COURSE TITLE	**DATA STRUCTURE**
COURSE CODE	**09CE3303**
COURSE CREDITS	**5**

Objective:

1 This subject will help to understand fundamental concepts of data structure. Data structure has high significance in the field of Computer and IT. Association of information is urgent for usage and for that it requires proficient calculations. Comprehension of information structures and their related applications are profoundly expected to build practical program.

Course Outcomes: After completion of this course, student will be able to:

1 Apply different data structures to solve real-life computational problems.

2 Demonstrate the need for data structures in efficient algorithm development.

3 Implement various sorting algorithms using appropriate data structures

4 Select and apply suitable data structures for given applications or scenarios

Pre-requisite of course: Students have basic knowledge about the C Programming,

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	4	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Basics of Data Structure** Data Structure , Data Representation, Data Types: Primitive and Non-Primitive, Algorithm, Time Complexity, Space complexity- Best case, Average case, Worst case	5
2	**Array & Stack** Study of Linear Data Structure, Representation of Array, Two-Dimensional Array, Multidimensional Array, Sparse Matrices , Application of Array, Introduction to Stack, Stack Operations: Push, Pop, Peep, Stack using Array, Applications of Stack , Polish Expression & Reverse Polish Expression	9
3	**Queue & Link List** Introduction to Queue, Queue Operations: Insertion, Deletion, Types of Queue: Simple, Circular, Double ended queue(Deque) & Priority Queue, Applications of Queue, Introduction to Linked List , Memory Allocation, Operations: Creation, Insertion, Deletion, Types of Linked List & Applications	8

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Contents : Unit	Topics	Contact Hours
4	**Tree And Graph** Non-linear Data Structure , Introduction to Binary Tree, Tree Terminologies: Tree, Degree of a Node, Degree of a Tree, Level of a node, Leaf Node, Depth / Height of a Tree, In-Degree and Out-Degree, Path, Operations on Tree: Insert, Delete, Search, Height of Tree & Number of Nodes, Binary Tree Traversal: In-order, Pre-order, Post-order, Representation of Graphs, Graph Traversal: BFS (Breadth First Search), DFS(Depth First Search), Spanning Tree, Shortest Path, Minimum Spanning Tree	9
5	**Sorting & Searching Techniques** Introduction to Sorting, Types of Sorting : Bubble Sort, Insertion Sort , Selection Sort, Merge Sort , Quick Sort, Introduction to Searching, Tyeps of Searching: Sequential Search, Binary Search	6
6	**Hashing** Introduction to Hashing, Hash Table, Various Hash function : Division Method, Multiplication & Mid-square Method, Applications of Hashing	5
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Practical-1** Perform dynamic memory allocation using malloc(), calloc(), and free() functions.	2
2	**Practical-2** Write a program to demonstrate the concept of Call by Value and Call by Reference.	2
3	**Practical-3** Perform the following operations of Stack using Array: 1. Push, 2. Pop, 3. Peep	3
4	**Practical-4** Write a program to convert Postfix expression into Infix expression using Stack.	3
5	**Practical-5** Perform the following operations of Simple Queue using Array: 1. Insert, 2. Delete, 3. Display	3
6	**Practical-6** Perform the following operations of Circular Queue using Array: 1. Insert, 2. Delete, 3. Display	3
7	**Practical-7** Implement Stack using Linked List.	2
8	**Practical-8** Implement Queue using Linked List.	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
9	**Practical-9** Write a program Insert a node at the front of the singly linked list.	2
10	**Practical-10** Write a program Insert a node at the end of the singly linked list.	2
11	**Practical-11** Write a program Delete a node at the front of the singly linked list.	2
12	**Practical-12** Write a program Delete a node at the end of the singly linked list.	2
13	**Practical-13** Write a program to count the number of nodes and search a specific node in a Singly Linked List.	3
14	**Practical-14** Write a program Insert a node at the beginning of the doubly linked list.	2
15	**Practical-15** Write a program Insert a node at the end of the doubly linked list.	2
16	**Practical-16** Write a program Delete a node at the beginning of the doubly linked list.	2
17	**Practical-17** Write a program Delete a node at the end of the doubly linked list.	2
18	**Practical-18** Write a program to insert an element at any position in a Doubly Linked List.	3
19	**Practical-19** Write a program to create a Binary Search Tree (BST).	3
20	**Practical-20** Write a program for Binary Tree Traversal: 1. In-order 2. Pre-order 3. Post-order	3
21	**Practical-21** Write a program for Bubble Sort.	2
22	**Practical-22** Write a program for Insertion Sort.	2
23	**Practical-23** Write a program for Merge Sort.	2
24	**Practical-24** Write a program for Quick Sort.	2
Total Hours		**56**

Textbook :

1 Data Structures Using C, 2nd Edition, E. Balagurusamy, McGraw Hill Education, 2025

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References:

1 Data Structures with C, Data Structures with C, Seymour Lipschutz, McGraw Hill Education, 2017

2 5th Edition, 5th Edition, Yashavant Kanetkar, BPB Publication, 2023

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
0.00	0.00	35.00	35.00	30.00	0.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

4 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

Supplementary Resources:

1 1. https://visualgo.net/en

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