1/2 M.Tech. FIRST SEMESTER

CSCS1T1	DATA STRUCUTES AND ALGORITHMS	Credits: 4

Lecture: 4 periods/week   **Internal assessment: 30 marks**
Tutorial: 1 period /week   **Semester end examination: 70 marks**

Objectives:
The objectives of the course are
1. To allow to assess how the choice of data structures and algorithm design methods impacts the performance of programs.
2. To choose the appropriate data structure and algorithm design method for a specified application.
3. To learn the systematic way of solving problems, various methods of organizing large amounts of data.
4. To solve problems using data structures such as linear lists, stacks, queues, binary trees, binary search trees, and graphs and writing programs for these solutions.
5. To efficiently implement the different data structures and solutions for specific problems.

Learning Outcome:
1. To describe the usage of various data structures.
2. To explain the operations for maintaining common data structures.
3. To write programs using linked structures such as List, trees, and graphs.
4. To choose, design and apply appropriate data structures for solving computing problems.
5. To analyze algorithms and to determine algorithm correctness and time efficiency.
6. To demonstrate various methods of organizing large amounts of data and arrange the data.

UNIT - I
Introduction, Analysis of Algorithms: Time Complexity & Space Complexity.
Linked Lists: Single, Double, Circular Lists. Linked Stacks & Linked Queues.

UNIT - II
Searching: Linear Search, Transpose Sequential Search, Interpolation Search, Binary Search, and Fibonacci Search.
Sorting: Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Shell Sort, Quick Sort, Heap Sort, Radix Sort, topological sorting.

UNIT - III
Trees: Binary Trees, representation of binary trees, tree traversals, expression trees (infix, prefix, postfix), threaded binary trees.
Graphs: Basic terminologies, representation, traversals (BFS, DFS).

UNIT - IV
Dictionaries, ADT, The list ADT, Stack ADT, Queue ADT, Hash table representation, hash function, collision resolution-separate chaining, and open addressing- linear probing, double hashing.

UNIT - V
Priority Queues: Definition, ADT, Realizing a Priority queue using Heaps, definition, insertion, deletion.
External Sorting: Model for external sorting, Multiway merge.

UNIT - VI
Search Trees: Binary search trees, Definition, ADT, Implementation, operations-searching, insertion and deletion.

UNIT - VII
Search Trees: AVL Trees, Definition, Height of an AVL tree, Operation- insertion, deletion and searching.

UNIT - VIII
Search Trees: Introduction to Red-Black and Splay trees, B- Trees, height of a B-tree, insertion, deletion and searching.

Learning Resources

Text book:

1. Data Structures and Algorithms- GAV Pai, TMH Publications.

Reference Books:

1. Classic Data Structures- Debasis Samantha, 2/e, PHI Learning.
2. Data Structures and Algorithm Analysis- Mark Allen Weiss,2/e, Pearson Education.
3. Introduction to Algorithms – Thomas H Cormen, Charles E Leiserson, Ronald L Rivest & Clifford Stein 3/e, PHI Learning.