FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2020-21

Programme: **Bachelor of Engineering (Information Technology)**

Semester: **III**

Course Code: **102040301**

Course Title: **Data Structures**

Course Group: **Professional Core Course**

Course Objectives:

The main objective of this course is to understand the concepts of data structures and how these concepts are useful in problem solving. Moreover, it will help to get familiarized with elementary data structures: Linear, Non-linear. Further, this subject will inculcate practicing programming techniques for efficient storage and retrieval for developing sophisticated computer applications.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
4	0	2	5	40 / 14	60 / 21	20/7	30/10	150 / 52

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction to Data Structure:** Introduction, Primitive Data Structure, Importance of Data Structure, Types of Data Structure, Primitive & Non-Primitive Data types.	02
2	**Elementary Data Structure - Linear:** Array: Definition & concept, Representation & Application, 2D & 3D arrays, Matrix representation Stack: Definition & concept, Representation, applications, Expression: Infix, prefix & postfix, Expression conversion, stack & expression, recursion. Queues: Definition & concept, types, representation, applications Linked List: Definition & concepts, types, representation, applications	12

3	**Elementary Data Structure – Non-Linear:** Trees: Definition & Concept, Representation & Application, types, Traversals, Advanced Tree Concepts: AVL Tree, Balancing, Height/Weight Balancing, Rotation Graphs: Definition & Concept, Representation & Application, types, Traversals. Advanced Graph Concepts: Spanning Trees, Shortest Paths, DFS/BFS.	**10**
4	**Sorting Techniques:** Introduction, Types of sorting techniques: Bubble sort, Radix sort, Selection sort, Quick sort, Merge sort, Insertion sort	**08**
5	**Searching & Hashing Techniques:** Introduction, Searching: Linear search, Binary search, Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques	**08**
	Total	**40**

List of Practicals / Tutorials:

1	● Write a program to insert/delete in linear array at specific position. ● Write a program to remove duplicate elements from liner array. ● Write a program to read 10 integers in an array. Sort them out on the basis of number of digits in each element.
2	● Demonstrate the concept of Call by value and Call by Reference. ● Write a program to prints array elements in reverse orders applying pointers ● Write program to implement stack and simple queue using array
3	● Write a program for stack using array for the following operations: Push, Pop, Peek and IsEmpty. ● Write a program for queue using array for the following operations: Enqueue, Dequeue, IsEmpty, IsFull. ● Write a program for circular queue using array for the following operations: Enqueue, Dequeue, IsEmpty, IsFull.
4	● Write a program for single linked list for the following operations: 1. Count the number of nodes in a given linked list 2. Delete the desired node from linked list 3. Insert the new node after the desired node into the linked list 4. Create a new list by reversing the list 5. Concatenates two linked list ● Write a program for stack using linked list for the following operations: Push, Pop, Peek and IsEmpty. ● Write a program for queue using linked list for the following operations: Enqueue, Dequeue, IsEmpty
5	Write a program of conversion of an expression from infix to Postfix, Prefix. Write a program to evaluate postfix expression.

6	● Write a program to implement doubly linked list for the following operations: 1. Insert a new node after the desired node 2. Delete the desired note 3. Display the nodes of doubly linked list ● Write a program to implement circular doubly linked list for the following operations: 1. Insert a new node after the desired node 2. Delete the desired note 3. Display the nodes of doubly linked list
7	● Write a program to construct binary search tree. ● Write a program to traverse binary search tree.
8	Write a program to construct AVL tree
9	● Write a program to demonstrate DFS and BFS. ● Write a program for given a directed graph, and check whether the graph contains a cycle or not. It should print true if the given graph contains at least one cycle, else it should print false. ● Write a program to implement minimum spanning tree algorithm
10	● Write a program to implement binary search ● Write a program to implement: Bubble sort, Radix sort, Selection
11	● Write a program to implement: Quick sort, Merge sort, Insertion sort ● Write a program to implement the mechanism to handle hash collision by: 1. Separate chaining 2. Open addressing

Reference Books:

1	Data Structures using C & C++ -By Ten Baum Publisher – Prenctice-Hall International.
2	Fundamentals of Computer Algorithms by Horowitz, Sahni,Galgotia Pub. 2001 ed.
3	Data Structures: A Pseudo-code approach with C -By Gilberg & Forouzan PublisherThomson Learning.

Supplementary learning Material:	
1	Lecture Notes
2	NPTEL courses

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
10%	30%	40%	20%	-	-	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the importance of data structures for data processing	**20**
CO-2	Understand the concepts and applicability of linear data structures	**30**
CO-3	Understand the concepts and applicability of Non-linear data structures	**30**
CO-4	Understand the sorting and searching techniques with real time applications	**20**

Curriculum Revision:	
Version:	1.0
Drafted on (Month-Year):	June-2020
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025