

## DATA STRUCTURES

<b>III Semester: ME / CSE / IT / ECE / CE   IV Semester AE / EEE</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACSB03	Core	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
<b>Contact Classes: 45</b>		<b>Tutorial Classes: Nil</b>		<b>Practical Classes: Nil</b>			<b>Total Classes: 60</b>	
<p><b>OBJECTIVES:</b></p> <p><b>The course should enable the students to:</b></p> <ol style="list-style-type: none"> <li>I. Learn the basic techniques of algorithm analysis.</li> <li>II. Demonstrate searching and sorting algorithms and analyze their time complexities.</li> <li>III. Implement linear data structures viz. stack, queue and linked list.</li> <li>IV. Demonstrate non-linear data structures viz. tree and graph traversal algorithms.</li> <li>V. Study and choose appropriate data structure to solve problems in real world.</li> </ol> <p><b>COURSE OUTCOMES (COs):</b></p> <ol style="list-style-type: none"> <li>1. Understand the concept of data structures and apply algorithm for solving problems like sorting, searching, insertion and deletion of data.</li> <li>2. Understand linear data structures for processing of ordered or unordered data.</li> <li>3. Explore various operations on dynamic data structures like single linked list, circular linked list and doubly linked list.</li> <li>4. Explore the concept of non linear data structures such as trees and graphs</li> <li>5. Understand the binary search trees, hash function, and concepts of collision and its resolution methods.</li> </ol> <p><b>COURSE LEARNING OUTCOMES (CLOs):</b></p> <ol style="list-style-type: none"> <li>1. Understand algorithms and data structures in terms of time and space complexity of basic operations.</li> <li>2. Choose a suitable algorithm to organize the data in ascending or descending order.</li> <li>3. Explore an algorithm to find the location of an element in a given list.</li> <li>4. Compare the time complexities of various searching and sorting algorithms.</li> <li>5. Implementation of stack and queues using an underlying array.</li> <li>6. Understand application of stacks in arithmetic expression conversion and evaluation.</li> <li>7. Understand working of circular queues and double ended queue.</li> <li>8. Understand dynamic data structures and their real time applications.</li> <li>9. Understand the basic insertion and deletion operations associated with linked list.</li> <li>10. Organize the data in various linked representation format.</li> <li>11. Understand the concept of non-linear data structures viz. trees and graphs.</li> <li>12. Application of trees, graphs and graph traversal techniques.</li> <li>13. Compare and Contrast the operations of binary search trees and AVL trees.</li> <li>14. Understand the concept of M-way search trees, operations and applications.</li> <li>15. Understand the implementation of hashing using hash table and hash function.</li> <li>16. Describe the concept of collision and its resolving methods in applications.</li> <li>17. Strengthen the knowledge of data structures and algorithms for employability.</li> </ol>								

<b>MODULE-I</b>	<b>INTRODUCTION TO DATA STRUCTURES, SEARCHING AND SORTING</b>
<p>Basic concepts: Introduction to data structures, classification of data structures, operations on data structures,</p> <p>Searching techniques: Linear search, binary search; Sorting techniques: Bubble sort, selection sort, insertion sort, and comparison of sorting algorithms.</p>	
<b>MODULE-II</b>	<b>LINEAR DATA STRUCTURES</b>
<p>Stacks: Primitive operations, implementation of stacks using Arrays, applications of stacks arithmetic expression conversion and evaluation; Queues: Primitive operations; Implementation of queues using Arrays, applications of linear queue, circular queue and double ended queue (deque).</p>	
<b>MODULE-III</b>	<b>LINKED LISTS</b>
<p>Linked lists: Introduction, singly linked list, representation of a linked list in memory, operations on a single linked list; Applications of linked lists: Polynomial representation and sparse matrix manipulation.</p> <p>Types of linked lists: Circular linked lists, doubly linked lists; Linked list representation and operations of Stack, linked list representation and operations of queue.</p>	
<b>MODULE-IV</b>	<b>NON LINEAR DATA STRUCTURES</b>
<p>Trees: Basic concept, binary tree, binary tree representation, array and linked representations, binary tree traversal, binary tree variants, application of trees; Graphs: Basic concept, graph terminology, graph implementation, graph traversals, Application of graphs, Priority Queue.</p>	
<b>MODULE-V</b>	<b>BINARY TREES AND HASHING</b>
<p>Binary search trees: Binary search trees, properties and operations; Balanced search trees: AVL trees; Introduction to M-Way search trees, B trees; Hashing and collision: Introduction, hash tables, hash functions, collisions, applications of hashing.</p>	
<b>Text Books:</b>	
<ol style="list-style-type: none"> <li>1. Rance D. Necaise, "Data Structures and Algorithms using Python", Wiley Student Edition.</li> <li>2. Benjamin Baka, David Julian, "Python Data Structures and Algorithms", Packt Publishers, 2017.</li> </ol>	
<b>Reference Books:</b>	
<ol style="list-style-type: none"> <li>1. S. Lipschutz, "Data Structures", Tata McGraw Hill Education, 1<sup>st</sup> Edition, 2008.</li> <li>2. D. Samanta, "Classic Data Structures", PHI Learning, 2<sup>nd</sup> Edition, 2004.</li> </ol>	
<b>Web References:</b>	
<ol style="list-style-type: none"> <li>1. <a href="https://www.tutorialspoint.com/data_structures_algorithms/algorithms_basics.htm">https://www.tutorialspoint.com/data_structures_algorithms/algorithms_basics.htm</a></li> <li>2. <a href="https://www.codechef.com/certification/data-structures-and-algorithms/prepare">https://www.codechef.com/certification/data-structures-and-algorithms/prepare</a></li> <li>3. <a href="https://www.cs.auckland.ac.nz/software/AlgAnim/dsToC.html">https://www.cs.auckland.ac.nz/software/AlgAnim/dsToC.html</a></li> <li>4. <a href="https://online-learning.harvard.edu/course/data-structures-and-algorithms">https://online-learning.harvard.edu/course/data-structures-and-algorithms</a></li> </ol>	