsack Problem; The Eight queens problem, General Template • Branch and Bound –The Assignment Problem; The Knapsack Problem, The min-max principle
8	<p>Introduction to Complexity Theory</p> <ul style="list-style-type: none"> • The class P and NP • Polynomial reduction • NP- Complete Problems • NP-Hard Problems • Travelling Salesman problem