

**DATA STRUCTURES AND APPLICATIONS**  
(Effective from the academic year 2018 -2019)

**SEMESTER – III**

<b>Course Code</b>	<b>18CS32</b>	<b>CIE Marks</b>	40
<b>Number of Contact Hours/Week</b>	3:2:0	<b>SEE Marks</b>	60
<b>Total Number of Contact Hours</b>	50	<b>Exam Hours</b>	03

**CREDITS –4**

**Course Learning Objectives:** This course (18CS32) will enable students to:

- Explain fundamentals of data structures and their applications essential for programming/problem solving.
- Illustrate linear representation of data structures: Stack, Queues, Lists, Trees and Graphs.
- Demonstrate sorting and searching algorithms.
- Find suitable data structure during application development/Problem Solving.

**Module 1**

**Contact Hours**

**Introduction:** Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, Dynamically allocated arrays.

**Array Operations:** Traversing, inserting, deleting, searching, and sorting. Multidimensional Arrays, Polynomials and Sparse Matrices.

**Strings:** Basic Terminology, Storing, Operations and Pattern Matching algorithms. Programming Examples.

**Textbook 1: Chapter 1: 1.2, Chapter 2: 2.2 - 2.7 Text Textbook 2: Chapter 1: 1.1 - 1.4, Chapter 3: 3.1 - 3.3, 3.5, 3.7, Ch apter 4: 4.1 - 4.9, 4.14 Reference 3: Chapter 1: 1.4 RBT: L1, L2, L3**

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**Module 2**

**Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression.

**Recursion** - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function.

**Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues, A Mazing Problem. Multiple Stacks and Queues. Programming Examples.

**Textbook 1: Chapter 3: 3.1 -3.7 Textbook 2: Chapter 6: 6.1 -6.3, 6.5, 6.7-6.10, 6.12, 6.13 RBT: L1, L2, L3**

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**Module 3**

**Linked Lists:** Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Linked Stacks and Queues. Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples

**Textbook 1: Ch apter 4: 4.1 – 4.6, 4.8, Textbook 2: Ch apter 5: 5.1 – 5.10, RBT: L1, L2, L3**


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**Module 4**

**Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples

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<b>Textbook 1: Chapter 5: 5.1 –5.5, 5.7; Textbook 2: Chapter 7: 7.1 – 7.9</b>	
<b>RBT: L1, L2, L3</b>	
<b>Module 5</b>	
<b>Graphs:</b> Definitions, Terminologies, Matrix and Adjacency List Representation Of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search. <b>Sorting and Searching:</b> Insertion Sort, Radix sort, Address Calculation Sort. <b>Hashing:</b> Hash Table organizations, Hashing Functions, Static and Dynamic Hashing. <b>Files and Their Organization:</b> Data Hierarchy, File Attributes, Text Files and Binary Files, Basic File Operations, File Organizations and Indexing <b>Textbook 1: Chapter 6 : 6.1 –6.2, Chapter 7:7.2, Chapter 8 : 8.1-8.3</b> <b>Textbook 2: Chapter 8 : 8.1 – 8.7, Chapter 9 : 9.1-9.3, 9.7, 9.9</b> <b>Reference 2: Chapter 16 : 16.1 - 16.7</b> <b>RBT: L1, L2, L3</b>	10
<b>Course Outcomes:</b> The student will be able to :	
<ul style="list-style-type: none"> <li>• Use different types of data structures, operations and algorithms</li> <li>• Apply searching and sorting operations on files</li> <li>• Use stack, Queue, Lists, Trees and Graphs in problem solving</li> <li>• Implement all data structures in a high-level language for problem solving.</li> </ul>	
<b>Question Paper Pattern:</b>	
<ul style="list-style-type: none"> <li>• The question paper will have ten questions.</li> <li>• Each full Question consisting of 20 marks</li> <li>• There will be 2 full questions (with a maximum of four sub questions) from each module.</li> <li>• Each full question will have sub questions covering all the topics under a module.</li> <li>• The students will have to answer 5 full questions, selecting one full question from each module.</li> </ul>	
<b>Textbooks:</b>	
<ol style="list-style-type: none"> <li>1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2<sup>nd</sup> Ed, Universities Press, 2014.</li> <li>2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1<sup>st</sup> Ed, McGraw Hill, 2014.</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. Gilberg &amp; Forouzan, Data Structures: A Pseudo-code approach with C, 2<sup>nd</sup> Ed, Cengage Learning, 2014.</li> <li>2. Reema Thareja, Data Structures using C, 3<sup>rd</sup> Ed, Oxford press, 2012.</li> <li>3. Jean-Paul Tremblay &amp; Paul G. Sorenson, An Introduction to Data Structures with Applications, 2<sup>nd</sup> Ed, McGraw Hill, 2013</li> <li>4. A M Tenenbaum, Data Structures using C, PHI, 1989</li> <li>5. Robert Kruse, Data Structures and Program Design in C, 2<sup>nd</sup> Ed, PHI, 1996.</li> </ol>	

  
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