DATA STRUCTURES

III Semester: ME / CSE / IT / ECE / CE | IV Semester AE / EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACSB03	Core	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Learn the basic techniques of algorithm analysis.
II. Demonstrate searching and sorting algorithms and analyze their time complexities.
III. Implement linear data structures viz. stack, queue and linked list.
IV. Demonstrate non-linear data structures viz. tree and graph traversal algorithms.
V. Study and choose appropriate data structure to solve problems in real world.

COURSE OUTCOMES (COs):

1. Understand the concept of data structures and apply algorithm for solving problems like sorting, searching, insertion and deletion of data.
2. Understand linear data structures for processing of ordered or unordered data.
3. Explore various operations on dynamic data structures like single linked list, circular linked list and doubly linked list.
4. Explore the concept of non linear data structures such as trees and graphs
5. Understand the binary search trees, hash function, and concepts of collision and its resolution methods.

COURSE LEARNING OUTCOMES (CLOs):

1. Understand algorithms and data structures in terms of time and space complexity of basic operations.
2. Choose a suitable algorithm to organize the data in ascending or descending order.
3. Explore an algorithm to find the location of an element in a given list.
4. Compare the time complexities of various searching and sorting algorithms.
5. Implementation of stack and queues using an underlying array.
6. Understand application of stacks in arithmetic expression conversion and evaluation.
7. Understand working of circular queues and double ended queue.
8. Understand dynamic data structures and their real time applications.
9. Understand the basic insertion and deletion operations associated with linked list.
10. Organize the data in various linked representation format.
11. Understand the concept of non-linear data structures viz. trees and graphs.
12. Application of trees, graphs and graph traversal techniques.
13. Compare and Contrast the operations of binary search trees and AVL trees.
14. Understand the concept of M-way search trees, operations and applications.
15. Understand the implementation of hashing using hash table and hash function.
16. Describe the concept of collision and its resolving methods in applications.
17. Strengthen the knowledge of data structures and algorithms for employability.

MODULE-I	INTRODUCTION TO DATA STRUCTURES, SEARCHING AND SORTING
Basic concepts: Introduction to data structures, classification of data structures, operations on data structures; Searching techniques: Linear search and Binary search; Sorting techniques: Bubble sort, selection sort, insertion sort and comparison of sorting algorithms.	
MODULE-II	**LINEAR DATA STRUCTURES**
Stacks: Primitive operations, implementation of stacks using Arrays, applications of stacks arithmetic expression conversion and evaluation; Queues: Primitive operations; Implementation of queues using Arrays, applications of linear queue, circular queue and double ended queue (deque).	
MODULE-III	**LINKED LISTS**
Linked lists: Introduction, singly linked list, representation of a linked list in memory, operations on a single linked list; Applications of linked lists: Polynomial representation and sparse matrix manipulation. Types of linked lists: Circular linked lists, doubly linked lists; Linked list representation and operations of Stack, linked list representation and operations of queue.	
MODULE-IV	**NON LINEAR DATA STRUCTURES**
Trees: Basic concept, binary tree, binary tree representation, array and linked representations, binary tree traversal, binary tree variants, application of trees; Graphs: Basic concept, graph terminology, graph implementation, graph traversals, Application of graphs, Priority Queue.	
MODULE-V	**BINARY TREES AND HASHING**
Binary search trees: Binary search trees, properties and operations; Balanced search trees: AVL trees; Introduction to M-Way search trees, B trees; Hashing and collision: Introduction, hash tables, hash functions, collisions, applications of hashing.	
Text Books:	
1. Rance D. Necaise, "Data Structures and Algorithms using Python", Wiley Student Edition. 2. Benjamin Baka, David Julian, "Python Data Structures and Algorithms", Packt Publishers, 2017.	
Reference Books:	
1. S. Lipschutz, "Data Structures", Tata McGraw Hill Education, 1st Edition, 2008. 2. D. Samanta, "Classic Data Structures", PHI Learning, 2nd Edition, 2004.	
Web References:	
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	