# Department of Computer Science
# Lab tasks– Object-Oriented Programming (C++)

**Duration: 3 Hours**

**Instructions:**

- Attempt **all questions**.
- Use proper class structure and encapsulation techniques.
- Code must be well-indented and logically organized.
- Marks are awarded for correctness, code clarity, and use of relevant OOP principles.

## Q1. Abstract Class and Pure Virtual Function

Define an abstract class `Shape` that contains a pure virtual function `double area()`. Then, implement two classes `Circle` and `Rectangle` that inherit from `Shape`. Each class should override the `area()` function and return the correct result.

- For `Circle`, accept radius and calculate area using the formula $\pi r^2$.
- For `Rectangle`, accept length and width and calculate area.
- Create objects of both types in `main()` and display the computed areas.

## Q2. Abstract Class with Friend Function

Create an abstract class `Account` with a pure virtual function `void showBalance()`. Then implement a class `SavingsAccount` that inherits from `Account` and contains a private data member `balance`.

Create a separate class `FriendAuditor` with a friend function `void checkBalance(SavingsAccount&)`. This function should access the private balance and display it. Demonstrate the working in `main()`.

## Q3. Operator Overloading – Complex Numbers

Write a class `Complex` with `real` and `imaginary` parts as data members.
Overload the following operators:

- `+` to add two complex numbers
- `-` to subtract one complex number from another
- `*` to multiply two complex numbers

Create two objects of `Complex`, take input for each, and display the results of the three operations.

## Q4. Operator Overloading – Inventory Management

Define a class `InventoryItem` with private members `itemName` and `quantity`.
Overload the `+` and `-` operators to perform the following:

- Increase the quantity of items (restocking)
- Decrease the quantity of items (selling)

Demonstrate both operations using objects in `main()` and display the final quantity of the inventory item.

## Q5. Friend Function – Temperature Conversion

Create a class `Thermometer` with a private data member `temperatureCelsius`.
Write a friend function `void showFahrenheit(Thermometer&)` that converts and displays the temperature in Fahrenheit using the formula:

$$F = \left(C \times \frac{9}{5}\right) + 32$$

Demonstrate its usage in `main()` by accepting temperature in Celsius and displaying the Fahrenheit equivalent using the friend function.