MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act,1956

COURSE CONTENT

DATA STRUCTURES

III Semester: CSD / CSE / CSM / ECE /EEE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2530504	Core	L	T	P	C	CIA	SEE	Total
		3	0	0	3	40	60	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		
Prerequisites: Programming for Problem Solving								

Course Overview:

   This course introduces fundamental **data structures** and their role in efficient data organization and problem solving. It covers linear and non-linear data structures, including linked lists, stacks, queues, trees, graphs, and hashing techniques. Students learn key algorithms for searching, sorting, and data retrieval. The course emphasizes practical applications and performance analysis of data structures.

Course Objectives:
1. Exploring basic data structures such as stacks and queues.
2. Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
3. Introduces sorting and pattern matching algorithms.

Course Outcomes: After Completion of the Course, Students should be able to
1. Explain fundamental data structure concepts, abstract data types, and linear data structures including linked lists, stacks, and queues along with their operations and applications.
2. Construct and analyze tree-based data structures such as binary trees, binary search trees, balanced trees, and multi-way search trees for efficient data organization.
3. Apply heap structures and searching techniques including interpolation and jump search for priority management and efficient data retrieval.
4. Represent graphs using appropriate data models and implement graph traversal algorithms for solving real-world computational problems.
5. Implement advanced data handling techniques using hashing methods, collision resolution strategies, sorting algorithms, and file organization concepts.

UNIT - I: Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operation on Data Structures, abstract data types, selecting a Data Structure, Linear list — Introduction, singly linked list, Circular Linked Lists, Doubly Linked List, Stacks- Operations, Stack algorithm, Stack ADT, Stack applications, Queues- operations, Queue Algorithm, Queue ADT, Queue Applications.

UNIT - II: Trees: Introduction, Types of Trees, creating a Binary Tree from a General Tree, traversing a Binary Tree, Binary Search Trees (BST), BST Operations- Searching, Insertion and Deletion, BST ADT, BST Applications, Threaded Binary Trees, AVL Trees, Red –Black Trees, Splay Trees

UNIT - III: Multi way Search Trees: Introduction, B Trees, B Trees ADT, 2-3 Trees, 2-3- Tree, B* Tree, B+ Trees Heaps: Binary Heaps, Binomial heaps, Fibonacci heaps, Comparison of Various Heaps, Applications Searching: Introduction, Interpolation Search, Jump search

UNIT - IV: Graphs: Introduction, Directed Graphs, Bi connected Components, Representation of Graphs, Graph Traversal Algorithms, Graph ADT, Applications of Graphs
Sorting: Radix Sort, Heap sort, Shell Sort, Tree Sort,

UNIT - V: Hashing and Collision: Introduction, Hash Tables, Hash Functions, Different Hash Functions: Division Method, Multiplication Method, Mid-square Method, Folding Method; collisions: Collision Resolution by Open Addressing, Collision Resolution by Chaining
Files and their Organization: Introduction, Data hierarchy, File Attributes, Text and Binary Files, Basic File Operations, File Organization, Indexing

TEXT BOOKS:
1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning
2. Data Structure using C– Reema Thareja, 3rd Edition, Oxford University Press.

REFERENCE BOOKS:
1. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

ELECTRONIC RESOURCES:

1. https://www.tutorialspoint.com/data_structures_algorithms/algorithms_basics.htm

2. https://www.codechef.com/certification/data-structures-and-algorithms/prepare

3. https://www.cs.auckland.ac.nz/software/AlgAnim/dsToC.html

4. https://online-learning.harvard.edu/course/data-structures-and-algorithms

MATERIALS ONLINE:
1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)