

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.Tech. (Information Technology)			
Subject Code & Name	Instructions Hours per Week			Credits			
3RIPC2 Data Structures	L	T	P	L	T	P	Total
	2	1	2	2	1	1	4
<b>Duration of Theory Paper: 3 Hours</b>							

**Learning Objectives:**

- To provide the knowledge of basic data structures and their implementations.
- To understand the importance of data structures in the context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

**Prerequisites :** Computer Programming knowledge

**Course Outcomes (COs)**

CO No.	Course Outcome	Program Outcomes (PO)
CO1	Understanding requirements of Data Structure as a tool for problem solving and get acquainted with basic Data Structures.	PO1, PO2, PO3
CO2	Understanding and ability to implement basic Data Structure using programming language.	PO1, PO2, PO3, PO5
CO3	Understanding and implementation of sorting algorithms, searching approaches and data structure's operation time complexity.	PO1, PO2, PO3, PO4, PO12
CO4	Understanding and implementation of various applications and general problems with suitable data structures.	PO1, PO2, PO3, PO4, PO5, PO12

**PO-CO Matrix**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	1	-	3	-	-	-	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	1
CO4	3	3	2	1	3	-	-	-	-	-	-	3

## **COURSE CONTENTS**

### **UNIT-I**

**Arrays and List:** Array: Definition, Representation, Address Calculation; Searching: Linear search, Binary search; Sorting: Bubble sort, Insertion sort, Selection sort, Radix sort, Shell sort; List: Introduction, Implementation as Linked list, Circular linked List, Doubly linked list, Applications of linked list.

### **Unit-II**

**Stacks:** Definition, Representations : static and dynamic, Implementation of stack, Applications of stack: Polish notation representation and conversion, Tower of Hanoi problem, Implementation of recursion, Quick sort and Merge sort.

### **Unit-III**

**Queues and Hashing:** Definition, Representations, Static and dynamic, Circular Queue, Double ended Queue, Priority Queue, Implementation of Priority Queue using Heap data structure, Heap Sort, applications of queues. Hash Structures: Representation, Search and Implementation and other issues.

### **Unit-IV**

**Trees:** Definition, Basic terminology, Binary tree, Complete Binary Tree, representations: Static and dynamic, Traversal techniques in binary tree, Heap tree, Binary Search tree, AVL tree, M-way search trees, B-tree & its variations.

### **Unit-V**

**Graphs:** Definition, Basic terminology, Graph Types, Representations: static, dynamic; Implementations, Searching in graphs, Shortest path in graphs, Applications.

### **Learning Outcomes :**

Upon Completing the Course, Student will able to:

1. Learn the basic types for data structure, implementation and application.
2. Know the strength (suitability) and weakness (operation complexity) of different data structures.
3. Use the appropriate data structure in context of the solution of a given problem..
4. Develop programming skills which are required to solve a given problem.

### **BOOKS RECOMMENDED:**

- [1] E. Horowitz & Sahni, Fundamental Data Structure, Galgotia Book Source, 1983.
- [2] A. Tannenbaum, Data Structure Using C, Pearson Education, 2003.
- [3] Kruz, Data Structure and Programming Design, 1987.
- [4] N. Wirth, Algorithms +Data Structure = Program, Prentice Hall of India, 1979.
- [5] Goodrich & Tamassia, Data Structures and Algorithms in C++, 2nd Edition, John Wiley & Sons, 2011.

### **List of Practical Assignments:**

1. Implementation of searching and sorting techniques.
2. Implementation of list using array and linked list.
3. Implementation of push and pop operation on stack
4. Implementation of polish notation and its conversion
5. Write a program to solve the problems using iteration/recursion
6. Program for recursion removal using stack
7. Program for insertion /deletion operation on various queue & Implementation of priority queue for process scheduling
8. Program for storing data as tree structure and implementation of various traversal techniques
9. Program for storing data as graph structure and implementation of various traversal techniques
10. Program for finding shortest path in graph.
11. Learn use of suitable data structures for solving problems: Maze, Polynomial Arithmetic, Tower of Hanoi etc.