GLS UNIVERSITY
Bachelor of Computer Applications (BCA)
(Core Course)
Semester-III
210301302 DATA STRUCTURES

1. Course Objective:

- To learn the systematic way of solving problems.
- To understand the different methods of organizing large amounts of data.
- To efficiently implement the different data structures.
- To efficiently implement solutions for specific problem prerequisites.

2. Course Duration:

The course will have sessions which are divided into five modules. Each module consists of nine sessions of 60 minutes each and carries a weightage of 20%.

3. Course Contents:

Module No.	Modules/Sub-Modules	No. of Sessions	Marks Weightage
I	**Introduction to Data Structure** • Basic concept of data, Problem analysis • Algorithm Analysis o Space Complexity(Average, best and worst case analysis) o Time Complexity(Average, best and worst case analysis) • Data types primitive and non-primitive • Types of Data Structure: Linear and Non- Linear • Hashing o Introduction to hashing o Hash Table o Hashing Applications • Arrays: Representation of single and multidimensional arrays • Sparse matrix and its representation • Lower and upper triangular matrices and Tri diagonal matrices and representation	09	20%
II	**Stack and Queue** • **Stack** o Introduction to Stack o Operations on Stack o Stack Applications: Infix, Postfix, Prefix expressions o Evaluation of postfix expressions o Conversion between infix, prefix and postfix • **Queue**	09	20%

	○ Representation of Queue ○ Operations on Queue ○ Implementation of Queue ○ Types of Queue ▪ Simple Queue ▪ Circular Queue ▪ Introduction to Priority Queue ▪ Introduction to Double-Ended Queue ○ Applications of Queue		
III	**Linked List** • **Introduction to Linked List** • Operations on Linked List ○ Creation of node ○ Inserting node (beginning, end, between) ○ Deletion (beginning, end, between) ○ Display Linked List • Types of Linked List ○ Singly Linked List ○ Doubly Linked List ○ Circular Linked List • Linked implementation of Stack • Linked implementation of Queue • Applications of Linked List	09	20%
IV	**Tree and Graph** • Trees ○ Definition ○ Terminology ○ Representation • Binary Tree ○ Representation ○ Traversal: Inorder, Preorder, Postorder ○ Insertion and Deletion • Binary Search Tree • AVL/ Height Balanced Tree • Threaded Binary Tree • Graph ○ Definition ○ Terminology ○ Representation ○ Adjacency Matrix and List • Graph Operations ○ BFS ○ DFS ○ Spanning Tree ○ Minimal spanning tree ○ Shortest path	09	20%
V	**Sorting, Searching & Hashing** • Sorting Techniques ○ Selection Sort ○ Bubble Sort	09	20%

	○ Merge Sort ○ Quick Sort • Searching Techniques ○ Linear/Sequential Search ○ Binary Search		

4. Teaching Methods:

The following pedagogical tools will be used to teach this course:

1. Lectures and Discussions
2. Assignments and Practical Demos
3. Problem Solving

5. Evaluation:

The students will be evaluated on a continuous basis and broadly follow the scheme given below:

1.	Assignments / Presentations	30% (Internal Assessment)
2.	Internal Examination	20% (Internal Assessment)
3.	External Examination	50% (External Assessment)

6. Basic Text Books:

Sr. No	Author/s	Name of the book	Publisher	Edition
T1	Varsha H. Patil	Data Structures using C++	Oxford	Latest

7. Reference Books:

Sr. No	Author/s	Name of the book	Publisher	Edition
R1	-	Data Structures through C++	Mc Graw Hill	Latest

8. List of Journals / Periodicals / Magazines / Newspapers etc.:

Sr. No	Link
1	E-book data structure using C++ by Yashwant Kanetkar
2	http://nptel.ac.in/courses/106102064/1
3	http://nptel.ac.in/courses/106102064/2
4	http://nptel.ac.in/courses/106102064/3
5	http://nptel.ac.in/courses/106102064/4

9. Session Plan:

Session No.	Topics / Chapters
1	Introduction to Data Structures
2	Basic concept of data, Problem analysis
3-4	Algorithm Analysis Space Complexity & Time Complexity
5	Data types primitive and non-primitive
6	Types of Data Structure: Linear and Non-Linear

7	Hashing and Array representation
8	Sparse matrix and its representation
9	Lower and upper triangular matrices and Tri diagonal matrices
10	Introduction to Stack
11	Operations on Stack
12-13	Stack Applications: Infix, Postfix, Prefix expression, Evaluation of postfix expressions
14	Conversion between infix, prefix and postfix
15	Representation of Queue & Operations on Queue
16	Implementation of Queue
17-18	Types of Queue & Applications of Queue
19	Introduction to Linked List
20-21	Operations on Linked Lis
22-25	Types of Linked List
26	Linked implementation of Stack
27	Linked implementation of Queue, Applications of Linked List
28	Trees: Definition, Terms, Representation
29-30	Binary Tree: Representation, Traversal: Inorder, Preorder, Postorder, Insertion and Deletion
31	Binary Search Tree, AVL/ Height Balanced Tree
32	Threaded Binary Tree
33	Graph: Definition, Terms, Representation, Adjacency Matrix and List
34	BFS & DFS
35-36	Spanning Tree, Minimum Spanning Tree, Shortest path
37	Introduction to Sorting Techniques
38	Insertion Sort
39	Bubble Sort
40	Selection Sort
41	Merge Sort
42	Introduction to Searching Techniques
43-45	Linear/Sequential Search, Binary Search

10. Learning Outcome:

Upon the completion of this course, students will be able to:

- Differentiate primitive and non-primitive structures.
- Design and apply appropriate data structures for solving computing problems.
- Apply sorting and searching algorithms to the small and large data sets using OOPS.
- Familiarize with other complex data structures such as graph, tree.
- Build test cases to analyze their solutions to make adjustments.