Course Title	Data Structures & Algorithms	**Course Code**	CS2002
Department	Department of Electrical Engineering (DEE)	**Campus**	Lahore
Knowledge Profile	Mathematics & Computing (WK2)	**Credit Hrs.**	3
Knowledge Area	Computer Science (KA02)	**Grading Scheme**	To be announced by instructor
SDG	4 | Quality Education	**PBL**	1
HEC Knowledge Area	Computing	**Applicable From**	Fall 2024
Pre-requisite(s)	CL1004, CS1004		

Course Objective	To understand the fundamental data structures and the various sorting and searching algorithms available in computer science and their application to different problems. The course also introduces the theory of complexity and develops the skills needed to analyze time (and space) requirements for a data structure and associated algorithms.

No.	Assigned Program Learning Outcome (PLO)
02	An ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
03	An ability to design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations
05	An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.

I = Introduction, R = Reinforcement, E = Evaluation, A = Assignment, Q = Quiz, M = Midterm, F=Final, L = Lab, P = Project, W = Written Report.

No.	Course Learning Outcome (CLO) Statements	Assessment Tools	Taxonomy Levels	PLO
1	Analyze the efficiency of algorithms and data structures in terms of time and space complexity.	Q1, M1	C4	2
2	Design linear data structures and their associated algorithms.	M1, A1, Q2	C5	3
3	Design tree and graph data structures and their associated algorithms.	M2, A2, Q3	C5	3
4	Apply the best searching/sorting algorithm to solve a problem	F, A3	C3	5

Text Books	**Title**	Data Structures, Algorithms and Applications in C++, 2nd Edition
	Author	Sartaj Sahni
	Publisher	Universities Press
Reference Books	**Title**	Data Structures and Algorithm Analysis in C++, 4th Edition
	Author	Mark Allen Weiss
	Publisher	
	Title	C++ Plus Data Structures, 3rd Edition, Jones and Bartlett, 2003
	Author	Nell Dale
	Publisher	

Week	Course Contents/Topics	Chapter*	CLO*
01	Fundamentals of Performance Analysis	2-4	1
02	Introduction to Abstract Data Types	7.1	2
02	Arrays as ADTs, Multidimensional arrays and mapping functions	7.2-7.3	2
03	Singly Linked List, Singly Circular linked list	5-6	2
04	Doubly Linked List, Doubly Circular linked list	5-6	2
05	Stack ADT	8	2
06	Queue ADT	9	2
7	Trees, Binary Trees, Binary Tree Traversals	11	3
8	Binary Tree Traversals Programming and related programming problems	11	3
9	Binary Search Trees. Insertion and Deletion	14	3
10	Priority Queues, Heaps	12	3
11	Graphs Introduction and Graph traversal Algorithms (DFS, BFS)	16	3
12	Graphs (Shortest Path and MST Algorithms)	16,19	3
13	Hash Tables / Algorithm Design Techniques (Greedy Methods)	10, 17	4
14	Divide and Conquer Methods - Sorting Algorithms (Mergesort, Quicksort, Heapsort)	18	4
15	Height Balanced Trees: AVL-trees - Insertion	15	4
16	AVL-trees Deletion	15	4

***Reference book chapters are given in brackets**

Assessment Tools	Weightage
Quizzes (3), Assignments (3)	20.0%
Midterm (I+II)	30.0%
Final Exam	50.0%