

Course Name: Analysis and Design of Algorithms

Ref.

1. **Introduction to Algorithms** by *Thomas H. Cormen*
2. **The Design and Analysis of Computer Algorithms** by *Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman*
3. **Design Methods and Analysis of Algorithms** by *S. K. Basu*
4. **Algorithm Design** by *Michael T. Goodrich and Roberto Tamassia*
5. **Art of Computer Programming, vol. 3** by *Donald Knuth*

(This is a half paper, i.e., Full Marks is 50)

Lecture #	Topics
1 and 2	Overview of Data Structure; Data Structure and algorithm; Properties of an algorithm; Historical notes on the development of algorithm – Euclid to Alan Turing; Contributions of India and Arab; A brief introduction to the Turing Machine; Design of Algorithm; Design techniques – Divide-and-Conquer, Dynamic Programming and Greedy methods
3 and 4	Analysis of an algorithm; Computational Complexity; Space Complexity and Time Complexity; Best case, average case, worst case analysis; Asymptotic notations – O , Ω , Θ , o , w notations
5 and 6	Recurrence relations; Methods to solve recursion; Design and analysis of searching techniques; Hashing; B-tree; External searching
7 and 8	Sorting problem; Sorting techniques – Insertion sort, Shell sort, Selection sort, radix sort, merge sort
9 and 10	Bubble sort, Quick sort, Heap sort, sorting in linear time
11 and 12	Dynamic Programming concepts; Comparison between Divide-and-Conquer and Dynamic Programming; Matrix chain multiplication
13 and 14	Greedy methods; Knap-sack problem; Amortized analysis
15 and 16	Graph algorithms; BFS, DFS; Minimum spanning tree – Kruskal's and Prim's algorithm; Dijkstra's shortest path algorithm
17 and 18	Computational Complexity Theory
19 and 20	Computational Complexity Theory – NP Completeness

<i>Lecture #</i>	<i>Topics</i>
21 and 22	Challenges in design of algorithm; An introduction to Genetic Algorithm and other soft computing techniques