

FACULTY OF COMPUTER APPLICATIONS
MCA

- **Sem.** : 1
- **Subject Code** : 05MC0101
- **Subject** : Data structure using C
- **Course Objectives** :
 1. To understand concept of algorithm analysis and data structure.
 2. To understand stack and queue with its applications.
 3. To understand linked list with its applications.
 4. To work with Tree and Graph.
 5. To compare different searching and sorting techniques.
- **Prerequisite:** Knowledge of C programming language

Unit No	Topics Covered	No of lectures required
1	Introduction to Data Structures: Introduction of Data Structure, Data Representation, Abstract Data Type, Data Types, Primitive Data Types, Data Structure and Structured Type, Atomic Type, Difference between Abstract Data Type, Data Types and Data Structures Analysis of Algorithm : Algorithms, Different Approaches to Designing an Algorithm, Complexity, Big O notation, Algorithm Analysis	10
2	Stack : Concept of Stack, Stack operations (ADT), Stack using Array, stack applications – expression evaluation and conversion (Infix to postfix and Infix to Prefix) and Recursion (Use of Stack in Recursion, Execution of Recursive call using Factorial, Recursion v/s Iteration, Tower of Hanoi), Stack using Linked List Queue : Concept of Queue, Queue operations (ADT), Types of Queue – Simple queue, Circular queue, Deque, Priority queue, Applications of Queue, Queue using Linked List	14

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3	<p>Linked Lists : Introduction, Array v/s Linked List, Types of Linked List – Singly Linked List, Doubly Linked List, Circular Singly Linked List and Circular Doubly Linked List</p> <p>Operations on Linked List - (For all the types of Linked list) 1] Create 2] Display 3] Insert o insert first o insert last o insert before desired o insert after desired 4] Delete o delete first o delete last o delete before desired o delete after desired 5] Search particular element 6] Sort list in ascending order 7] Update an element. 8] Count no. of nodes</p> <p>More operations on Singly linked list – 1. Copying a linked list 2. Length of linked list 3. Reversing a linked list 4. Concatenating two linked lists</p> <p>Application of Linked List – Polynomial Manipulations, Sparse Matrix, Representation of Complex Numbers</p>	10
4	<p>Tree : Introduction, Types of Trees, Binary Tree – Basic definitions of Binary Tree, Properties of Binary Tree, ADT of Binary tree, Representation of Binary Tree, Operations on Binary Search Tree, Binary Tree Traversal, Reconstruction of Binary Tree, Conversion of General Tree to Binary tree, Applications of Binary tree</p>	10

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MCA**Main Reference :**

1. Data Structures using C, ISRD Group, ACE Series, Tata McGraw Hill Publication, First Edition.

Other References :

1. An Introduction to Data Structures with Applications, Tremblay Tata McGraw-Hill Education, Second edition.
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, The MIT Press, 3rd Edition
3. Data Structures Using C, Reema Thareja, Oxford, Second Edition.
4. Data Structures Using C++, Varsha H. Patil, Oxford, First Edition.

Web References :

1. <https://www.programiz.com/dsa>
2. <https://www.geeksforgeeks.org/data-structures/>

App References :

1. AlgoPrep - Algorithms & Data structures Made Easy Pranit Krishna Kulkarni Education
2. Data Structures Handbook, Bash Overflow Education

Syllabus Coverage from text /reference book & web/app reference:

Unit #	Chapter Numbers
1	1,2
2	6,7
3	4,5
4	8,9,10,12
5	11,13

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PRACTICALS

Note : Practical using C programming language

Unit No	List of Practicals
2	<p>***** Stack *****</p> <ol style="list-style-type: none"> 1] Write a program which performs following stack operations. ->push() -> pop() -> peep() -> update() 2] Write a program to find out factorial of number using stack. 3] Write a program to print string in reverse order using stack. 4] Write a tower of Hanoi program. 5] Write a program of dynamic stack. <p>***** QUEUE *****</p> <ol style="list-style-type: none"> 1] Write a program which performs following operations using simple queue. <input type="checkbox"/> <input type="checkbox"/> insert()-> delete() -> display() 2] Write a program which performs following operations using circular queue. <input type="checkbox"/> <input type="checkbox"/> Insert()-> delete() -> display() 3] Write a program of dynamic queue.
3	<p>***** LINKED LIST *****</p> <p>Perform following operations :</p> <ol style="list-style-type: none"> 1] Create 2] Display 3] Insert <ul style="list-style-type: none"> ○ insert first ○ insert last ○ insert desired ○ insert before desired ○ insert after desired 4] Delete <ul style="list-style-type: none"> ○ delete first ○ delete last ○ delete desired ○ delete before desired ○ delete after desired

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	<p>5] Search particular element 6] Sort list in ascending order 7] Update an element. 8] Count no. of nodes</p> <p>⇒ Write a program to perform above operations using singly linked list ⇒ Write a program to perform above operations using doubly linked list ⇒ Write a program to perform above operations using circular singly linked list ⇒ Write a program to perform above operations using circular doubly linked list</p> <p>Linked List Application :</p> <ol style="list-style-type: none"> 1. Write a program to perform polynomial addition. 2. Write a program to check the given matrix is sparse or not.
4	<p align="center">*****TREE AND GRAPH*****</p> <p>1] Write a program to perform following operations on binary tree :</p> <ol style="list-style-type: none"> 1. insert node 2. delete node 3. update node value <p>2] Write a program to create a binary tree . Traverse tree in preorder , postorder and inorder. 3] Write a program to represent graph using linked list and implement for DFS and BFS algorithm for traversing.</p>
5	<p align="center">*****SORTING AND SEARCHING *****</p> <p>1] Enter N elements and arrange the elements using :</p> <ul style="list-style-type: none"> <input type="checkbox"/> Selection sort <input type="checkbox"/> Bubble sort <input type="checkbox"/> Insertion sort <input type="checkbox"/> Quick sort <input type="checkbox"/> Shell sort <input type="checkbox"/> Merge sort <p>2] Enter N elements and perform search operations using :</p> <ul style="list-style-type: none"> <input type="checkbox"/> Linear search <input type="checkbox"/> Binary search (with recursion, without recursion) <p>3] Write a program of hashing.</p>