Course Type	Course Code	Name of Course	L	Т	Р	Credit
DE	CSD401	Advanced Algorithms	3	0	0	9

Course Objective:

The main objective of this course is to make the students understand advanced level algorithms with their design and analysis. It will also make them familiar with some advanced data structures.

Learning Outcomes

- To impart knowledge of advanced algorithms
- To familiar with some advanced data structures
- To know the areas of such algorithms and data structures

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Methods of Amortized Analysis of Algorithms such as Aggregate Analysis, Accounting Method And Potential Method	3	TounderstandvariousmethodsofAmortized Analysis with some examples
2	Topological Sorting, Strongly Connected Components, Single Source Shortest Paths In DAG, Johnson's Algorithm	6	To familiar with advanced level graph algorithms with their applications
3	Polynomials and the FFT architecture and algorithms	5	To impart knowledge about DFT computation and FFT
4	String Matching Algorithms such as Naïve Approach, Finite Automata Approach, Rabin-Karp And Knuth-Morris-Pratt	6	Students will learn various string matching algorithms.
5	Computational Geometric Algorithms: Point location Algorithms, Plane sweep techniques for Segment Intersection Problems	5	To familiar with some geometric algorithms and their real applications
6	Matrix Algorithms: LU Decomposition, LUP Decomposition, Linear System of Equations Solver, Matrix Inversion	5	Students will be exposed to how to use matrix methods to solve linear system of equations and how to obtain inverse of a high dimensional matrix.
7	kd-Tree, Binomial and Fibonacci Heaps: Definition, properties, Searching, construction and deletion algorithms	8	Students will learn how to design algorithms for various operations on these advanced level data structures.
8	Approximation Algorithms: Vertex Cover Problem, Travelling Salesman Problem, Set Cover Problem	4	To understand how to develop approximation algorithms for some NP complete/NP hard problems

Text Books:

1. Cormen, Leiserson, Rivest and Stein, Introduction to Algorithms, Prentice Hall of India, 3rd Edition, 2010. **Reference Books:**

- 1. Sartaj Sahni and Sanguthevar Rajasekaran Ellis Horowitz, Fundamentals of Computer Algorithms, Universities Press.
- 2. Mark De Berg et al., Computational geometry: Algorithms and Application, 3rd edition, Springer, 2008.