Lab worksheet 4: Object Oriented Concepts

1. Imagine you are building a University Management System using Java to manage all the academic and administrative activities of the university. The system will involve the creation of classes like **Person, Lecturer, Student, Degree, Department, Course,** and **UniversityManagementSystem**. These classes will help you showcase OOP principles.

   Implement the following classes:

   - **Person** Class:
     - Create an abstract class named **Person**.
     - Add a private String variable **name**.
     - Include an abstract method **displayInfo()**.
     - Implement getter and setter methods for the name variable.
     - Provide a constructor that initializes the name variable.

   - **Lecturer** Class:

     - Create a class named **Lecturer** that extends the **Person** class.
     - Add a private String variable **position**.
     - Include a variable **department** of type **Department**.
     - Add a private ArrayList variable **coursesTeaching** to store **Course** objects.
     - Implement a constructor to initialize all variables.
     - Implement the **displayInfo()** method to display the **Lecturer** information.
     - Implement getter and setter methods for the **position** variable.
     - Implement a setter method for the **department** variable.
     - Implement **displayDepartmentInfo()** to display information about the **department**.
     - Implement **addCourse()** method to add a **Course** to the ***coursesTeaching*** ArrayList.
     - Implement **removeCourse()** method to remove a **Course** from the ***coursesTeaching*** ArrayList.
     - Implement **listCoursesTeaching()** method to print the details of the **Course** objects in the ***coursesTeaching*** ArrayList.

   - **Student** Class:

     - Create a class named **Student** that extends the **Person** class.
     - Add private String variables **studentID** and **year**.
     - Include a variable **degree** of type **Degree**.
     - Add a private ArrayList variable **coursesEnrolled** to store **Course** objects.
     - Implement a constructor to initialize all variables.

- Implement the **displayInfo()** method to display the **Student** information.
- Implement getter and setter methods for **studentID** and **year**.
- Implement **registerDegree(), displayDegreeInfo(), enrollCourse(), unenrollCourse(),** and **listCoursesEnrolled()** methods.

- **Degree** Class:

  - Create a class named **Degree**.
  - Add a private String variable **name**, a private Integer variable **numberOfStudents**, and a private ArrayList variable **coursesOffering** to store **Course** objects.
  - Implement a constructor to initialize these variables.
  - Implement the **displayInfo()** method to display **Degree** information.
  - Implement getter and setter methods for **name** and **numberOfStudents**.
  - Implement **offerCourse()**, **withdrawCourse(),** and **listCoursesOffering()** methods.

- **Department** Class:

  - Create a class named **Department**.
  - Add private String variable **name**.
  - Include a variable **departmentHead** of type **Lecturer**.
  - Add private ArrayList variables **coursesOffering** and **lecturersBelongsTo** to store **Course** and **Lecturer** objects.
  - Implement a constructor to initialize these variables.
  - Implement the **displayInfo(**) method to display **Department** information.
  - Implement getter and setter methods for **name**.
  - Implement **appointDepartmentHead(), displayDepartmentHeadInfo(), offerCourse(), withdrawCourse(), addLecturer(),** and **removeLecturer()** methods.

- **Course** Class:

  - Create a class named **Course**.
  - Add private String variables **name, enrollType,** and private Integer variable **numberOfStudentsEnrolled**.
  - Include variables **lecturerInCharge** of type **Lecturer** and **degreeBelongsTo** of type **Degree**.
  - Implement a constructor to initialize these variables.
  - Implement the **displayInfo()** method to display **Course** information.

- Implement getter and setter methods for **name, enrollType,** and **numberOfStudentsEnrolled**.
- Implement **addLecturerInCharge(), removeLecturerInCharge(), addDegreeBelongsTo(),** and **removeDegreeBelongsTo()** methods.

- **UniversityManagementSystem** Class:

  - Create a class named **UniversityManagementSystem** with the main method.
  - Inside the main method, create a sample scenario with the following steps:
    - Create one or more **Department** object(s) (e.g., "Software Engineering").
    - Create one or more **Degree** object(s) (e.g., "Computer Science").
    - Create one or more **Course** object(s) (e.g., "Object-Oriented Programming").
    - Create one or more **Lecturer** object(s).
    - Create one or more **Student** object(s).
    - Add all the missing information to the objects using the methods provided in their respective class.
    - Display information about the **Lecturer**, the **Student,** the **Department**, the **Course**, and the **Degree**.