

16CS202 DATA STRUCTURES

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	CS	W/ARA	SSH	SA	S	BS
45	-	30	-	5	40	8	5	-

Course Description and Objectives:

This course is aimed at offering fundamental concepts of data structures and explain 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, structures to develop solutions for particular problems.
- analyze characteristics of various data structures.
- differentiate between Graphs and Trees.
- derive the importance of sorting and applying it wherever useful.
- argue the usefulness of data structures in solving 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.*

UNIT - 1**L- 9**

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**L- 9**

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**L- 9**

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; Applications.

UNIT - 4**L- 09**

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**L-09**

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

LABORATORY EXPERIMENTS**Course Outcomes:**

The student will be able to :

- understand the importance of structure, abstract data type and their basic usability in different applications through different programming languages.
- understand the linked implementation and its uses both in linear and non-linear data structure.
- understand various data structures such as stacks, queues, trees, graphs, etc. to solve various computing problems.
- decide a suitable data structure to solve a real world problem.

LIST OF EXPERIMENTS:

Total hours: 30

1. Selection, Bubble, Insertion, Quick and Merge sorting algorithms.
2. Linear and Binary search algorithms.
3. Single 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.

ACTIVITIES:

- *Design and Implement a School Management System.*
- *Design and Implement a Social Networking Site.*
- *Implement a project to find out the most common words in the articles.*
- *Design and Implement a Library Book Management System.*
- *Design and Implement a CricBuzz Application.*

TEXTBOOK:

1. 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..