

Course Title	Course Structure			Pre-Requisite
Data Structures	L	T	P	Fundamentals of Programming
	3	0	2	

#### Course Objective:

The objective of data structures and algorithms is to enable students to implement, understand, and analyze basic techniques of algorithm analysis. They define how efficiently we can store and organize data, as well as different algorithms for computational tasks. This subject aims to develop problem-solving skills, algorithmic thinking, and the ability to write efficient programs.

#### Course Outcome (CO):

- Understand basic data structures such as arrays, linked list, stacks, and queues.
- Analyze the concepts of algorithm evaluation, and find time and space complexities for searching and sorting algorithms.
- Implement different types of trees, and apply them to problem solutions.
- Discuss graph structure, and understand various operations on graphs and their applicability.
- Apply algorithm for solving problems like sorting, searching, insertion, and deletion of data.

S.No.	Content	Contact Hours
Unit 1	<p><b>Introduction:</b> Introduction to Algorithmic, Complexity- Time-Space Trade off. Introduction to abstract data types, design, implementation, and applications. Introduction to List data structure.</p> <p><b>Arrays and Strings:</b> Representation of Arrays in Memory: one dimensional, Two dimensional, and Multidimensional, Accessing of elements of array, performing operations like Insertion, Deletion, and Searching. Sorting elements of arrays. Strings and String Operations.</p> <p><b>Stacks and Queues:</b> Introduction to data structures like Stacks and Queues. Operations on Stacks and Queues, Array representation of Stacks, Applications of Stacks : recursion, Polish expression and their compilation conversion of infix expression to prefix and postfix expression, Operations of Queues, Representations of Queues Applications of Queues, Priority queues.</p>	9
Unit 2	<b>Linked Lists:</b> Singly linked lists, Representation of linked list, Operations of Linked list such as Traversing, Insertion and Deletion, Searching, and Applications of Linked List. Concepts of Circular	8

	linked list and Doubly linked list and their Applications. Stacks and Queues as linked list.	
Unit 3	<b>Trees:</b> Basic Terminology, Binary Trees and their representation, binary search trees, various operations on Binary search trees like traversing, searching, Insertion and Deletion, Applications of Binary Search Trees, Complete Binary trees, Extended binary trees. General trees, AVL trees, Threaded trees, B- trees.	8
Unit 4	<b>Searching and Sorting:</b> Linear Search, Binary Search, Interpolation Search, Insertion Sort, Quick sort, Merge sort, Heap sort, sorting on different keys, and External sorting.	8
Unit 5	<b>Graphs:</b> Terminology and Representations, Graphs & Multi-graphs, Directed Graphs, Representation of graphs and their Transversal, Spanning trees, shortest path and Transitive Closure, Activity Networks, Topological Sort and Critical Paths.  <b>File Structure:</b> File Organization, Indexing & Hashing, Hash Functions, Collision Resolution Techniques.	9
Total		42

### Books:-

S.No.	Name of Books/Authors/Publisher
1	Fundamentals of Data Structures; E. Horowitz, & S. Sahni, Universities Press, 2 <sup>nd</sup> Edition (2008).
2	Tannenbaum, "Data Structures", PHI
3	An introduction to data structures and application by Jean Paul Tremblay & Pal G. Sorenson (McGraw Hill).
4	R.L. Kruse, B.P. Leary, C.L. Tondo, "Data structure and program design in C", PHI