



School of Computing & Information Technology

Department of Computer Science & Engineering

**LAB MANUAL
CS-1331
DATA STRUCTURES LAB**

Program	:	B. Tech.	Semester :	III Semester CSE/IT/CCE
Session	:	2019-20	Subject Code :	CS 1331
Course Name	:	Data Structures Lab		
Credits	:	[0 0 1 1]		

Course Instructor(s)

- Dr. Prakash Ramani
- Dr. Mahesh Jangid
- Ms. Anubha Parashar
- Dr. Manoj Bohra
- Dr. Muthukumaran Kasinathan
- Dr. Manjit Kaur
- Dr. Anju Yadav
- Mr. Virender Dehru
- Mr. Rohit Kumar Gupta

Course Objectives

- To make the students understand various ways of organising data and storing it into memory and use the type depending upon the application.
- To develop algorithm designing and analyzing skills in students.
- To enhance programming skills of students.

Learning Outcomes : After completion of this course, a student will be able to:

- Explain basic concepts of various data structures
- Describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations
- Select and/or apply appropriate data structures to solve problems.
- Implement various sorting and searching algorithms

Lab Assessment :

- Internal Assessment : 70 Marks

Marks to be awarded to a student based on the performance of the student in the continuous evaluation done by the faculty during the semester.

- External Assessment : 30 Marks

External assessment will be done by conducting two hours end semester practical exam and a viva voce.

Index Format

S.No.	Aim of the Program	Date of Performing Experiment	Date of Submission	Remarks	Signature of the Faculty

How to Write Programs in the Lab Record

Students have to follow the following format for writing the programs, implemented on the computer, in the lab file :

Aim / Objective : Write the objective of the program.
Source Code : Source Code of the Program Implemented on the Computer
Output : Output of the program upon execution.

For example:

Aim : Write a program in C to display Hello World on the computer Screen

SourceCode :

```
#include<stdio.h>
```

```
void main()  
{  
    printf("Hello World");  
}
```

Output

Hello World

Department of Computer Science & Engineering
Data Structures Lab

Course Code: - CS1331

Credit: - [0 0 1 1]

List of Experiments

Semester-Odd (III Semester)

Lab 1 : Single Dimensional Array

- Write a program to search an element in an array using linear search technique. Write separate functions for reading the array, and for searching the element in the array.
- Write a program to search an element in an array using binary search technique. Write separate functions for reading the array, and for searching the element in the array.
- Write a program to insert an integer in an array of N integers. Write separate functions for reading the array, displaying the array and to insert the element in the array.
- Write a program to delete an integer in an array of N integers. Write separate functions for reading the array, displaying the array and to delete the element from the array.
- Write a program to sort an array of N integers using selection sort technique. Write separate functions for reading the array, sorting the array and to display the elements of the array.
- Write a program to sort an array of N integers using bubble sort technique. Write separate functions for reading the array, sorting the array and to display the elements of the array.

Lab 2 & 3 : Two Dimensional Array

- Write a program to find the multiplication of two matrices. Write separate functions for reading the matrix, displaying the matrix and to find the multiplication of the matrices.
- Write a program to find the transpose of a matrix. Write separate functions for reading, displaying and to find the transpose of the matrix.
- Write a program to find check whether the matrix is upper triangular or not. Write separate functions for reading the matrix and to check whether the matrix is upper triangular or not.
- Write a program to find check whether the matrix is lower triangular or not. Write separate functions for reading the matrix and to check whether the matrix is lower triangular or not.

Lab 4 & 5 : Linked List

- Write a program to perform following operations on the singly linked list :
Inserting a node (at the start, at the end, in between), deleting a node (starting node, last node, in between node), displaying information stored in the nodes.
Write separate functions for each of the operations.
- Write a program to perform following operations on the circular linked list :
Inserting a node (at the start, at the end, in between), deleting a node (starting node, last node, in between node), displaying information stored in the nodes.
Write separate functions for each of the operations.
- Write a program to perform following operations on the doubly linked list :
Inserting a node (at the start, at the end, in between), deleting a node (starting node, last node, in between node), displaying information stored in the nodes.
Write separate functions for each of the operations.
- Write a program to add two polynomials using linked list.

Lab 6 & 7 : Stack

- Write a program to implement stack using array. Write separate functions for the following operations on stack : Push (inserting element), Pop (deleting element).
- Write a program to implement stack using linked list. Write separate functions for the following operations on stack : Push (inserting element), Pop (deleting element)
- Write a program to convert an expression from infix notation to postfix notation.
- Write a program to evaluate an expression in postfix notation.

Lab 8 : Queue

- Write a program to implement simple queue using array. Write separate functions for the following operations on queue : Enqueue (inserting element), Dequeue (deleting element).
- Write a program to implement simple queue using linked list. Write separate functions for the following operations on queue : Enqueue (inserting element), Dequeue (deleting element).
- Write a program to implement circular queue using array. Write separate functions for the following operations on queue : Enqueue (inserting element), Dequeue (deleting element).

- Write a program to implement circular queue using linked list. Write separate functions for the following operations on queue : Enqueue (inserting element), Dequeue (deleting element).

Lab 9 & 10 : Trees

- Write a program to implement binary search tree. Write separate functions for each of the following operations on binary search tree: Creating Binary Search Tree, Inserting a node in the tree, Deleting a node from the tree and to search an element in the tree.
- Write a program to search a largest number in a binary search tree which is less than equal to N.
- Write a program to traverse a binary search tree in pre-order, post-order and in-order.
- Write a program to find the minimum value in a binary search tree.

Lab 11 & 12 : Graphs

- Write a program to find the transitive closure of a directed graph.
- Write a program to find the minimum spanning tree using Prim's algorithm
- Write a program to implement BFS Algorithm
- Write a program to implement DFS Algorithm.

Lab 13 : Sorting

- Write a program to sort an array of N integers using insertion sort technique. Write separate functions for reading the array, sorting the array and to display the elements of the array.
- Write a program to sort an array of N integers using merge sort technique. Write separate functions for reading the array, sorting the array and to display the elements of the array.
- Write a program to sort an array of N integers using quick sort technique. Write separate functions for reading the array, sorting the array and to display the elements of the array.
- Write a program to sort an array of N integers using heap sort technique. Write separate functions for reading the array, sorting the array and to display the elements of the array.