Course Type	Course Code	Name of Course	L	T	P	Credit
DC4	CSC206	**Algorithm Design & Analysis**	3	0	0	9

Course Objective

Provide fundamental knowledge about algorithms, algorithm design paradigms, 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 of analyzing algorithms
- Acquire in depth knowledge about proving correctness of an algorithm
- Learn about different complexity classes

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	**Introduction:** Notions of Algorithms, Algorithm Paradigms, Complexity Analysis, Asymptotic Notations, Practical Complexities.	6	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	8	To understand fundamentals of divide and conquer strategy, recurrence relations, solving recurrence relations
3.	**Greedy Algorithms:** Fractional Knapsack Problem, Activity Selection Problem, Minimum Cost Spanning Trees, Single-Source Shortest Paths	8	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.	8	Understanding of different problems solved by dynamic programming and their proof of correctness
5.	**Back Tracking:** 8-Queens Problem, Graph Coloring, Hamiltonian Cycles.	4	To understand fundamentals of back tracking technique.
6.	**Branch-and-Bound:** Least Cost Search, 15-Puzzle Problem.	3	Understanding of different problems solved by branch-and-bound technique.
7.	NP-Hard and NP Complete Problems	5	To understand the basic principles of deterministic and non-deterministic algorithms, polynomial time reductions.

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:

J. Kleinberg and E. Tardos, Algorithm Design, Pearson Education.