DATA STRUCTURES

III Semester: ME / CSE / IT / ECE / CE	IV Semester AE / EEE
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Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB03	Core	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			ses: 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