University of Engineering and Technology Lahore
Course Outline Report
Subject: CSC-200 Data Structures and Algorithms

Course Description

This course provides a **theoretical foundation** in data structures and algorithms, focusing on their design, analysis, and mathematical modeling. Students will learn to evaluate the efficiency of algorithms using **asymptotic notation**, explore fundamental **abstract data types (ADTs)**, and understand how different data structures optimize computational tasks. Students will explore abstract data types (ADT), recursion, algorithm complexity, and the implementation of key structures like stacks, queues, trees, graphs, and hash tables. This course also emphasizes **problem-solving techniques** and **complexity analysis** for classical algorithms.

Course Learning Outcomes (CLOs)

CLO No.	Description	PLOs	Domain	Domain Level
CLO1	Describe and explain fundamental data structures (arrays, lists, stacks, queues, trees, graphs, hash tables), their operations and applications.	PLO 1	Cognitive	Understand
CLO2	Analyze the performance of data structures to determine their time and space complexity.	PLO 3	Cognitive	Analyze
CLO3	Design efficient solutions for complex problems by selecting suitable data structures and algorithms based on specific requirements.	PLO 4	Cognitive	Create

Tentative Weekly Lecture Plan

Week	Topics	Mapped CLOs
Week 1	Introduction to Data Structures and Algorithms ADTs, need for structured data	CLO1
Week 2	Overview of time/space complexity (Big-O, Big-Ω, Big-Θ), Searching (Linear, Binary) and Sorting Algorithms (Bubble, Insertion, Selection)	CLO2
Week 3	Arrays and Strings Operations, limitations, applications	CLO1, CLO2, CLO3
Week 4-5	Linked Lists Singly, Doubly, Circular, memory model, use cases	CLO1, CLO2, CLO3

Week 6	Stacks Array vs. linked-list implementation, applications (expression evaluation and conversion, undo)	CLO1, CLO2, CLO3
Week 7	Queues and Priority Queues Circular queue, dequeue, priority concepts	CLO1, CLO2, CLO3
Week 8	Recursion Stack frame model, recursion vs. iteration, Merge Sort, Quick Sort; comparative analysis	CLO1, CLO2
Week 9	Trees Binary Tree, Binary Search Tree (BST), traversal algorithms	CLO1, CLO2, CLO3
Week 10	Balanced Trees AVL Trees, rotations, balance factor	CLO1, CLO2, CLO3
Week 11	Heaps and Heap Sort Min/max heaps, heap-based priority queues	CLO1, CLO2, CLO3
Week 12	Hash Tables Hash functions, collision handling (chaining, open addressing)	CLO1, CLO2, CLO3
Week 13	Graphs I Representations (adjacency list/matrix), BFS/DFS	CLO1
Week 14	Graphs II Shortest Path Algorithms (Dijkstra), connected components	CLO1
Week 15	Algorithms comparative analysis	CLO2
Week 16	Course Wrap-Up + Final Review Applied case studies, complexity comparisons	CLO1, CLO2, CLO3