18MC102DATA STRUCTURES

Course Description and Objectives:

This course is aimed at offering fundamental concepts of data structures and explains how to implement them. It begins with the basic concepts of data, data structures and then introduces the primitive and non-primitive data structures in detail. It forms the basis for understanding various ways of representing data and its usage in different computing applications.

Course Outcomes:

The student will be able to:
 ➢ Apply advanced C programming techniques such as pointers, dynamic memory allocation and structures to develop solutions for specific problems.
 ➢ Analyze characteristics of various data structures.
 ➢ Apply the concepts of graphs and trees in computer applications.
 ➢ Evaluate the importance of sorting and searching techniques in solving certain real time problems.

Skills:
 • Analyse the data structure required for various applications.
 • Develop the sorting algorithm suitable for a given scenario.
 • Implement array or linked list for a given problem.
 • Describe Pros & Cons of each data structure.
 • Usage of trees and graphs.

Activities:

ACTIVITY – 1: LIBRARY MANAGEMENT SYSTEM (LMS)

Our University wants to provide a Library management system (LMS) interface to the students and staff for the purpose of self issue and returns. If any user (student or staff) wants to take book from library, he must interact with Library management system by providing the credentials (username and password) of user. Then, LMS allows the user to get issues and returns by their own.

Activity – 2 :   EMPLOYEE MANAGEMENT SYSTEM

In this project, we maintain the details of all employees and their children using nesting of structures. Consider each employee has four children and all are studying same number of subjects in same class. These are the structure members of Employee, Children, and Subjects.

Employee	Children	Subjects
ID	name	sub1
Name	age	sub2
Age	gender	sub3
Gender	struct subjects	total
Salary		
Struct children		

ACTIVITY – 3: HOTEL MANAGEMENT SYSTEM

Develop an application for Hotel management system with the following modules using structures, pointers to structure variables, passing structure pointers to function.
1. Get availability
2. Features of room
3. Room allocation
4. Show customer details
5. Room de-allocation
6. Restaurant
7. Billing.

Make your own assumptions for this project, design and implement Hotel management system.

ACIVITY – 4 : CALENDER APPLICATION

Develop a calender application that uses many windows properties to make it colorful, for example, to indicate the vacation, it uses the red foreground color. The calendar can be used for two purposes. First to see the date and month as usual calendars and second to find out the day corresponding to given date. Some of the silent features of the project are

- It uses various windows properties to make the program colorful although it has lack of graphics.
- It entirely uses C code which is written in simple manner with lots of comments and important notes can be added.
- The date with such notes appears different than others with red background color.
- The months can be navigated using arrow keys.

ACTIVITY – 5: CRICKET SCORE SHEET

Developing a real-time cricket score sheet which displays a welcome screen that fades up to display the main menu.The main menu comprises three options namely:

- New Score Sheet
- View Score Sheet
- Exit

ACTIVITY – 6: BANK APPLICATION

Develop a Banking project in C language which will implement the following features and functionality in the program.

- Account Creation
- Deposit Amount
- Withdraw Amount
- View Details
- Foreign Exchange
- Exit

ACTIVITY – 7: CALENDER 1900 - 2100

The simple Project should accept the date, month and year between 1900 to 2100 and should display the calendar of that particular month.

Syllabus

UNIT – 1   **14 Hours**

DATA REPRESENTATION AND SORTING: Introduction - Data, Data type, Data Structure, Primitive and Non-primitive - Data type, Data Structure; Storage structures - Sequential and Linked storage representations; Sorting - Quick sort, Merge sort, Heap sort and Radix sort; Hashing - Hash tables, Hash functions, Different Hash functions - Division method, Multiplication method, Mid-Square method, Folding method.

UNIT – 2   12 Hours

LINKED LISTS: Introduction, Types of Linked List - Singly Linked List, Doubly Linked List, Circular Linked List; Operations - Insertion, Deletion, Traverse forward/reverse order; Multi lists, Applications of Linked Lists.

UNIT – 3   12 Hours

STACKS AND QUEUES: Stacks - Introduction, Array and Linked representations, Implementation and their applications; Queues - Introduction, Array and Linked representations, Implementation and their applications, Types - Linear, Circular and Doubly- ended queues.

UNIT – 4   12 Hours

TREES: Introduction, Properties, Binary Tree - Introduction, Properties, Array and Linked representations; Tree traversals and their Implementation, Expression trees, BST Definition and implementation; AVL Trees - Definition and Implementation.

UNIT – 5   10 Hours

GRAPHS: Introduction, Properties, Modeling problems as graphs representations - Adjacency matrix, Adjacency list; Traversals - Breath first search and Depth first search; Applications of graphs.

LIST OF EXPERIMENTS:

The following need to be implemented:

1. Quick, Merge, Heap and Radix sorting techniques.
2. Linear and Binary search algorithms.
3. Singly linked list, doubly linked list and circular linked list.
4. Stack using an array and linked list.
5. Queue using an array and linked list.
6. Tree using an array and linked list.
7. Check if given expression is fully parenthesis or not using stack.
8. Tree traversing techniques.
9. BST using an array and linked list.
10. Graph traversal techniques.

Text Book:

ReemaThareja, "Data Structures Using C", 2nd edition, Oxford University Press, 2014.

Reference Books:

1. Richard F. Gilberg and Bhrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", 2nd edition, Cengage Learning, 2004.
2. Jean Paul Tremblay and Paul G. Sorenson, "An Introduction to Data Structures with Applications", 2nd edition, Tata Mc-Graw Hill, 2004.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd edition, Pearson Education, 2006..