INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**BACHELOR OF TECHNOLOGY (COMPUTER ENGINEERING)**
SEMESTER	**3**
COURSE TITLE	**DATA STRUCTURE**
COURSE CODE	**01CE1301**
COURSE CREDITS	**4**

Objective:

1 To implement efficient algorithms and programs it is necessary to organize or structure the data. Understanding of data structures and their related applications are highly needed to build sustainable program.

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

1 Understand different types of data structures and their functions.
2 Implementing linear data structures and algorithms.
3 Apply various methods on Non-Linear data structures.
4 Analyse sorting and searching techniques with applications.
5 Evaluate various techniques of hashing and its collision.

Pre-requisite of course: Basic fundamentals of C/C++/Java

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Data Structures:** Data Management concepts, Data types – primitive and non-primitive,, Types of Data Structures, Linear & non-linear Data Structures,, Abstract Data Types	3

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Contents : Unit	Topics	Contact Hours
2	**Linear Data Structures & their representation: Array:** Array: Representation of arrays,, sparse matrix and its representation,, Storage Structures for arrays, Applications of arrays., Stack: Stack definitions and concepts,, Operations on stacks (push, pop, peep, change),, Polish Expressions and their compilation, Tower of Hanoi., Queue: Representation of Queue,, operations on Queue (insert, delete),, Simple Queue, Circular Queue,, Double Ended Queue,, Priority Queues,, Applications of Queue., Linked List: Linked list Understanding and their Operations,, Singly Linked List,, Doubly Linked List, Circular Linked List,, Circular Doubly Linked, Applications of Linked List.	16
3	**Nonlinear Data Structure:** Graph: Graphs and their understanding,, Matrix representations of a given graph,, graph, Depth First Search (DFS),, Breadth First Search (BFS), Tree: Tree definitions and their concepts,, Representation of binary tree,, Binary tree traversal methods (Inorder, postorder, preorder),, Binary search trees,, Method to Convert a general tree to binary tree,, Threaded binary tree,, Applications of Trees, Balanced tree and its mechanism,, AVL tree,, Weight Balanced Trees,, B Tree, B+ Tree.	15
4	**Sorting & Searching techniques:** Sorting Concepts and methods: Bubble Sort,, Selection Sort, Insertion Sort,, Quick Sort, Merge Sort, Searching Concepts and Methods: Sequential Search,, Binary Search	5
5	**Hashing and Collision** Hashing Concepts and methods. Hash Table Methods-Introduction,, Hash Functions, Collision in Hashing,, Collision-Resolution Techniques with examples.	3
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Practical 1** ntroduction to pointers. Call by Value and Call by Reference. [Swap two values with a function. Demonstrate Call by Value and Call by Reference]	2
2	**Practical 2** Introduction to Dynamic Memory Allocation and use of DMA functions malloc(), calloc(), free(), etc. [Construct a structure for students having roll number, name, and marks, ask the user for the number of students, allocate memory run time, get all data and print given data in table format.	2
3	**Practical 3** Write a program to implement STACK using array that performs following operations: (a) PUSH (b) POP (c) PEEP (d) CHANGE (e) DISPLAY (f) isEmpty (g) isFull	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
4	**Practical 4** Implement a program to convert infix notation to postfix notation using stack.	2
5	**Practical 5** Write a program to implement QUEUE using arrays that performs following operations: (a) INSERT (b) DELETE (c) PEEK (d) CHANGE (e) DISPLAY (f) isEmpty (g) isFull	2
6	**Practical 6** Write a program to implement Circular Queue using arrays that perform the following operations. (a) INSERT (b) DELETE (c) PEEK (d) CHANGE (e) DISPLAY (f) isEmpty (g) isFul	2
7	**Practical 7** Write a menu-driven program to implement the following operations on the singly linked list: (a) Insert a node at the front of the linked list. (b) Insert a node at the end of the linked list. (c) Insert a node at a given position in the linked list. (d) Insert a node such that the linked list is in ascending order.(according to info. Field) (e) Delete the first node of the linked list. (f) Delete the last node of the linked list. (g) Delete a node before the specified position. (h) Delete all occurrences of the given value.	2
8	**Practical 8** (i) Write a program to implement a stack using a linked list. (ii) Write a program to implement a queue using a linked list	2
9	**Practical 9** Write a program to implement the following operations on the doubly linked list. (a) Insert a node at the front of the linked list. (b) Insert a node after the specified position. (c) Delete the last node of the linked list. (d) Delete a node before the specified position.	2
10	**Practical 10** Write a program to implement Binary Search Tree where the user can perform: (a) Insert a value in an existing Tree (b) Delete a value from the tree (c) Traverse a Tree: Pre-Order, In-Order, Post-Order.	2
11	**Practical 11** Write a program to implement Linear Search and Binary Search.	2
12	**Practical12** Write a program to implement Bubble Sort.	2
13	**Practical 13** Write a program to implement Merge Sort.	2
14	**Practical 14** Write a program to implement Quick Sort.	2
Total Hours		**28**

Textbook :

1 Data Management and file processing, Mary E.S. Loomis, PHI, 2009

References:

1 An Introduction to Data Structures with Applications, An Introduction to Data Structures with Applications, Jean-Paul Tremblay and Paul G. Sorenson, Tata McGraw Hill 2nd Edition, 2004

2 Data Structures using C & C++, Data Structures using C & C++, Yedidyah Langsam, Moshe J. Augrsstein, Aaron M. Tenenbahum, PHI, 2012

3 Data Structures and Program Design in C, Data Structures and Program Design in C, Robert L. Kruse, PHI, 1997

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**
20.00	20.00	25.00	20.00	10.00	5.00

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 https://visualgo.net/en

2 https://www.cs.usfca.edu/~galles/visualization/Algorithms.html

3 https://quizlet.com

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