Course Name: DATA STRUCTURES

Course Code: ES1046

Credits: 4	**Teaching Scheme: Theory: 3 Hours/ Week** **Lab: 2 Hours/ Week**

Section I

Revision:

Array, Functions, Call by Value and Call by Reference, Recursion, structure, pointers, pointer to pointer, Pointer to array, array of pointers, pointers to function.

Introduction to Data Structures: Concept of data, Data object, Data structure, Abstract Data Types. Concept of primitive and non-primitive, linear and Non-linear, static and dynamic, persistent and ephemeral data structures.

STACKS

Concept of stack, stack as ADT, Implementation of stack, Concept of implicit and explicit stack, Applications of stack-(Matching Parenthesis Problem, Expression Conversion-infix to prefix, infix to postfix, postfix expression evaluation)

QUEUES

Concept of queues as ADT, Implementation of queue, Concept of circular queue, double ended queue, and priority queue. Applications of queues.

Section II

LINKED LISTS

sequential Vs linked memory organization, singly linked list, linked implementation of stack and queue, doubly linked list, circular linked list, ordered linked list, Linked list as an ADT. Representation of polynomials using linked lists.

SEARCHING AND SORTING TEHNIQUES

Need of searching and sorting, Concept of internal and external sorting, sort stability. Searching methods: Linear and binary search algorithms their comparison. Sorting methods: Bubble, selection, insertion, merge, quick, bucket sort, Radix Sort.

ANALYSIS OF ALGORITHMS

Analysis of algorithm: frequency count and its importance in analysis of an algorithm, Time complexity & Space complexity of an algorithm, Big 'O', 'Ω' and 'Θ' notations, Best, Worst and Average case analysis of an algorithm

Applications of data structures, Introduction to Trees and Graphs

List of Practical: (Any Six)

1. C program to push (),pop (), display (), peek (), stack full () and stack empty () operations on stack using array.
2. C Program to convert Infix to postfix expression Using Stack.

3. C program to convert Prefix to postfix expression Using Stack.
4. C program to implement Linear queue using array and perform the following operations a)Insert b)delete c)peek d)queue full() e)queue empty()
5. C program to implement Circular queue using array and perform the following operations a) Insert b) delete c)display rear d)display front d)queue full() e)queue empty()
6. C program to implement Doubly ended queue using array and perform the following operations a) Insert front b) Insert rear c)delete rear d)delete front
7. C program to implement singly linked list and perform the following operations a) Insert at beginning b)Insert at end c)Insert after specified node d) delete at beginning e) delete at end f) delete after specified node g)display h)search an element
8. C program to implement doubly linked list and perform the following operations a) Insert at beginning b) Insert at end c)Insert after specified node d) delete at beginning e) delete at end f) delete after specified node g)display h)search an element
9. C program to implement circular singly linked list and perform the following operations a) Insert at beginning b) Insert at end c) Insert after specified node d) delete at beginning e) delete at end f) delete after specified node g) displayh) search an element
10. C program to implement circular doubly linked list and perform the following operations a) Insert at beginning b) Insert at end c) Insert after specified node d) delete at beginning e) delete at end f) delete after specified node g) displayh) search an element
11. C program to implement Linear search.
12. C program to implement Binary search.
13. C program to implement bubble sort.
14. C program to implement Selection sort.
15. C program to implement Insertion sort.
16. C program to implement merge sort.
17. C program to implement quick sort.
18. C program to implement bucket sort.

List of Projects:

Students will be doing course projects in different areas of application of programming such as Science and Numeric Applications, Number theoretic algorithms, 3D Graphics and Animations, Large integer Arithmetic using string processing, To solve the problems of rotational motion, Heat transfer problems etc, Database/File Handling Application, Game development using C, Algorithms in computational geometry(eg. convex-hull, closest pair of points), Desktop GUIs, Solving statistical problems.

Text Books:

1. "Data Structures using C & c++", Y. Langsam, M. Augenstin and A. Tannenbaum , Prentice Hall India, Second edition,ISBN-978-81-203-1177-0,
2."Data Structure through C in depth", Shrivastava & Shrivastava, BPB Publications ,Special Indian Edition, ISBN:8176567418

Reference Books:

1."Data structure and program design in c", R.L.Kruse, B.P.Leung, C.L.Tondo,Prentice Hall Of India, latest edition , ISBN 0 -13-725649-3
2."Data Structure", Seymour Liptsutz Tata McGraw Hill Publication, seventh reprint 2007,ISBN-13:978-0-07-060168-0
3."Data Structure through C".,Y.P. Kanetkar, BPB publication, ISBN (978-8176567060)

Moocs Links and additional reading material: www.nptelvideos.in

Course Outcomes:

The student will be able to –

1. understand basics of data structures and Systemize incorporation of data structures in context with real world's scenarios
2. implement and demonstrate stack data structure with applications.
3. implement and demonstrate Queue data structure with applications.
4. formulate a solution for a given problem with linked version of data structures and capabilities.
5. use various types of sorting and searching techniques.
6. analyze asymptotic time complexity of an algorithm using suitable mathematical tools.