2/4 B.Tech. FIRST SEMESTER

CS3T3 **DATA STRUCTURES** **Credits: 4**

(Common to CSE, IT & ECM)

Required

Lecture: 4 periods/week **Internal assessment: 30 marks**

Tutorial: 1 period /week **Semester end examination: 70 marks**

Course Context and Overview This Course main objective for the student to understand Analysis and Designing of the Algorithms and how the different data structures are used for efficient accessing of the data and Manipulation of the data at the end of the session we can able to Know different Kinds of data structures and we can able to provide different algorithms for time and space complexity.

Prerequisites: Basic Programming Language

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:

Ability to:

1. Apply the techniques to evaluate the performance of algorithms.
2. Implement linear data structures like linked lists, stacks, queues and their applications.
3. Implement the the basic operations on different types of trees.
4. Demonstrate the traversal techniques of graphs and their applications.
5. Implement sorting algorithms and complete their complexities.

UNIT I:

INTRODUCTION:

Algorithm specification: Introduction, Recursive algorithms, Data Abstraction, PerformanceAnalysis: Space complexity, time complexity, asymptotic notation.

UNIT II:

STACKS AND QUEUES

Stacks, stacks using dynamic arrays, queues, circular queues using dynamic arrays, Evaluation of an expression: Expressions, evaluating postfix expression, infix to postfix.

UNIT III:
LINKED LISTS
Single linked lists, Representing chains, operations for chains, operations for circularly linked lists, doubly linked lists.

UNIT IV:
ADVANCED LINKED LISTS
Polynomials: Representation, adding polynomials, sparse matrix representation, linked stacks and queues.

UNIT V:
TREES
Introduction: Terminology, representation of trees, binary trees: abstract data type, Properties of binary trees, binary tree representation, binary tree traversals: Inorder, preorder, postorder.

UNIT VI:
ADVANCED TREES
Binary search trees: Definition, searching BST, insert into BST, delete from a BST, Height of a BST, AVL Trees.

UNIT VII:
GRAPHS
The Graph ADT: Introduction, definition, graph representation, elementary graph operations: BFS, DFS, Spanning trees, minimum cost spanning tree: Prim's, Kruskal's.

UNIT VIII:
SORTINGS
Insertion sort, quick sort, merge sort, heap sort, radix sort.

Learning Resources

Text Book:

1. Fundamentals of Data Structures in C – 2nd Edition, Horowitz, Sahani, Anderson-Freed, University Press.

Reference Books:

1. Data Structures and Algorithm Analysis in C – 2nd Edition, Mark Allen Weiss, Pearson Classic Data Structures – 2nd Edition, Debasis Samantha, PHI