17HS026 DATA STRUCTURES

Course Objectives

To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.

Course Outcomes

After completing this course satisfactorily, a student will be able to:

1. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms
2. Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs.
3. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs
4. Demonstrate different methods for traversing trees
5. Compare alternative implementations of data structures with respect to performance
6. Compare and contrast the benefits of dynamic and static data structures implementations
7. Describe the concept of recursion, give examples of its use, describe how it can be implemented using a stack .
8. Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing.

UNIT - 1

SORTING AND SEARCHING: Introduction - Data, Data type, Data Structure, Primitive and Non primitive- Data type, Data Structure; Storage structures - Sequential and Linked storage representations; Applications of Structures, Hashing.

SORTING: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort.

SEARCHING: Binary Search and Linear Search

UNIT - 2

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

UNIT - 3

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

UNIT - 4

TREES: Introduction, Properties, Binary Tree - Introduction, Properties, Array and Linked Representations, Tree traversals and their Implementation, Expression trees, BST Definition andimplementation;

UNIT - 5

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

REFERENCE BOOKS

1. ReemaThareja, "Data Structures Using C", 2nd edition, Oxford University Press, 2014.
2. Sahni S, Data Structures, Algorithms and Applications in C++, McGraw-Hill, 2002.
3. SamantaD, Classic Data Structures, Prentice-Hall of India, 2001.
4. Heilman G I,. Data Structures and Algorithms with Object-Oriented Programming, Tata McGraw-l lill. 2002. (Chapters I and 14).
5. Tremblay P, and Sorenson P G, Introduction to Data Structures with Applications, Tata McGraw-Hill,

Student activity:

1. Create a stack using C
2. Create a Queue using C