

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NCSC203	ALGORITHM DESIGN AND ANALYSIS	3	1	0	4
Course Objective						
Provide fundamental knowledge about algorithms, algorithm design paradigms, and proof of correctness and measurement of space and time complexity.						
Learning Outcomes						
Upon successful completion of this course, students will: • Learn about various paradigms of designing algorithms • Learn about different techniques for analyzing algorithms • Acquire in-depth knowledge about proving the correctness of an algorithm • Learn about different complexity classes						
Unit No.	Topics to be Covered	Lecture+ Tutorial	Learning Outcome			
1	Introduction: Notions of Algorithms, Algorithm Paradigms, Complexity Analysis, Asymptotic Notations, Practical Complexities.	6 + 1	Understanding of algorithm design techniques, validation of algorithms, and space and time complexity measurement of algorithms.			
2	Divide and Conquer Paradigm: Recurrence Relations, Order Statistics, Strassen’s Matrix Multiplication, Finding the Closest Pair of Points, Finding the convex hull	8 + 3	To understand the fundamentals of divide and conquer strategy, recurrence relations, and solving recurrence relations			
3	Greedy Algorithms: Fractional Knapsack Problem, Activity Selection Problem, Job Sequencing with Deadlines, Optimal Storage on Tape, Minimum Cost Spanning Trees, Single-Source Shortest Paths	8 + 3	Understanding of different problems solved by greedy method and their proof of correctness			
4	Dynamic Programming: Weighted Interval Scheduling, Subset Sum and Knapsack, Matrix Chain Multiplication, Single-Source and All-Pairs Shortest Paths, Traveling salesperson problem, Longest Common Subsequence. Multistage Graph Problem	8 + 3	Understanding of different problems solved by dynamic programming and their proof of correctness			
5	Back Tracking: N-Queens Problem, Graph Coloring, Hamiltonian Cycles.	4 + 1	To understand the fundamentals of backtracking technique.			
6	Branch-and-Bound: Least Cost Search, 15-Puzzle Problem.	3 + 1	Understanding of different problems solved by branch-and-bound technique.			
7	NP-Hard and NP-Complete Problems	5 + 2	To understand the basic principles of deterministic and non-deterministic algorithms, polynomial-time reductions.			
Total: 42 (L) + 14 (T)						

Text Books:

1. Cormen, Leiserson, Rivest and Stein, Introduction to Algorithms, Prentice Hall of India.
2. E. Horowitz, S. Sahni, and S. Rajasekaran, Fundamentals of Computer Algorithms, Universities Press.

Reference Books:

1. J. Kleinberg and E. Tardos, Algorithm Design, Pearson Education.
2. Michael T. Goodrich, and Roberto Tamassia. Algorithm design and applications. Wiley Publishing.