

National University of Computer and Emerging Sciences



Lab Manual 09 Object Oriented Programming

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Objectives

After performing this lab, students shall be able to:

- ✓ Inheritance

Task 1: Hospital Management System

Design a hospital management system that includes the following classes and their relationships:

Person: A base class with attributes such as name, address, and email.

Patient: A derived class from Person, with additional attributes such as patientId and a list of appointments.

Doctor: A derived class from Person, with additional attributes such as employeeId and a list of appointments.

Appointment: A class with attributes such as appointmentId, appointmentDateTime, and a reference to the associated patient and doctor.

Department: A class with attributes such as departmentName and a list of doctors in the department.

Relationships:

Composition: A department has multiple doctors, and a doctor can only belong to one department.

Aggregation: A doctor has multiple appointments, but an appointment can exist independently of a doctor.

Association: An appointment has an association with a patient and a doctor who is involved in the appointment.

A basic C++ code structure with classes and function prototypes is attached for your reference.

Task 2: Multilevel Inheritance with Data Processing and Polymorphism

Create a class hierarchy that represents employees and engineers. The parent class, "Employee," should store employee IDs and salaries in two separate 1D arrays, while the child class, "Engineer," should store the Pakistan Engineering Council (PEC) numbers for each engineer in another 1D array.

Design a class "Employee" with the following data members:

```
int* emp_id
float* salary
int size
```

Design a class "Engineer" that inherits from the "Employee" class and has the following additional data members:

```
int* pec_Num
int size
```

Implement the following functions in both the "Employee" and "Engineer" classes:

- a. A constructor to initialize the data members.
- b. A destructor to clean up dynamically allocated memory.
- c. A "print" function with the same signature that will print the respective data members.
- d. A "calculate_average_salary" function that returns the average salary of the employees or engineers.

Implement a "promotion" function in the "Engineer" class that:

- a. Receives an employee ID and a percentage value as input.
- b. Increases the salary of the engineer with the given employee ID by the specified percentage.

In the main function, perform the following tasks:

- a. Create an object of the "Engineer" class and test the functionality of both the parent and child classes.
- b. Assign the address of the child object to a parent class pointer.
- c. Test the functionality of both the parent and child classes using the parent class pointer, and identify any issues that arise when accessing the child class methods through the parent class pointer.