2018-19 Onwards (MR-18)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. II Semester		
Code: 80503	DATA STRUCTURES (Common for EEE, ECE, CSE and IT)	L	T	P
Credits: 3		3	-	-

Prerequisites: Computer Programming

Course Objectives:
This course will deliver the knowledge in introducing the concepts of various data structures such as linked lists, stacks, queues, trees and graphs along with the applications.

MODULE I: Performance Analysis and Introduction to data structures [12 Periods]
Performance Analysis: Algorithm definition and characteristics, time and space complexity, Asymptotic Notations – Big O, Omega and Theta notations.
Introduction to data structures: Types of data structures: Linear and Non-linear data structures. Recursion definition- Linear and Binary recursion, Design methodology and implementation of recursive algorithms, Recursive algorithms for Towers of Hanoi.

MODULE II: Linked Lists [13 Periods]
Single Linked Lists: Definition, Operations-Insertion, Deletion and Searching, Concatenating single linked lists, Circular linked lists, Operations- Insertion, Deletion.
Double Linked Lists: Definition, Operations- Insertion, Deletion. Applications of Linked list. Sparse matrices - Array and linked representations.

MODULE III: Stacks and Queues [13 Periods]
A: Stacks - Basic stack operations, Representation of a stack using arrays and linked lists, Stack Applications - Reversing list, factorial calculation, postfix expression evaluation, infix-to-postfix conversion.
B: Queues - Basic queue operations, Representation of a queue using array and Linked list, Classification and implementation – Circular, Enqueue and Dequeue, Applications of Queues.

MODULE IV: Trees and Graphs [13 Periods]
Trees: Basic concepts of Trees, Binary Tree: Properties, Representation of binary tree using array and linked lists, operations on a binary tree, binary tree traversals, creation of binary tree from in, pre and post-order traversals, Tree traversals using stack, Threaded binary tree.
Graphs: Basic concepts of Graphs, Representation of Graphs using Linked list and Adjacency matrix, Graph algorithms, Graph traversals- (BFS & DFS).

MODULE V: Search Trees [13 Periods]
Binary Search Trees and AVL Trees: Binary Search Tree, Definition, Operations - Searching, Insertion and Deletion, AVL Trees (Elementary treatment-only Definitions and Examples).
B-Trees and Red-Black Trees: B-Trees, Red-Black and Splay Trees (Elementary treatment-only Definitions and Examples), Comparison of Search Trees.

TEXTBOOKS

1. Jean Paul Tremblay, Paul G Sorenson, "**An Introduction to Data Structures with Applications**", Tata McGraw Hills, 2nd Edition, 1984.
2. Richard F. Gilberg, Behrouz A. Forouzan, "**Data Structures: A Pseudo code approach with C** ", Thomson (India), 2nd Edition, 2004.

REFERENCES

1. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan, "**Fundamentals of Data Structure in C**", University Press (India), 2nd Edition, 2008.
2. A. K. Sharma, "**Data structures using C**", Pearson, 2nd Edition, June, 2013.
3. R. Thareja, "**Data Structures using C**", Oxford University Press, 2nd Edition, 2014.

E-RESOURCES

1. http://gvpcse.azurewebsites.net/pdf/data.pdf
2. http://www.sncwgs.ac.in/wp-content/uploads/2015/11/Fundamental-Data-Structures.pdf
3. http://www.learnerstv.com/Free-Computer-Science-Video-lectures-ltv247-Page1.htm
4. http://ndl.iitkgp.ac.in/document/yVCWqd6u7wgye1qwH9xY7-3lcmoMApVUMmjlExpIb1zste4YXX1pSpX8a2mLgDzZ-E41CJ6PVmY4S0MqVbxsFQ
5. http://nptel.ac.in/courses/106102064/1

Course Outcomes:

At the end of the course, students will be able to

1. **Identify** the appropriate data structures and analyze the performance of algorithms.
2. **Understand** and implement single, double, and circular linked-lists.
3. **Implement** Stacks and Queues using array and linked-list representations.
4. **Develop** programs by using non linear data structures such as trees and graphs.
5. **Design** and Implement applications of advanced data structures.