

4.3 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.

COURSE OUTCOMES

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

CO1: Identify the problem and formulate an algorithm for it.

CO2: Recognize the best data structures to solve the problem

CO3: Store data, process data using appropriate data structures

CO4: Sort the data in ascending or descending order.

CO5: Implement trees and various traversing techniques.

CO6: Develop searching and sorting algorithms and to compare them for checking efficiency.

DETAILED CONTENTS

UNIT I

Fundamental Notations

- 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

UNIT II

Arrays and Linked Lists

- 2.1 Concept of Arrays
- 2.2 Storage representation of multi-dimensional arrays.

- 2.3 Operations on arrays with Algorithms (searching, traversing, inserting, deleting)
- 2.4 Introduction to linked list
- 2.5 Representation of linked lists in Memory
- 2.6 Operations on linked list (Insertion, deletion and traversals)
- 2.7 Application of linked lists
- 2.8 Doubly linked lists
- 2.9 Operations on doubly linked lists (Insertion, deletion and traversals)

UNIT III

Stacks, Queues and Recursion

- 3.1 Introduction to stacks
- 3.2 Representation of stacks
- 3.3 Implementation of stacks
- 3.4 Applications of stacks
- 3.5 Introduction to queues
- 3.6 Implementation of queues
- 3.7 Circular Queues
- 3.8 De-queues
- 3.9 Application of Queues
- 3.10 Recursion

UNIT IV

Trees

- 4.1 Concept of Trees
- 4.2 Representation of Binary tree in memory
- 4.3 Traversing Binary Trees (Pre order, Post order and In order)
- 4.4 Searching, inserting and deleting binary search trees
- 4.5 Introduction to Heap

UNIT V

Sorting and Searching

- 5.1 Introduction to sorting and searching
- 5.2 Search algorithm (Linear and Binary)
- 5.3 Sorting algorithms (Bubble Sort, Insertion Sort, Quick Sort, Selection Sort, Merge Sort, Heap Sort)

PRACTICAL EXERCISES

Write programs in C to implement:

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

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, Matangini

Chottopadhyay; 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/HSBTE/NITTTR.

SUGGESTED WEBSITES

1. <http://swayam.gov.in>

INSTRUCTIONAL STRATEGY

This is a programming skill based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weight age with hands on practice for programming skill development.