Course Type	Course Code	Name of Course	L	T	P	Credit
ESO	CSE201	**Data Structures & Algorithms**	3	0	0	9

Course Objective
Understanding towards how the choice of data structures and algorithm design methods impacts the performance of the program.

Learning Outcomes
Ability for the following.

- Choose the appropriate data structure and algorithm design method for a specified application.
- Write programs using object-oriented design principles.
- Solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, Minimum Spanning Tree, Single-source shortest path computation, topological sorting, , string matching algorithms and graphs and writing programs for these solutions.
- Solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, and writing programs for these solutions.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Objectives of time analysis of algorithms; Big Oh and Theta notations	3	Learning towards algorithm performance analysis in terms of time and space complexity
2	Elementary data-structures: arrays, linked lists, queues, stacks and their applications.	7	Understanding of elementary data structures with some applications
3	Binary search algorithm, binary trees, binary-search-tree data-structure, Balanced binary-search-tree: Red-Black trees,	7	Learning of efficient searching solution using binary tree and their variations
4	Bubble, Insertion, Merge, Heap and quicksort Sorting algorithms	7	Understanding of various sorting algorithms with varying complexity
5	Greedy paradigm with examples, Divide and conquer paradigm with examples, Dynamic-programming paradigm with examples	6	learning of various algorithm paradigms with application in example problems
6	Definition of graphs, paths, trees, cycles. Data structures for graphs: adjacency lists, adjacency matrix.Graph algorithms: Depth First Search, Breadth First Search, Minimum Spanning tree, Dijkstra's, Bellman ford and Floyd Warshell's shortest path algorithms	6	Understanding of graph data structure with their representation, traversal methods. Learning of shortest path problem and various standard shortest path algorithms
7	Naive, Automata based, KMP String matching algorithms	4	Understanding of various string matching algorithms with varying complexity
8	Hashing techniques	2	Understanding of efficient searching solution using hash table

Text Books:
1. Cormen, Leiserson, Rivest and Stein, *Introduction to Algorithms,* Prentice Hall of India, 3rd Edition, 2010.
2. AV Aho, J Hopcroft, JD Ullman, Data Structures and Algorithms, Addison- Wesley, 1983.
3. MT Goodrich, R Tamassia, DM Mount, Data Structures and Algorithms in Java, 5th Ed., Wiley, 2010. (Equivalent book in C also exists.)

Reference Books:
1. Cormen, Leiserson, Rivest and Stein, *Introduction to Algorithms,* Prentice Hall of India, 3rd Edition, 2010.
2. An Introduction to Data Structures with Application, J .P . Tremblay and P. G . Sorenson, TMH