

<b>Devi Ahilya Vishwavidhyalaya, Indore, India</b> <b>Institute of Engineering &amp; Technology</b>				<b>II Year B.Tech.</b> <b>(Electronics and Telecommunication Engineering)</b>		
<b>Course Code &amp; Name</b>	<b>Instructions Hours per Semester and Credits</b>					
<b>3RTPC3</b>  <b>DATA STRUCTURE</b>	<b>Classroom Instruction (CI)</b>		<b>Lab Instruction (LI)</b>	<b>Term Work (TW) and Self Learning (SL)</b>	<b>Total no. of Hours Per semester</b>	<b>Total Credits (Total Hours/30)</b>
	<b>L</b>	<b>T</b>	<b>P</b>	<b>TW+SL</b>	<b>120</b>	<b>4</b>
	<b>30</b>	<b>10</b>	<b>20</b>	<b>60</b>		

**Course Learning Objectives:**

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in content of writing efficient programs
3. To develop skills to apply appropriate data structures in problem sorting.

**Prerequisites:**

Computer Programming knowledge, C/C++ Language

**COURSE CONTENTS**

**Unit-I**

**Data Structure and Arrays:** Data structures & Programming, Types of data structures, Program Design, Complexities, Algorithm Specifications: Performance Analysis and Measurement (Time and space analysis of algorithms) Average, best- and worst-case analysis, Asymptotic Notation.

**Array:** Definition, Representation, Address Calculation; Searching: Linear search, Binary search

**Unit-II**

**Linked List and Sorting:**

**Linked List:** Singly Linked List, Doubly Linked list, Circular linked list, Linked implementation of Stack, Applications of linked list.

**Sorting:** Bubble sort, Insertion sort, Selection sort, Radix sort, Shell sort, Quick sort and Merge sort.

**Unit-III**

**Queues and Stack:**

**Queues:** 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.

**Stack:** Definition, Representations: static and dynamic, Implementation of stack, Applications of stack: Polish notation representation and conversion, Tower of Hanoi problem, Implementation of recursion

## Unit-IV

### Hashing and Trees:

**Hashing:** Hash Structures: Representation, Search and Implementation and other issues, the symbol table, Hashing Functions, Collision-Resolution Techniques, File Structure: Concepts of fields, records and files, hashing for direct files.

**Trees:** -Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, postorder, preorder), Binary search trees, Conversion of General Trees to Binary Trees, B-tree & its variations, Applications of Trees- Some balanced tree mechanism, AVL trees, M- way search trees.

## Unit-V

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

### Course Outcomes:

CO.No.	CO
CO1	Able to explain fundamental data structures, analyze algorithm complexities, and apply array-based searching techniques.
CO2	Able to implement various linked list structures and compare different sorting algorithms with respect to efficiency.
CO3	Able to apply stack and queue data structures in algorithmic problem solving, including recursion, expression conversion, and priority-based processing.
CO4	Able to design and analyze hashing techniques and tree structures, including BST, AVL, B-trees, and M-way trees.
CO5	Able to implement graph representations and apply graph traversal and shortest-path algorithms in real applications.

### BOOKS RECOMMENDED:

- [1].E.Horowitz & Sahni,” Fundamental Data Structure” ,GalgotiaBookSource, 1983.
- [2]. A.Tannenbaum,“Data Structure Using C”,PearsonEducation, 2003.
- [3]. Kruse,“Data Structure and Programming Design”,PrenticeHall,1987.
- [4]. N.Wirth,“Algorithms+DataStructure=Program”,Prentice Hall of India,1979.
- [5]. Goodrich & Tamassia, “Data Structures and Algorithms in C++”,2 nd Edition, John Wiley & Sons, 2011.

### CO-PO-PSO Relationship

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
3RTPC3.CO1	3	3	2	2	1							1	3	2
3RTPC3.CO2	3	3	3	2	2							1	3	2
3RTPC3.CO3	3	3	3	2	2							1	3	3
3RTPC3.CO4	3	3	3	2	2							1	3	2

3RTPC3.CO5	3	3	3	2	2							2	3	3
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**List of Practical Assignments:**

During the learning of course, students need to carryout following assignments:

1. Implementation of Array and also perform insertion, deletion and traversing in it.
2. Write a program to perform Linear searching in an array.
3. Write a program to perform Binary searching in an array.
4. Write a program for Bubble sort technique.
5. Write a program for Insertion sort technique.
6. Write a program for Merge sort technique.
7. Implementation of Linked list and also perform insertion, deletion, traversing and searching in it.
8. Write a program for static implementation of stack and also perform push and pop operation on stack.
9. Write a program for dynamic implementation of stack and also perform push and pop operation on stack.
10. Write a program for static implementation of Queue and also perform insertion and deletion operation in it.
11. Write a program for dynamic implementation of Queue and also perform insertion and deletion operation in it.
12. Write a program to solve the problems using iteration/ recursion.
13. Write a program for storing data as tree structure and implementation of various traversal techniques.
14. Write a program for storing data as graph structure and implementations of various traversal techniques.