3.5   DATA STRUCTURES USING C

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RATIONALE

Data structures are the techniques of designing the basic algorithms for real-life projects. Understanding of data structures is essential and this facilitates the understanding of the language. The practice and assimilation of data structure techniques is essential for programming. The knowledge of 'C' language and data structures will be reinforced by practical exercises during the course of study. The course will help students to develop the capability of selecting a particular data structure.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Identify the problem and formulate an algorithm for it.
- Identify the best data structures to solve the problem
- Store data, process data using appropriate data structures
- Sort the data in ascending or descending order.
- Implement trees and various traversing techniques.
- Implement various searching and sorting algorithms and to compare them for checking efficiency.

DETAILED CONTENTS

1.   Fundamental Notations   (08 Periods)

1.1   Problem solving concept top down and bottom up design, structured programming
1.2   Concept of data types, variables and constants
1.3   Concept of pointer variables and constants
1.4   Categories of Data structure

2.   Arrays   (08 Periods)

2.1   Concept of Arrays

2.2   Storage representation of multi-dimensional arrays.

2.3   Operations on arrays with Algorithms (searching, traversing, inserting, deleting)

3.   Linked Lists   (12 Periods)

3.1   Introduction to linked list

3.2   Representation of linked lists in Memory

3.3   Operations on linked list (Insertion, deletion and traversals)

3.4   Application of linked lists

3.5   Doubly linked lists

3.6   Operations on doubly linked lists (Insertion, deletion and traversals)

4.   Stacks, Queues and Recursion   (12 Periods)

4.1   Introduction to stacks

4.2   Representation of stacks

4.3   Implementation of stacks

4.4   Applications of stacks

4.5   Introduction to queues

4.6   Implementation of queues

4.7   Circular Queues

4.8   De-queues

4.9   Application of Queues

4.10   Recursion

5.   Trees   (12 Periods)

5.1   Concept of Trees

5.2   Representation of Binary tree in memory

5.3   Traversing Binary Trees (Pre order, Post order and In order)

5.4   Searching, inserting and deleting binary search trees

5.5   Introduction to Heap

5.6   Application of Trees

6.   Sorting and Searching   (12 Periods)

6.1   Introduction to sorting and searching

6.2   Search algorithm (Linear and Binary)

6.3   Sorting algorithms (Bubble Sort, Insertion Sort, Quick Sort, Selection Sort, Merge Sort, Heap Sort

7.   Graph   (06 Periods)

7.1   Introduction to Graph

7.2   Basic Operations

7.3   Depth First Search

7.4   Breadth First Search

LIST OF PRACTICALS

Write programmes in C to implement

1.   Addition of two matrices using functions
2.   Multiplication of two matrices
3.   Push and pop operation in stack
4.   Inserting and deleting elements in queue
5.   Inserting and deleting elements in circular queue
6.   Insertion and deletion of elements in linked list
7.   Insertion and deletion of elements in doubly linked list
8.   Factorial of a given number with recursion and without recursion
9.   Fibonacii series with recursion and without recursion
10.   Program for pre-order, post order and in order traversal of binary tree.
11.   The selection sort technique
12.   The bubble sort technique
13.   The quick sort technique
14.   The merge sort technique
15.   The binary search procedures to search an element in a given list
16.   The linear search procedures to search an element in a given list

INSTRUCTIONAL STRATEGY

This subject clears all fundamentals of programming techniques. Teachers should stress on explaining all the techniques and algorithms in detail in theory sessions. The students should be asked to convert their ideas about a problem into an algorithm in theory class and implement it in practical class. This willhelp the students to have clear concepts of programming.

MEANS OF ASSESSMENT

– Assignments and quiz/class tests, mid-term and end-term written tests
– Actual laboratory and practical work, exercises and viva-voce
– Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Data Structure using C by Robert Kruse; Prentice Hall of India
2. Data Structure through C by Yashwant Kanekar; BPB Publications
3. Data structures – Schaum's Outline Series by Lipschutz; McGraw Hill Education Pvt Ltd , New Delhi
4. Data Structure using C by ISRD Group ; Tata McGraw Hills Education Pvt Ltd , New Delhi
5. Expert Data Structures with C by R.B. Patel ; Khanna Publishers, New Delhi.
6. Data Structures and Algorithm Using C by RS Salaria; Khanna Book Publishing Co. (P) Ltd. New Delhi
7. Data Structure through C in depth by SK Srivastava, Deepali Srivastava; BPB Publications
8. Data Structure through "C" Language by Sameeran Chattopadhyay, MatanginiChottopadhyay; BPB Publications
9. Data Structure through "C" Language by DOEACC; BPB Publications
10. Data Structure using "C" Lab Workbook by Shukla; BPB Publications
11. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	10
2	08	15
3	12	15
4	12	15
5	12	15
6	12	15
7	06	15
Total	**70**	**100**