

**PESIT(BSC)**  
**Department of Computer Science and Engineering**

<b>DATA STRUCTURES AND APPLICATIONS</b> (Effective from the academic year 2015 -2016) <b>SEMESTER - III</b>			
<b>Subject Code</b>	<b>15CS33</b>	<b>IA Marks</b>	<b>20</b>
<b>Number of Lecture /Week</b>	<b>4</b>	<b>Exam Marks</b>	<b>80</b>

**Faculty: Mr.Sandesh B J, Ms. Sai Prasanna**

**No. of Sessions: 60**

**Course Description:**

This course focuses on data structures and its types. It introduces the concepts and discusses in detail various operations on linear and nonlinear data structures. Concept of stacks, queues, linked lists, trees and graphs, algorithms for accessing and manipulating these data structures is included. It also focuses on various searching, sorting and file organization methods.

**Prerequisites:**

Programming in C language

**Course Objectives:**

- Understand, Practice and Assimilate fundamentals of data structures and their applications essential for programming/problem solving
- Describe, Analyze, Design and Evaluate the Linear Data Structures: Stack, Queues, Lists
- Describe, Analyze, Design and Evaluate the Non-Linear Data Structures: Trees, Graphs
- Describe, Analyze, Design and evaluate the sorting & searching algorithms
- Assess appropriate data structure during program development/Problem Solving

**Course Plan:**

Class	Chapter Title	Topics to be covered	% of portion covered	
				Cumulative
1.	<b>Module I Introduction to Data Structures, Arrays and Strings</b>	Introduction to Data Structures	20%	20%
2.		Classification of Data Structures: Primitive and Non-Primitive, Linear and Nonlinear		
3.		Data structure Operations: Create, Insert, Delete, Search, Sort, Merge, Traversal		
4.		Review of Structures, Unions and Pointers		
5.		Self Referential Structures		
6.		<b>Arrays:</b> Definition, Representation, Operations - Insert, Delete, Simple Merge		
7.		Search, Sort		
8.		Multidimensional Arrays		
9.		Applications of Arrays		
10.		<b>Strings:</b> Definition, Representation, Operations		
11.		String manipulation Applications.		
12.		Dynamic Memory Management Functions - <i>malloc, calloc, realloc, free</i>		
13.	<b>Module II Linear Data Structures and their Sequential Storage Representation</b>	<b>Stack:</b> Definition, Representation, Operations and Applications	20%	40%
14.		Polish and reverse polish expressions		
15.		, Infix to postfix conversion		
16.		evaluation of postfix expression		
17.		Infix to prefix		
18.		postfix to infix conversion		
19.		Recursion - Factorial, GCD, Fibonacci Sequence		
20.		Tower of Hanoi		
21.		Binomial Co-efficient ( $nCr$ )		
22.		Ackerman's Recursive function		
23.		<b>Queue:</b> Definition, Representation, Operations		
24.		Double Ended Queue; Applications of Queues		
25.	<b>Module III</b>	<b>Linked List:</b> Definition, Representation, Operations	20%	60%
26.		Types: Singly Linked List, Doubly Linked list, Circular linked list		
27.		Linked implementation of Stack, Queue		
28.		Double Ended Queue		
29.		Priority queues		
30.		Applications of Linked lists - Polynomial Manipulation		
31.		Multi precision arithmetic		
32.		Symbol table organizations		
33.		Sparse matrix		

		representation with multilinked data structure		
34.	<b>Linear Data Structures and their Linked Storage Representation</b>	Sparse matrix representation with multilinked data structure		
35.		Merging two lists		
36.		removing duplicates reversing a list		
37.		union and intersection of two lists etc.		
38.	<b>Module IV Nonlinear Data Structures</b>	<b>Trees:</b> Definitions, Terminologies	20%	80%
39.		Array and linked Representation of Binary Trees		
40.		Types- Complete/full, Almost Complete, Strictly, Skewed		
41.		Traversal methods - Inorder, postorder, preorder		
42.		Binary Search Trees - Creation, Insertion, Deletion		
43.		Traversal, Searching; Expression tree		
44.		Threaded binary tree		
45.		Conversion of General, Trees to Binary Trees		
46.		Constructing BST from traversal orders		
47.		Applications Of Trees: Evaluation of Expression		
48.		Tree based Sorting. Programming Examples		
49.	<b>Module V Graphs, Sorting and Searching, Hashing, File Structures</b>	<b>Graph:</b> Definitions, Terminologies	20%	100%
50.		Matrix and Adjacency List Representation Of Graphs		
51.		Elementary Graph operations		
52.		Traversal methods: Breadth First Search and Depth First Search		
53.		<b>Sorting and Searching:</b> Insertion Sort		
54.		Radix sort, Address Calculation Sort		
55.		<b>Hashing:</b> The Hash Table organizations		
56.		Hashing Functions, Static and Dynamic Hashing		
57.		Collision-Resolution Techniques		
58.		<b>File Structures:</b> Definitions and Concepts		
59.		File Organizations - Sequential		
60.		Indexed Sequential, Random Access		

## **Course Outcomes:**

After studying this course, students will be able to:

- Acquire knowledge of
  - Various types of data structures, operations and algorithms
  - Sorting and searching operations
  - File structures
- Analyse the performance of
  - Stack, Queue, Lists, Trees, Graphs, Searching and Sorting techniques
- Implement all the applications of Data structures in a high-level language
- Design and apply appropriate data structures for solving computing problems

## **TEXT BOOK:**

1. Fundamentals of Data Structures in C - Ellis Horowitz and Sartaj Sahni, 2nd edition, 2014, Universities Press
2. Data Structures: A Pseudo-code approach with C - Gilberg&Forouzan, 2nd edition, 2014, Cengage Learning

## **REFERENCE BOOKS:**

1. Data Structures using C, second edition, Reemathareja, Oxford press
2. Data Structures - Seymour Lipschutz, Schaum's Outlines, revised 1st edition, McGraw Hill
3. An Introduction to Data Structures with Applications- Jean-Paul Tremblay & Paul G. Sorenson, 2<sup>nd</sup> Edition, 2013, McGraw Hill
4. Data Structures using C - A M Tenenbaum, Pearson
5. Data Structures and Program Design in C - Robert Kruse, PHI