

**SUBJECT NAME: Data Structure through C**  
**SUBJECT CODE: BCAC302**

**Credit: 3L + 2P**

**COURSE OBJECTIVE:**

The course aims to provide students with a solid foundation in fundamental data structures and algorithms, as well as proficiency in implementing them using C. This will empower students with the knowledge, skills, and problem-solving abilities necessary to tackle complex computational problems and excel in their academic and professional pursuits in the field of computer application.

<b>COURSE OUTCOME</b>	
CO1	Students will comprehend the fundamental concepts of data structures, including arrays, linked lists, stacks, queues, and trees, and how they are implemented in the C programming language.
CO2	Gain proficiency in implementing various data structures using C programming language, including dynamic memory allocation, pointers, and structures.
CO3	Develop the ability to analyze problems and choose appropriate data structures and algorithms to solve them efficiently.
CO4	Enhance problem-solving skills by applying data structures and algorithms to solve real-world problems and algorithmic challenges.
CO5	Collaborate effectively in team projects involving the design and implementation of complex data structures and algorithms, fostering communication and teamwork skills.

**DETAILED SYLLABUS:**

<b>Module No:</b>	<b>NAME OF THE TOPIC</b>	<b>HOURS</b>	<b>MARKS</b>
<b>M1</b>	Structure and Union, typedef definition, Implementation of structure and Union, Accessing members of the structure, Pointer to structure, passing structure in function, Passing structure through pointer, Self-referential pointer, Nested Structure	<b>4</b>	<b>5</b>
<b>M2</b>	Arrays: 1D, 2D and Multi-Dimensional Arrays, Sparse Matrices. Polynomial representation, Implementation of Stack and Queue, Example of Infix, Postfix, and prefix, Priority Queue	<b>7</b>	<b>10</b>

<b>M3</b>	Linked Lists : Singly, Doubly and Circular Lists, Normal and Circular representation of Self Organizing Lists, Skip Lists, Polynomial representation, Implementation of Stack and Queue, Circular List, Stack as Circular list, Queue as Circular list	<b>8</b>	<b>15</b>
<b>M4</b>	Recursion: Definition, Internal Stack representation, Factorial function, Fibonacci Sequence, Binary Search, The tower of Hanoi Problem	<b>5</b>	<b>8</b>
<b>M5</b>	Trees : Introduction to Tree as a data structure, Binary Trees (Insertion, Deletion, Recursive and Iterative Traversals of Binary Search Trees), Threaded Binary Trees (Insertion, Deletion, Traversals), Height-Balanced Trees (Various operations on AVL Trees).	<b>8</b>	<b>15</b>
<b>M6</b>	Searching and Sorting: Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Merge Sort, Quick sort, Shell Sort, Comparison of Sorting Techniques	<b>8</b>	<b>12</b>
<b>M7</b>	Hashing : Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collision by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing	<b>5</b>	<b>5</b>
	<b>INTERNAL EXAMINATION</b>	<b>3</b>	<b>30</b>
	<b>TOTAL</b>	<b>48</b>	<b>100</b>

**Practical:**

**SUBJECT NAME: Data Structure Lab**  
**SUBJECT CODE: BCAC392**

**Credit:2**

**List of Practical:**

- 1. Implementation of array operations.**
- 2. Stacks and Queues: adding, deleting elements.**
- 3. Circular Queue: Adding & deleting elements**
- 4. Merging Problem: Evaluation of expressions operations on Multiple stacks & queues**
- 5. Implementation of linked lists: inserting, deleting, and inverting a linked list.**
- 6. Implementation of stacks & queues using linked lists:**

<p><b>7. Polynomial addition, Polynomial multiplication</b></p> <p><b>8. Sparse Matrices: Multiplication, addition.</b></p> <p><b>9. Recursive and Non Recursive traversal of Trees Threaded binary tree traversal. AVL tree implementation Application of Trees.</b></p> <p><b>10. Application of sorting and searching algorithms Hash tables' implementation: searching, inserting and deleting, searching &amp; sorting techniques.</b></p> <p><b>Assignments:</b></p> <p><b>Based on the curriculum as covered by the subject teacher</b></p>
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**SUGGESTED READING:**

1. **Data Structures Through C in Depth** by S. K. Srivastava and Deepali Srivastava - BPB Publications
2. **Data Structures Through C** by Yashavant Kanetkar - BPB Publications
3. **Data Structures: A Pseudocode Approach with C** by Richard F. Gilberg and Behrouz A. Forouzan (Adapted by Dinesh P. Mehta) - Cengage Learning India
4. **Data Structures and Algorithm Analysis in C** by Mark Allen Weiss (Adapted by Dinesh Mehta) - Pearson Education India
5. **Data Structures Using C and C++** by Tanenbaum - Pearson Education India
6. **Data Structures and Algorithms Made Easy** by M. S. Kutti Swamy - Pearson Education India