Department of Computer Science and Engineering

Course Code: CSE222	Credits: 1.5
Course Name: Object Oriented Programming Lab	Faculty: FRS

Lab 05 – Polymorphism and Encapsulation

Task 1 - Shape Hierarchy:

Create a class hierarchy for geometric shapes like **Circle** and **Rectangle** with a common base class, **Shape**.

Encapsulate attributes in the base class: **area** and **color**.

Implement polymorphism with the following methods:

calculateArea(): Calculate and return the area of the shape.

displayInfo(): Display the color and area of the shape.

Task 2 - Bank Accounts:

Implement a simple banking system with different types of accounts like **Savings** and **Checking** that inherit from a common **Account** class.

Encapsulate attributes in the base class: **balance** and **accountNumber**.

Implement polymorphism with the following methods:

deposit(double amount): Deposit the given amount into the account.

withdraw(double amount): Withdraw the given amount from the account.

displayAccountInfo(): Display the account number and current balance.

Task 3 - Employee Management:

Create an employee management system with different types of employees like **FullTime** and **PartTime** that inherit from a common **Employee** class.

Encapsulate attributes in the base class: **name**, **employeeID** and **salary**.

Implement polymorphism with the following methods:

calculateEarnings(): Calculate and return the earnings of the employee.

displayInfo(): Display the employee's name, ID, and earnings.

Task 4 - Vehicle Rental:

Develop a vehicle rental system with different types of vehicles like **Cars** and **Bikes** that inherit from a common **Vehicle** class.

Encapsulate attributes in the base class: **make**, **model** and **rentalRate**.

Implement polymorphism with the following methods:

calculateRentalCost(int days): Calculate and return the rental cost for the specified number of days.

displayVehicleInfo(): Display the make, model, and rental rate.

Task 5 - Library Catalog:

Create a library catalog system with different types of materials like **books** and **DVDs** that inherit from a common catalog **Item** class.

Encapsulate attributes in the base class: **title**, **author** and **year**.

Implement polymorphism with the following methods:

displayDetails(): Display the title, author, and year of publication.

Task 6 - Online Shopping Cart:

Build an online shopping cart with various product types like **Electronics** and **Clothing** that inherit from a common Product class.

Encapsulate attributes in the base class: **name**, **price** and **quantity**.

Implement polymorphism with the following methods:

calculateTotalCost(): Calculate and return the total cost of the product.

displayProductInfo(): Display the product name, price, and quantity.

Task 7 - Animal Kingdom:

Implement an animal classification system with different types of animals like **Mammals** and **Birds** that inherit from a common **Animal** class.

Encapsulate attributes in the base class: **habitat** and **diet**.

Implement polymorphism with the following methods:

displayCharacteristics(): Display the habitat and diet of the animal.

Task 8 - Quiz Application:

Create a quiz application with different question types like **MultipleChoice**, **TrueFalse** that inherit from a common **Question** class.

Encapsulate attributes in the base class: **question** and **difficultyLevel**.

Implement polymorphism with the following methods:

scoreQuestion(): Score the question based on the user's response.

displayQuestion(): Display the question and difficulty level.

Task 9 - Student Management:

Develop a student management system with different types of students like **Undergraduate** and **Graduate** that inherit from a common **Student** class.

Encapsulate attributes in the base class: **studentName**, **studentID** and **grades** (which is an array).

Implement polymorphism with the following methods:

calculateAverageGrade(): Calculate and return the average grade of the student from the grades array.

displayStudentInfo(): Display the student's name, ID, and average grade.

Task 10 - Movie Database:

Build a movie database with various movie genres like **Action** and **Comedy** that inherit from a common **Movie** class.

Encapsulate attributes in the base class: **title**, **director** and **releaseYear**.

Implement polymorphism with the following methods:

displayMovieInfo(): Display the movie title, director, and release year.