

Course Code	Course Name	Credits (TH+P+TUT)		
C302	Data Structure	3 - 0 – 0		
Prerequisite:	C programming			
Course Objectives:	<div>1. To discuss types of different data structures and concept of Abstract Data Type</div> <div>2. To discuss the concept of stack and queue and apply them to various applications.</div> <div>3. To describe the concept of link list and apply it to various applications</div> <div>4. To introduce the different kinds of trees.</div> <div>5. To discuss graph related concepts and traversals along with application.</div> <div>6. To teach various searching techniques.</div>			
Course Outcomes:	<b>After successful completion of this course, learner will be able to:</b> <div>1. Describe types of data structure and write ADT.</div> <div>2. Implement stack and different types of queues using array and their applications</div> <div>3. Perform various types of link list operations and their applications</div> <div>4. Perform operations on Binary Search Tree, AVL tree, Btree and B+Tree</div> <div>5. Implement Graph traversals BFS, DFS and application of Graph in topological sorting</div> <div>6. Describe various Hashing functions, Collision techniques and compare various searching techniques Linear Search, Binary Search and Hashing</div>			
Module No. & Name	Sub Topics	CO Mapped	Hrs	Total Hrs/Module
i. Prerequisites and Course outline	Prerequisite Concepts and Course Introduction.	-	02	02
1. Introduction to Data Structures	Introduction to Data Structures, Concept of ADT,	CO1	01	02
	Types of Data Structures-Linear and Nonlinear, Operations on Data Structures.		01	
2.Stack and Queues	Introduction, ADT of Stack, Operations on Stack, Array Implementation of Stack	CO2	01	09
	Applications of Stack-Well formedness of Parenthesis		01	
	Infix to Postfix Conversion		01	
	Postfix Evaluation		01	
	Recursion		01	
	Introduction, ADT of Queue, Operations on Queue, Array Implementation of Queue		01	
	Implementation of circular and Double Ended Queue, Priority Queue, Applications of Queue		03	
3. Linked List	Introduction, Representation of Linked List, Linked List v/s Array.	CO3	01	10

	Types of Linked List - Singly Linked List, Circular Linked List, Doubly Linked List, Operations on Singly Linked List and Doubly Linked List		<b>06</b>	
	Stack and Queue using Singly Linked List		<b>01</b>	
	Singly Linked List Application-Polynomial Representation and Addition		<b>02</b>	
<b>4. Trees</b>	Introduction, Tree Terminologies, Binary Tree, Binary Tree Representation, Types of Binary Tree	<b>CO4</b>	<b>01</b>	<b>11</b>
	Binary Tree Traversals		<b>02</b>	
	Binary Search Tree, Operations on Binary Search Tree		<b>04</b>	
	Applications of Binary Tree-Expression Tree, Huffman Encoding		<b>01</b>	
	Search Trees-AVL, rotations in AVL Tree, operations on AVL Tree, Introduction of B Tree, B+ Tree		<b>03</b>	
<b>5. Graphs</b>	Introduction, Graph Terminologies, Representation of Graph	<b>CO5</b>	<b>01</b>	<b>04</b>
	Graph Traversals-Depth First Search (DFS) and Breadth First Search (BFS)		<b>02</b>	
	Graph Application- Topological Sorting		<b>01</b>	
<b>6. Searching Techniques</b>	Linear Search, Binary Search, Hashing-Concept, Hash Functions	<b>CO6</b>	<b>01</b>	<b>03</b>
	Collision Resolution Techniques		<b>02</b>	
<b>ii. Course conclusion</b>	Recap of Modules, Outcomes, Applications, and Summarization.	<b>--</b>		<b>01</b>
<b>Total Hours</b>				<b>42</b>
<b>Books:</b>				
<b>Textbooks:</b>	<ol style="list-style-type: none"> <li>1. Aaron M Tenenbaum, Yedidyah Langsam, Moshe J Augenstein, "Data Structures Using C", Pearson Publication.</li> <li>2. Reema Thareja, "Data Structures using C", Oxford Press.</li> <li>3. Richard F. Gilberg and Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", 2nd Edition, CENGAGE Learning.</li> <li>4. Jean Paul Tremblay, P. G. Sorenson, "Introduction to Data Structure and Its Applications", McGraw-Hill Higher Education</li> <li>5. Data Structures Using C, ISRD Group, 2nd Edition, Tata McGraw-Hill.</li> </ol>			
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Prof. P. S. Deshpande, Prof. O. G. Kakde, "C and Data Structures", DreamTech press.</li> <li>2. E. Balagurusamy, "Data Structure Using C", Tata McGraw-Hill Education India.</li> <li>3. Rajesh K Shukla, "Data Structures using C and C++", Wiley-India</li> <li>4. GAV PAI, "Data Structures", Schaum's Outlines.</li> <li>5. Robert Kruse, C. L. Tondo, Bruce Leung, "Data Structures and Program, Design in C", Pearson</li> </ol>			

<b>Useful Links:</b>	

1. <https://nptel.ac.in/courses/106/102/106102064/>
2. <https://www.coursera.org/specializations/data-structures-algorithms>
3. <https://www.edx.org/course/data-structures-fundamentals>
4. [https://swayam.gov.in/nd1\\_noc19\\_cs67/preview](https://swayam.gov.in/nd1_noc19_cs67/preview)

**Assessment:**

**Continuous Assessment for 40 marks:**

1. Test 1 – 20 marks
2. Test 2 – 20 marks

**End Semester Theory Examination will be of 60 marks of 02 hrs min 30 duration.**