CSC-221 Data Structures	
Course Title:	***Data Structures***
Course Code:	CSC-221
Pre-Requisites:	
Credit Hours Theory:	3
Credit Hours Lab (If Applicable):	1
Course Objectives:	A detailed study of Basic Structures commonly used in Data Processing, Implementation (in C++) and Applications of basic data structures, A Comparative study of different Sorting and Searching Techniques
Learning Outcomes:	After the successful completion of course, the students will be able to: **CLO-1**: Good understanding of the basic data structure. **CLO-2**: The knowledge to implement abstract data types. **CLO-3**: The ability to use an appropriate data structure for the solution of a problem.
Contents (Catalog Description):	This course will focus on data structures and algorithms for manipulating them. Data structures for storing information in tables, lists, stacks, queues, trees and graphs will be covered. Basic algorithms for creating, manipulating and using these structures will also be discussed. Different types of searching and sorting techniques will also be introduced and will be compared. Students will carry out a number of programming assignments, which will emphasize various aspects of data organization and manipulation process.
Recommended Text Books:	A. M. Tenenbaum, **Data Structures using C and C++,** Prentice-Hall
Reference Books:	• Nell Dale, **C++ Plus Data Structures**, Jones and Bartlet, Inc. • Sahni, **Data Structures, Algorithms and Applications**, McGrawHill. • Mark Allen Weiss, **Data Structures and Algorithm Analysis in C++**, Addison Wesley. • **Theory and Problems of Data Structures**, Schaum's Outline Series. • Frank M. Carrano, **Data Abstraction and Problem Solving with C++**, Addison Wesley.
Helping Web Sites:	▪ https://www.cs.auckland.ac.nz/~jmor159/PLDS210/ds_ToC.html ▪ https://people.mpi-inf.mpg.de/~mehlhorn/Toolbox.html
General Instructions for students:	Attendance is mandatory. Every class is important. All deadlines are hard. Under normal circumstances late work will not be accepted. Students are required to take all the tests. No make-up tests will be given under normal circumstances. There is 0 tolerance for plagiarism. Any form of cheating on exams/assignments/quizzes is subject to serious penalty. Attendance 75% attendance is mandatory. Latecomers will be marked as absent.

	Evaluation Criteria Assignments/projects 20% Quizzes 10% Mid-Term 20% Final 50%

Sixteen Week Lesson Plan	**Week**	**Topics Covered**
	1	1st Lecture Introduction and Overview, Elementary Data Organization 2nd Lecture Overview of Data Structures, Basic Data Structure Operations 3rd Lecture Abstract Data Types (ADTs)
	2	1st Lecture Stacks: Definition, Basic Operations, Stack ADT and Applications 2nd Lecture Application of Stacks: Checking the Validity of Expressions 3rd Lecture Representing Stacks in C++
	3	1st Lecture Application of Stacks: Infix, Postfix and Prefix Expressions, Algorithm to Evaluate a Postfix Expression 2nd Lecture Application of Stacks: Algorithm to Convert an Infix Expression into Postfix 3rd Lecture Recursion
	4	1st Lecture Queues: Definition and Basic Operations and ADT 2nd Lecture Applications of Queues, Quiz 1

		3rd Lecture Representing Queues in C++
	5	1st Lecture Priority Queues, Quiz 1 return and discussion. 2nd Lecture Implementation of Priority Queues 3rd Lecture De-Queues
	6	1st Lecture Linked Lists: Definition, Basic Operations and ADT, Quiz 2 2nd Lecture Linked implementation of Stacks and Queues 3rd Lecture Representing Linked Lists in C++
	7	1st Lecture Circular Linked Lists, Quiz 2 return and discussion. 2nd Lecture Doubly Linked Lists 3rd Lecture Addition of long integers using Linked List
	8	1st Lecture Trees: Definitions and Basic Terminology 2nd Lecture Binary Tree Operations, Heaps 3rd Lecture Representing Binary Trees in C++
	9	**Mid Term Exam**
	10	1st Lecture Application of Binary Trees: The Huffman Algorithm 2nd Lecture Trees and their Representation in C++,

		3rd Lecture Application of Trees: Game Trees, Quiz 3
	11	1st Lecture Graphs: Definition and Basic Operations, Quiz 3 return and discussion. 2nd Lecture Representing Graphs in C++ 3rd Lecture Graph Search and Traversal Techniques
	12	1st Lecture Application of Graphs: Minimum Cost Spanning Trees, Quiz 4 2nd Lecture Application of Graphs: Dijkstra's Shortest Path Algorithm 3rd Lecture Dijkstra's Shortest Path Algorithm
	13	1st Lecture Sorting Techniques: General Background Exchange Sorts: Bubble Sort, 2nd Lecture Quick Sort, Quiz 4 return and discussion. 3rd Lecture Selection Sorts
	14	1st Lecture Tree Sorts 2nd Lecture Insertion Sorts 3rd Lecture Merge and Radix Sorts
	15	1st Lecture

		Searching Techniques: General Background, Sequential Search 2nd Lecture Indexed Sequential Search 3rd Lecture Binary Search, Tree Search
	16	1st Lecture Hashing: Basic Concepts 2nd Lecture Hashing Function 3rd Lecture Resolving Hash Clashes
	17	1st Lecture, 2nd Lecture, 3rd Lecture Revision
	18	**Final Exam**

CONTRIBUTION OF COURSE LEARNING OUTCOMES (CLOs) TO PROGRAMME LEARNING OUTCOMES (PLOs)

BS Software Engineering		**Data Structures and Algorithms**						
No	**Program Learning Outcomes**	**Course Learning Outcomes**						
		1	**2**	**3**	**4**	**5**	**6**	**7**
1	Engineering Knowledge	✓						
2	Problem analysis		✓					
3	Design/Development of solutions			✓				
4	Investigation							
5	Modern tool usage							
6	Engineer and society							
7	Environment and sustainability							
8	Ethics							
9	Individual and Team work							
10	Communication							
11	Project Management							
12	Lifelong learning							