



SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Master of Computer Applications



MCA I Semester 1

Subject Name: Data Structures Using C

Subject Code: MTCA23101

Type of course: Professional Core Course

Prerequisite (if any):

- Programming Language with C
- Mathematical Fundamentals

List of Courses where this course will be prerequisite:

- Basic Mathematics
- Object Oriented Programming
- Database management Systems
- Computer Networks
- Machine Learning

Rationale: Data structure and algorithms help in understanding the nature of the problem at a deeper level. This helps the graduate to write efficient code while developing solutions to the problems in computer science.

Teaching and Examination Scheme:

| TEACHING SCHEME | | | | Theory Marks | | Practical Marks | | Total |
|-----------------|---|---|---|--------------|-----|-----------------|-----|-------|
| L | T | P | C | TEE | CAT | TEP | CAP | |
| 3 | 0 | 0 | 3 | 60 | 40 | - | - | 100 |

CAT: Continuous Assessment Theory comprised of CA1 and CA2 **CA1:** Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CAP:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course





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Content:

| Sr. No. | Content | Teaching Hrs. | Module Weightage |
|---------|--|---------------|------------------|
| 1 | Introduction to Data Structures: Definition, Types and Operations of Data Structures. Arrays: Definition and Types of Arrays, Storage Structure for Arrays in Memory. Operations on Linear Arrays: Traversing, Inserting, Deleting, Searching, Sorting and Merging. Structures: Basics of Structures, usage of structure, declaring structure, accessing structure elements, nested structures, Arrays of Structures, Structures and Functions. Self-referential Structures, Typedef | 03 | 07% |
| 2 | Searching: Linear Search and Binary Search, Comparison of Methods. Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Radix Sort. | 07 | 15% |
| 3 | Stacks: Definition, Representation of Stacks using Arrays, Operations on Stacks using Array, Application of Stacks: Arithmetic Expressions, Polish Notation, Conversion of Infix Expression to Postfix Expression, Evaluation of Postfix Expression. Recursion: Definition, Recursive Notation, Runtime Stack, Applications of Recursion: Factorial of Number, GCD, Fibonacci Series and Towers of Hanoi. Queues: Definition, Representation of Queues using Array, Types of Queue: Simple Queue, Circular Queue, Double-Ended queue, Priority Queue, Operations on Simple Queues and Circular Queues using Array, Applications of Queues. | 12 | 27% |





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| | | | |
|---|--|----|-----|
| 4 | Linked Lists: Definition, Comparison with Arrays, Representation, Types of Linked lists: Singly Linked List, Doubly Linked List and Circular Linked List, Operations on Lists: Traversing, Inserting, Deleting and Searching in lists. Applications of Linked Lists: Addition of Polynomials. | 12 | 27% |
| 5 | Graphs: Definition, Storage Representation of Graphs, Directed/Undirected Graphs, Weighted/Unweighted Graphs, Paths of different lengths, Cycle, Cyclic Graphs, Acyclic Graphs, Spanning Trees, Shortest Path, Traversal. Trees: Definition, Terminology, Binary Trees, Traversal of Binary Tree, Binary Search Tree, Inserting, Deleting and Searching in Binary Search Tree, Height Balanced Trees: AVL Trees, Insertion and Deletion in AVL Tree, 2-3 Trees, and Weight Balanced Tree. | 11 | 24% |

Suggested Specification table with Marks (Theory):

| %Distribution of Marks | | | | | |
|------------------------|---------|---------|---------|---------|---------|
| R Level | U Level | A Level | N Level | E Level | C Level |
| 20 | 20 | 20 | 10 | 10 | 20 |

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.





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Reference Books:

| Sr. No. | Title of book /article | Author(s) | Publisher and details like ISBN | Year of publication | Publication Edition |
|---------|--|---|---|---------------------|---------------------|
| 1 | Expert Data Structures with C | R.B. Patel | Khanna Book Publishing Company | 2023 | 4th Edition |
| 2 | Data Structures with C | Seymour Lipschutz | Schaum's Outlines, Tata McGraw-Hill | 2011 | 2nd Edition |
| 3 | Data Structures Through C | Yashavant Kanetkar | BPB Publications | 2022 | 4th Edition |
| 4 | Data Structures Using C | Reema Thareja | Oxford University Press | 2014 | Second Edition |
| 5 | Fundamentals of Data Structures in C | Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed | Universities Press | 2007 | Second Edition |
| 6 | An Introduction to Data Structures with Applications | Jean-Paul Tremblay, Paul G. Sorenson | Tata McGraw-Hill ISBN: 9780070651500 | 2007 | 2nd Edition |
| 7 | Data Structures and Algorithm Analysis in C | Mark Allen Weiss | Pearson Education ISBN: 8177583581 | 2002 | 2nd Edition |
| 8 | Design and Analysis of Algorithms | Parag H Dave, Himanshu B Dave | Pearson Education ISBN: 9332585482 | 2017 | 3rd Edition |
| 9 | Introduction to Algorithms | Thomas H. Cormen, Charles E. Leiserson, Ronald L Rivest, Clifford Stein | The MIT Press, ISBN: 978-0262033848 | 2009 | 3rd Edition |





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Course Outcomes:

| Sr. No. | CO Statement After learning this subject, students will be able to | Marks % Weightage |
|---------|--|----------------------|
| CO-1 | Understand the fundamental concepts of data structures and apply the concept of arrays | 07 |
| CO-2 | Perform sorting and searching operations and analyze the sorting techniques | 15 |
| CO-3 | Implement stack, queue | 27 |
| CO-4 | Apply linked list operations | 27 |
| CO-5 | Understand the fundamentals of Trees and Graphs | 24 |

Mapping with POs:

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 | PO 11 | PO 12 | PO 13 |
|------------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| CO-1 | 3 | 1 | 2 | 2 | 1 | 1 | 0 | 2 | 0 | 0 | 1 | 0 | 0 |
| CO-2 | 3 | 2 | 3 | 2 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| CO-3 | 3 | 1 | 2 | 2 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| CO-4 | 3 | 1 | 2 | 2 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| CO-5 | 3 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| Rationale* | | | | | | | | | | | | | |

Rationale*: Explaining why it is matching this particular program outcome





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List of Open learning website:

- https://www.tutorialspoint.com/data_structures_algorithms/index.htm
- <https://www.geeksforgeeks.org/data-structures/>
- <https://www.javatpoint.com/data-structure-tutorial>

List of Open-Source Software:

- Inbuilt compiler GCC available on UBUNTU

Major Equipment Needed: NA

