# MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
*(A constituent unit of MAHE, Manipal)*

## COURSE PLAN

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|---|---|---|
| **Department** | : | Data Science and Computer Applications |
| **Course Name & code** | : | Data Structures and Algorithms Lab & MCA 4261 |
| **Semester & branch** | : | II Semester & M.C.A. |
| **Name of the faculty** | : | Dr. Raghurama Holla & Dr.Natesha B V |

**No of contact hours/week:**

| L | T | P | C |
|---|---|---|---|
| 0 | 1 | 3 | 1 |

## Course Outcomes (COs)

| | *At the end of this course, the student should be able to:* | No. of Contact Hours | Marks |
|---|---|---|---|
| CO1: | Demonstrate the working of basic searching, sorting algorithms, and recursion | 02 | Marks |
| CO2: | Demonstrate the memory representation of data structures like sparse matrices and polynomials | 02 | Marks |
| CO3: | Demonstrate data structures like stack, queue, circular queue, linked lists, trees and graphs | 05 | Marks |
| CO4: | Apply the data structure stack to solve some probelms | 02 | Marks |
| CO5: | Demonstrate the working of advanced sorting methods | 01 | Marks |
| | **Total** | 12 | 100 |

## Assessment Plan

| 1. Continuous Evaluation | 60% |
|---|---|
| 2 evaluations of 10 marks each : 20 marks<br>2 quizzes of 10 marks each: 20 marks<br>1 Execution check(Lab exercises) : 10 marks<br>1 Viva : 5 marks<br>Observation Book: 5 marks | |
| **2. Lab Examination** | 40% |
| • 2 questions of 20 marks each | |

## Lesson Plan

| L. No. | Topics | Course Outcome Addressed |
|---|---|---|
| L1 | Mapping of 2-D arrays to 1-D arrays:<br>1. Obtain the Row-major and Column-major representation of the given input matrix.<br>2. Map the following 2-D arrays (matrices) to 1-D arrays (lists).<br>a) Upper triangular matrix<br>b) Lower triangular matrix<br>c) Diagonal matrix<br>d) Tri-diagonal matrix<br>e) Row-major<br>f) Column-major<br>Display the element at any specified position (row, column). | CO2 |
| L2 | 1. Represent a sparse matrix using 1-D array. Use this 1-D array to reconstruct the original matrix.<br>2. Represent a polynomial using 1-D array and perform addition operation on two polynomials. | CO2 |
| L3 | Solving problems using Recursion:<br>a) Tower of Hanoi for n disks(Recursion application)<br>b) Factorial of a given number<br>c) GCD of 2 numbers<br>d) Fibonacci series upto nth term | CO1 |
| L4 | 1) Implementation of Stack using arrays<br>2) Conversion of Infix expression to Postfix expression (using stack)<br>3) Conversion of Infix expression to Prefix expression (using stack) | CO3,CO4 |
| L5 | 1) Evaluation of Postfix expression<br>2) Evaluation of Prefix expression | CO3,CO4 |
| L6 | 1) Implementation of Queue using arrays<br>2) Implementation of Circular Queue using arrays | CO3 |

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| **L7** | 1) Implement a sorted singly linked list. Include the following options: inserting a node, deleting a node and displaying the list.<br>2) Reverse a singly-linked list using recursion.<br>3) Implementing stack using Singly linked list.<br>4) Implementing queue using Singly linked list | CO3 |
| **L8** | 1) Implement a sorted doubly linked list. Include the following options: inserting a node, deleting a node and displaying the list in both directions.<br>2) Create a binary search tree and traverse it in preorder, inorder and postorder traversal methods | CO3 |
| **L9** | 1.Represent a directed graph in the following ways:<br>a) Adjacency matrix<br>b) Adjacency list<br>2.) Represent an undirected graph in the following ways:<br>a) Adjacency matrix<br>b) Adjacency list | CO3 |
| **L10** | Implement the following sorting techniques.<br>(a) Quick sort<br>(b) Bubble sort<br>(c) Selection sort<br>(d) Insertion sort | CO3, CO5 |
| **L11** | 1. Merge Sort<br>2. Implement the following searching techniques.<br>a) Sequential search.<br>b) Binary search (Iterative method).<br>c) Binary search (Recursive method). | CO3, CO5 |
| **L12** | End-Semester Laboratory Examination | - |
| **L13** | Click or tap here to enter text. | CO |
| **L14** | Click or tap here to enter text. | CO |

## References:


1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, 4th Edition, Addison Wesley, 2009.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein “Introduction to Algorithms”, 3rd Edition, PHI Publications, 2009.
3. Sartaj Sahani, “Data Structures, Algorithms and Applications in C++”, 2nd Edition, Universities Press, 2005. J. P. Trembley and Sorenson, “An Introduction to Data Structures with Applications” 2nd Edition, 36th Reprint, McGraw Hill, 2008.
4. J. P. Trembley and Sorenson, “An Introduction to Data Structures with Applications” 2nd Edition, 36th Reprint, McGraw Hill, 2008.

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**Submitted by:** Dr. Raghurama Holla

**(Signature of the faculty)**

**Date:** 30-01-2023

**Approved by:** Click or tap here to enter text.

**(Signature of HOD)**

**Date:** 30-01-2023

**FACULTY MEMBERS TEACHING THE COURSE (IF MULTIPLE SECTIONS EXIST):**

| FACULTY | SECTION | FACULTY | SECTION |
|---|---|---|---|
| Miss Linda Varghese | A | | |
| Dr. Raghurama Holla | B | | |
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