Subject	**Data Structure and Algorithm Lab**
Session	**2024**
Semester	**Fall 2025**
Course Instructor	**Week-01**

Lab Manual - Week 1:

Objective:

This week, we will focus on basic to advanced programming concepts, including fundamental problem-solving skills, loops, conditionals, functions, and algorithms. The aim is to understand time complexity, improve coding logic, and practice different algorithms to handle common tasks.

Problem Statement 1: Basic Arithmetic Operations
Problem: Write a C++ program to perform the following operations on two numbers entered by the user: addition, subtraction, multiplication, division, and modulus. Display the results for each operation.
Objective: Practice basic arithmetic operations and understand operator usage.

Problem Statement 2: Prime Number Check
Problem: Write a C++ program that checks if a number is prime. The program should take an integer as input and output "Prime" if the number is prime, otherwise output "Not Prime."
Objective: Understand conditionals and loops.

Problem Statement 3: Factorial Calculation
Problem: Write a C++ program to calculate the factorial of a number using both an iterative and recursive approach.
Objective: Understand recursion and iteration.

Problem Statement 4: Palindrome Checker
Problem: Write a C++ program to check if a string is a palindrome. A palindrome is a word that reads the same forward and backward (e.g., "madam").
Objective: Understand string manipulation and basic algorithms.

Problem Statement 5: Count Vowels and Consonants in a String
Problem: Write a C++ program to count the number of vowels and consonants in a given string. Ignore spaces and non-alphabetic characters.
Objective: Practice string iteration, conditionals, and counting techniques.

Problem Statement 6: Matrix Multiplication
Problem: Write a C++ program to multiply two matrices. The program should take two 2D arrays (matrices) as input and output their product.
Objective: Practice matrix operations and understand nested loops.

Problem Statement 7: Find All Pairs with Given Sum
Problem: Write a C++ program that takes an array of integers and a target sum as input. The program should find and print all pairs of integers in the array that sum up to the target value.
Objective: Use nested loops and array manipulation. Understand the time complexity of this approach ($O(n^2)$).

Problem Statement 8: Find the Second Largest Element in an Array
Problem: Write a C++ program to find the second-largest element in an array without sorting.
Objective: Practice array manipulation and basic searching.