COURSE TITLE	Data Structures
COURSE CODE	CC-202
COURSE CREDIT	3
Session Per Week	4
Total Teaching Hours	40 HOURS

AIM

This course introduces students to get the detail knowledge of Basic data structures, representations, building and use of those data structures in different applications in real world.

LEARNING OUTCOMES

Students would be able-
1) To understand the concept, role and importance of Data.
2) To recognize the use of Data Structure for real applications.
3) To identify the key differences between various data structures.
4) To comprehend the type of data structure to apply according to the scenery of applications.
5) To be aware of the real building of the data structure using various programming languages.
6) To implement the various operations of data structures by using algorithms.
7) To deal with every tiny elements of the Data Structures.

DETAIL SYLLABUS

UNIT	TOPIC / SUB TOPIC	TEACHING HOURS
1	**Introduction to Data Structures, Arrays & Linked List**	10

	• **Introduction**
	  o Data
	  o Data Types
	    ▪ Abstract Data Types (Primitive)
	    ▪ User-Defined Data Types (Non-Primitive)
	  o Data Structures:
	  o Definition
	  o Classification of Data Structures and details of each classifications
		2

	• **Array**
	  o Definition
	  o Mapping
	  o Sparce Matrix
		1

1	**• Linked list**
	o Comparison of Array and Linked List
	o Types of Linked Lists
	o Representation of Linked Lists
	o Operations on Doubly Linked Lists (Algorithm and Explanation)
	  ▪ Creation
	  ▪ Traversal
	  ▪ Insertion
	    i. At Front
	    ii. In Between (After and Before)
	    iii. At End
	  ▪ Deletion
	    i. From Beginning
	    ii. From Between
	    iii. From End
		2

	• Searching:
	o Introduction to Searching
	o Searching Techniques:
	  ▪ Sequential Search
	  ▪ Binary Search
		2

	• Sorting:
	o Introduction to Sorting
	o Sorting Techniques:
	  ▪ Bubble sort
	  ▪ Selection sort
	  ▪ Insertion sort
	  ▪ Quick sort
	  ▪ Merge sort
		3

2	**Stack & Queues**	10

	• Stack:
	o Introduction (Idea of the Stack)
	o Operations of the Stack (Algorithm and Explanation)
	o Implementation of the Stack (Using Array and linked list)
	o Applications of the Stack:
	  ▪ Definition: Reverse and Polish
	  ▪ Conversion: Infix to Postfix using manually and stack for parenthesis
	    and Non-parenthesis (with Algorithm)
	  ▪ Recursion(Definition)
		5

	• Queue: o Introduction (Idea of the Queue) o Types of Queue o Operations of Simple and Circular Queue (Algorithm and Explanation) o Implementation of the Queue (Using Array and Linked list)	5

	Tree	10

3	• Introduction
	• Terminology
	• **Binary Tree:**
	  o Definition
	  o Representation of Binary Tree
	  o **Operation on Binary Tree**
	    ▪ Creation
	    ▪ Insertion
	    ▪ Deletion
	    ▪ Traversal (Pre-Order, In-Order and Post- Order) Ecluding general
	      binary tree
	    ▪ Conversion from (Pre, In or Post) into Binary Tree
		5

	• **Types of Binary Tree**
	  o Full Binary Tree
	  o Complete Binary Tree
	  o Binary Search Tree
	  o Expression Tree
	  o Threaded Binary Tree
	  o Heap Tree
	  o Height Balanced Tree (AVL Tree)
	  o B-Tree
		5

	Graph	10

4	• Introduction
	• Basic Terminology
	• **Representation of Graph**
	  o Adjacency Matrix (Array)
	  o Adjacency Linked
	• **Traversal of Graph**
	  o Breadth First Traversal (Algorithm and Tracing)
	  o Depth First Traversal (Algorithm and Tracing)
		6

	• **Application of Graph**
	  o Spanning Tree
	    ▪ Mnimum Spanning Tree (BFS and DFS)
	    ▪ Prim's Algorithm
	    ▪ Kruskal's Algorithm
	o Shortest Path Algorithm
	o Dijkstra's Algorithm
		4

TEXT BOOK:

Data and File Structures using C Publisher: Oxford
By Reema Thareja
• **Chapter-4 (4.1, 4.2, 4.3) – Introduction to Data Structures**
• **Chapter-5 (5.1, 5.2, 5.3, 5.6.5, 5.16) – Array and Searching**
• **Chapter-8 (8.2, 8.7) – Linked List**
• **Chapter-9 (9.1, 9.3, 9.4, 9.5, 9.7, 9.8, 9.11, 9.12, 9.13, 9.14, 9.16[Only Definition],9.17[Definition and 9.17.1]) –**
   Stack & Queues
• **Chapter-10 (10.1, 10.2, 10.4[excluding 10.4.4]) - Tree**
• **Chapter-11 (11.1, 11.2.2, 11.2.3, 11.3, 11.4 [Definition and 11.4.2], 11.6[Definition and 11.6.2]) - Tree**
• **Chapter-12 (12.1[Definition and 12.1.1, 12.1.2]) - Tree**
• **Chapter-13 (13.1, 13.4, 13.5, 13.7[excluding 13.7.5]) - Graph**
• **Chapter-14 (14.1, 14.2, 14.3, 14.4, 14.5, 14.6) - Sorting**

REFERENCE BOOKS:

1. Data Structures and Algorithms in C++ Publisher: Dreamtech
By B. M. Harvani
2. Magnifying Data Structures Publisher: PHI
By: Arpita Gopal
3. Data Structures using C & C ++ Publisher: Wiley-India
By : Rajesh K. Shukla
4. Introduction to Data Structures in C Publisher: Pearson Education
By: Ashok N. Kamthane
5. Data Structures Using C Publisher: Pearson Education By : A. K Sharma

REQUIRED SOFTWARE/S

Turbo c

COURSE TITLE	Data Structures Practicals
COURSE CODE	CC-206
COURSE CREDIT	3
Session Per Week	3
Total Teaching Hours	40 HOURS

AIM

Student will be provided with practical knowledge of basic data structures, representation, building and use of various data structures in different applications in real world.

LEARNING OUTCOMES

1.) To gain the knowledge of various advanced data structure topics practically.
2.) To develop skills for effective use of the pointers and structures in programming.

Note

The students are expected to write program in "C or C++ Programming "languages unit wise as given below. The list in each unit is indicative only and **may or may not be asked in the examination.** The programs given below are only sample example for practice in lab.

DETAIL SYLLABUS

UNIT	TOPIC / SUB TOPIC	TEACHING HOURS
1	**Linked List** 1. Write program to implement following operations using Singly link list • Insert at first • Insert at Last • Insert at specified location (Before or After the Node) • Delete from first • Delete from last • Delete any specified node • Traversal • Sorting • Splitting • Merging • Counting Operations(Total no. of nodes, even and odd no. of nodes)	10 4

1	2. Write program to implement following operations using Doubly link list • Insert at first • Insert at Last • Insert at specified location (Before or After the Node) • Delete from first • Delete from last • Delete any specified node • Traversal • Sorting • Splitting • Merging • Counting Operations(Total no. of nodes, even and odd no. of nodes)	6
2	**Searchin and Sorting**	**10**
	1. Write a program to implement sequential search. 2. Write a program to implement binary search.	2
	3. Write a program to implement bubble sort. 4. Write a program to implement selection sort 5. Write a program to implement merge sort 6. Write a program to implement quick sort 7. Write a program to implement insertion sort.	8
3	**Stack**	**10**
	• Stack: 1. Write a program to implement following operations in stack Using array and Linked List. • PUSH • POP • PEEP 2. Write a program to implement Evaluation of given postfix expression.	5
	3. Write a program to implement conversion of infix expression into postfix expression (parentheses and non parentheses). 4. Write a program to implement recursion. 5. Write a program to reverse the string using the stack.	5
4	**Queue and Tree**	**10**
	Queue: 1. Write a program to implement Simple Queue operations using Array and Linked List. • ENQUEUE • DEQUEUE • Traversal (display) 2. Write a program to implement Circular Queue operations Using Array. • ENQUEUE • DQUEUE • Traversal (display)	5

4	3. Write a program to implement following operations on Binary Search Tree using Linked List. • Creation • Insertion • Traversal(In-order, Pre-order, Post-order)	5

TEXT BOOK:

Data and File Structures using C Publisher: Oxford
By Reema Thareja

REFERENCE BOOKS:

1. Data Structures and Algorithms in C++ Publisher: Dreamtech
By B. M. Harvani
2. Magnifying Data Structures Publisher: PHI
By: Arpita Gopal
3. Data Structures using C & C ++ Publisher: Wiley-India
By : Rajesh K. Shukla
4. Introduction to Data Structures in C Publisher: Pearson Education
By: Ashok N. Kamthane
5. Data Structures Using C Publisher: Pearson Education By : A. K Sharma

REQUIRED SOFTWARE/S

Turbo c