SILVER OAK UNIVERSITY

Computer Application

Integrated M.Sc(IT)

Subject Name: Data Structures

Subject Code:

Semester: 2

Prerequisite: Programming language C

Objective: The Objectives of this course is to explore the principles, algorithms and to develop capability of selecting particular data structure. Topics include Linear Data Structure, Non Linear data structure, Hashing and file structures, Sorting and Searching.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Evaluation Scheme				Total Marks
L	T	P	C	Internal		External		
				Th	Pr	Th	Pr	
4	0	2	5	40	20	60	30	150

Content:

Unit No.	Course Contents	Teaching Hours	Weightage %
1	**INTRODUCTION TO DATA STRUCTURE:** Data Management concepts, Data types – primitive and non-primitive, Performance analysis and measurement – (Time and Space analysis of algorithms - Average, best and worst case analysis),Types of Data Structures- Linear & Non Linear Data Structures.	5	10
2	**Linear data structures – Array and Stack:** **Array** -Representation of arrays, Application of array **Stack –**Concepts and representation, Operations on stack, Applications of stacks, Polish expression, Reverse polish expression and their compilation, Recursion, Tower of Hanoi.	8	15
3	**Linear data structures – Queue and Linked List:** **Queue** - Representation of queue, Operations on queue, Circular queue, Priority queue, Array representation of priority queue, Double ended queue, Application of queue **Linked list** – Concept and Representation of Linked list,	10	15

	Operations on linked list, Types of linked : Singly linked list, Doubly linked list, Circular linked list , Application of linked list.		
4	**NONLINEAR DATA STRUCTURE – TREE AND GRAPH**: **Tree**: Definitions , Properties of trees , Representation of binary tree, Binary tree traversal - Inorder, Postorder, Preorder; Threaded binary tree, Binary search trees, Balanced Tree - AVL trees and weighted balance tree **Graph**: Basic Concept of Graph Theory and its Properties, Matrix Representation Of Graphs, Elementary Graph operations, Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree	15	30
5	**HASHING**: Symbol Table, Hashing fun, Collision Resolution – Techniques.	5	10
6	**SORTING & SEARCHING:** **Sorting** – Bubble Sort, Selection Sort, Quick Sort, Merge Sort, Insertion sort. **Searching** – Sequential Search and Binary Search	9	20

Course Outcome:

Sr. No.	CO statement	Unit No
CO-1	To examine real world problems by applying various algorithm design techniques based on appropriate data structure.	1
CO-2	Apply and create Abstract type of linear data structures by implementing basic data manipulation operations.	2,3
CO-3	Apply and create Abstract type of Nonlinear data structures by implementing basic data manipulation operations.	4
CO-4	Develop hashing techniques to improve time complexity in data storing algorithms using minimum collision.	5
CO-5	Analyze & compare various searching-sorting techniques based on time complexity.	6

List of Experiments/Tutorials:

1. Introduction to Dynamic Memory Allocation. DMA functions malloc(), calloc(), free() etc.
2. Implement Stack data structure with operations push, pop, change and peep.
3. Implement solution to Tower of Hanoi problem using recursion.
4. Implement a program to evaluate the expression using stack.
5. Implement Simple Queue data with operations insert and delete.
6. Implement a circular queue for buffering system which performs the following operations: insert, delete, empty and full.
7. Write a menu driven program to implement following operations using singly linked list.
    a. Insert a node at the front of the linked list
    b. Insert a node at the end of the linked list
    c. Insert a node after given node in linked list
    d. Delete a node from linked list
8. Implement circular and doubly linked list. Perform following operations.
    a. Insert at the beginning.
    b. Insert at the end.
    c. Delete given element.
9. Write a program to create a binary search tree and find traversal sequence of the following tree orders:
    a. Preorder
    b. Inorder
    c. Postorder
10. Implement Static hashing method.
11. : Implement following sorting techniques:
    a. Quick sort
    b. Merge sort
    c. Insertion sort
12. Implement following search techniques:
    a. Sequential search
    b. Binary Search

Major Equipment:

Hardware: Computer System with minimum PIV processor (or equivalent) and minimum 1 GB MB RAM

Software: Turbo C/C++ or any software that support c/c++ compiler

Books Recommended:-

1. Data Structures using C & C++ -By Ten Baum Publisher – Prenctice-Hall International.
2. Fundamentals of Computer Algorithms by Horowitz, Sahni,Galgotia Pub. 2001 ed.
3. Fundamentals of Data Structures in C++-By Sartaj Sahani.
4. Data Structures: A Pseudo-code approach with C -By Gilberg & ForouzanPublisher-Thomson Learning.
5. An Introduction to Data Structures with Applications. by Jean-Paul Tremblay& Paul G. Sorenson Publisher-Tata McGraw Hill

List of Open Source Software/learning website:

1. https://ds1-iiith.vlabs.ac.in/data-structures-1/
2. https://nptel.ac.in/courses/106/102/106102064/