FACULTY OF ENGINEERING & TECHNOLOGY

Second Year Bachelor of Engineering

Course Code: 102040301

Course Title: Data structures

Type of Course:Professional Core Course

Course Objectives:

To understand the concepts of data structures and how these concepts are useful in problem solving.
To get accustomed with elementary data structures: Linear, Non-linear
To practice 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)				
				Internal		External		Total
Lecture	Tutorial	Practical		Theory	J/V/P*	Theory	J/V/P*	
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.	2
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

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

4	Sorting Techniques Introduction, Types of sorting techniques: Bubble sort, Radix sort, Selection sort, Quick sort, Merge sort, Insertion sort	**8**
5	Searching & Hashing Techniques Introduction Searching: Linear search, Binary search, Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques,	**8**
6	Advanced Data Structures Heaps: Types of Heap, applications, Binary Heap, Fibonacci Heap, Building a Heap, Heaps & Priority Queues, Heapify function. Red-Black Trees: Introduction & concept, properties, applications, insert & delete operation in Red-Black Trees, Balancing. Forests: Sets, Dis-joint sets, Forest-trees, usage & applications, operations	**6**

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

Distribution of Theory Marks						**R**: Remembering; **U**: Understanding; **A**: Application, **N**: Analyze; **E**: Evaluate; **C**: Create
R	**U**	**A**	**N**	**E**	**C**	
10%	30%	40%	20%	0%	0%	

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.

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.

Course Outcomes (CO):

Sr.	**Course Outcome Statements**	**%weightage**
CO-1	Describe the efficient methods of data storage and retrieval	**10**
CO-2	Implement dynamic memory allocation in for different data structures	**10**
CO-3	Design and implement linear data structures	**30**
CO-4	Design and implement Non-linear data structures	**30**
CO-5	Design and implement sorting and searching techniques	**20**

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

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 travers binary search tree.
8	Write a program to construct AVL tree

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in

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
11	Write a program to implement binary search Write a program to implement: Bubble sort, Radix sort, Selection
12	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
13	Write a program to implement max-heap. Write a program to implement Red-Black tree.

Supplementary learning Material:	
1	NPTEL courses

Curriculum Revision:	
Version:	**1**
Drafted on (Month-Year):	Feb-21
Last Reviewed on (Month-Year):	Feb-21
Next Review on (Month-Year):	Click or tap to enter a date.

Opp. Shastri Maidan, Beside BVM College, Vallabh Vidyanagar, Dist: Anand, Gujarat - 388120
(O): 02692-238001 | Email: adminoffice@cvmu.edu.in | www.cvmu.edu.in