| SANKALCHAND PATEL UNIVERSITY ।। अथातो ज्ञानजिज्ञासा ।। | **FACULTY OF COMPUTER SCIENCE**<br>**Master Of Computer Application (Integrated) (Sem-IV)**<br>In Effect from Academic Year 2023-24 |
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|---|---|
| **Branch Name:** | **MCA** |
| **Program Code:** | **CS201** |
| **Course Name:** | **DATA STRUCTURES-II** |
| **Course Code:** | **1CS3010403T** |
| **Pre-requisite Course:** | **Basic knowledge of programming language like C, C++** |

## Course Objectives:

1. To extend proficiency in implementation of Data Types.
2. To be able to carry out the study of various Algorithms of Time and Space Complexity.
3. To get a good quality understanding of applications of Data Structures.

| Teaching Scheme (Hours per week) | | | | Evaluation Scheme (Marks) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory | | Practical | | |
| Lecture | Tutorial | Practical | Credit | University Assessment | Continuous Assessment | University Assessment | Continuous Assessment | Total |
| 3 | - | - | 3 | 60 | 40 | - | - | 100 |

## Subject Contents:

| Sr. No | Topic | Total Hours | Weightage (%) |
|---|---|---|---|
| 1 | **Introduction to Nonlinear Data Structures :**<br>Nonlinear Data Structure Component.<br>Definition of Tree, Representation of Tree, Basic Terminology of Tree, Types of Tree, Binary Tree, Conversion of General Tree to a Binary Tree, Understanding and Implementing Binary Tree Traversal, Constructing a Binary Tree from Traversal Results, Storage Representation and Manipulation of Binary Tree, Applications of Tree, Binary Search Trees, Sparse Matrices. | 14 | 30 |
| 2 | **Nonlinear Data Structures-Graph**<br>Basic concept of Graph:<br>Graph and Networks: Concept, BFS Algorithm, DFS Algorithm (04)<br>Matrix Representation of Graphs, Graphic Representation of List Structures, Other Representation of Graphs, Breadth First Search (BFS), Depth First Search (DFS), Garbage Collection. | 14 | 30 |
| 3 | **Sorting & Searching:**<br>Linear Search, Binary Search.<br>Sorting Methods, Internal and External Sorting, Bubble Sort, Quick Sort, Merge Sort, Insertion Sort. | 12 | 25 |
| 4 | **Hashing and Collision:**<br>Hashing Functions and Method<br>Collision Resolution Techniques. | 08 | 15 |

## Text Books:


1. "An Introduction to Data Structures with Applications", Jean-Paul Tremblay, Paul G. Sorenson, Tata McGraw-Hill, 2nd Edition, (2007).
2. "Data Structures Via C++: Objects by Evolution", A. Michael Berman, , Oxford Univ. Press (2004)
3. "Sorting & Searching - The Art of Computer Programming" D E Knuth, , Vol. 3, Pearson Education (1998).


## Reference Books:


1. “Fundamentals of Data Structures in C”, Horowitz, Sahni, Anderson-Freed, , University Press (2nd edition-2007)
2. "Data Structures Using C & C++", Tenenbaum, PHI.

**List of Open Source Software/learning website:**

1. https://www.w3schools.in/data-structures
2. https://www.tutorialspoint.com/data_structures_algorithms/index.htm

**Course Learning Outcomes (CLO): On completion of this course, the students will be able to:**

| CLO | Description | Bloom'sTaxonomyLevel |
|---|---|---|
| CLO1 | To be able to describe and classify fundamental concepts of object-oriented programming, basic and advanced data structures. | 2 Understand |
| CLO2 | To choose the best algorithm to solve a problem by Tree and Graph Structure.To create the algorithms and program of various operations on Q Trees and Graphs. | 1 Remember<br>3 Apply |
| CLO3 | To evaluate algorithms with respect to time and space complexity<br>To create the algorithms and program of various operations on Sorting and Searching Technique. | 2 Understand<br>3 Apply |
| CLO4 | Implementation of Hashing Functions ,Method and Collision Resolution Techniques. | 3 Apply<br>2 Understand |
| CLO5 | To be able to design, implement and debug small-to-moderate programs to manipulate and manage data elements while exhibiting the object-oriented programming skills. | 7 Create<br>6 Evaluate<br>5 Analyze |
| CLO6 | To be able to explain, understand, compare and apply algorithms and principles of object-oriented programming and advanced data structures to a specific situation. | 2 Understand<br>1 Remember |

**Mapping of CLOs with Pos & PSOs**

| Course Learning Outcomes | Program Outcomes(POs) | | | | | | | | | | | | Program Specific Outcomes (PSOs) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Learning Outcomes** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CLO1** | **M** | **M** | **L** | | M | | **L** | M | L | M | | **M** | **H** | **M** |
| **CLO2** | M | M | H | | | **M** | M | | | **H** | L | L | **H** | **M** |
| **CLO3** | H | M | H | | **M** | **M** | | **M** | L | M | | H | **L** | **M** |
| **CLO4** | M | | **H** | **M** | M | **L** | M | **L** | **M** | | H | H | H | **M** |
| **CLO5** | H | M | H | | **M** | **M** | | **M** | L | M | | H | **L** | **M** |
| **CLO6** | M | | **H** | **M** | M | **L** | M | **L** | **M** | | H | H | H | **M** |

**H: High, M: Medium, L: Low**