# Object Oriented Database Mini-Project

## College Enrollment System

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**GitHub:**

https://github.com/Ahmed9Osama/College-OODB-Mini-Project

# Object-Oriented Database Project Documentation

## 1. Project Title

College Enrollment System Object-Oriented Database Project Using ObjectDB and Java

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## 2. Project Overview

This project demonstrates an Object-Oriented Database Management System (OODBMS) using ObjectDB and Java. The system models a college database with three main entities:
- Student
- Course
- Enrollment (to manage the many-to-many relationship between students and courses).

The project highlights core functionalities such as CRUD operations (Create, Read, Update, Delete), entity relationships, and object querying.

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## 3. Objectives

1. Implement object-oriented database concepts.
2. Perform CRUD operations using JPA (Java Persistence API).
3. Manage entity relationships (One-to-Many, Many-to-One).
4. Execute queries using JPQL (Java Persistence Query Language).

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## 4. Tools & Technologies Used

- Java: Programming language.
- ObjectDB: Object-oriented database management system.
- JPA (Java Persistence API): Persistence management for objects.
- Eclipse IDE: Development environment.
- PlantUML: For class diagram generation.

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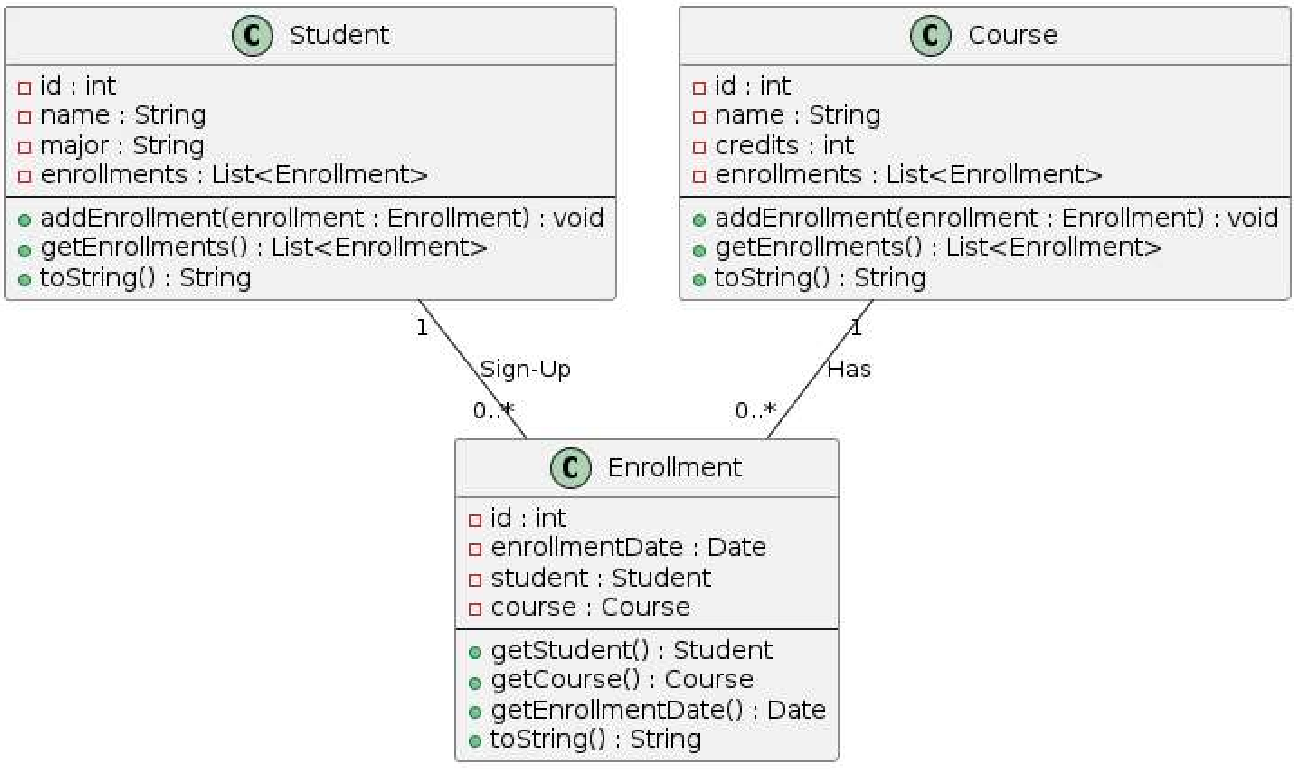
## 5. UML Class Diagram



```
@startuml
' Define the Student class
class Student {
  - id : int
  - name : String
  - major : String
  - enrollments : List<Enrollment>
  --
  + addEnrollment(enrollment : Enrollment) : void
  + getEnrollments() : List<Enrollment>
  + toString() : String
}

' Define the Course class
class Course {
  - id : int
  - name : String
  - credits : int
  - enrollments : List<Enrollment>
  --
  + addEnrollment(enrollment : Enrollment) : void
  + getEnrollments() : List<Enrollment>
  + toString() : String
}

' Define the Enrollment class
class Enrollment {
  - id : int
  - enrollmentDate : Date
  - student : Student
  - course : Course
  --
  + getStudent() : Student
  + getCourse() : Course
  + getEnrollmentDate() : Date
  + toString() : String
}

' Relationships
Student "1" -- "0..*" Enrollment : "Sign-Up"
Course "1" -- "0..*" Enrollment : "Has"
@enduml
```

## 6. System Design

### 1. Student Class

Attributes:

- id : int (Primary Key)
- name : String
- major : String

Relationships:

- One-to-Many with Enrollment (A student can have multiple enrollments).

Methods:

- addEnrollment(Enrollment enrollment)
- getEnrollments()
- toString()

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### 2. Course Class

Attributes:

- id : int (Primary Key)
- name : String
- credits : int

Relationships:

- One-to-Many with Enrollment (A course can have multiple enrollments).

Methods:

- addEnrollment(Enrollment enrollment)
- getEnrollments()
- toString()

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### 3. Enrollment Class

Attributes:

- id : int (Primary Key)
- enrollmentDate : Date
- student : Student (Many-to-One relationship)
- course : Course (Many-to-One relationship)

Methods:

- toString()

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## 7. System Features

1. Data Persistence: The project uses ObjectDB and JPA for data persistence.
2. CRUD Operations:
- Create: Add students, courses, and enrollments.
- Read: Fetch and display data.
- Update: Modify existing entities.
- Delete: Remove entities.

3. Queries:
- Retrieve all students and their enrollments.
- Aggregate query to count total courses.

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## 8. Code Structure

1. Student.java: Defines the Student class.
2. Course.java: Defines the Course class.
3. Enrollment.java: Defines the Enrollment class.
4. MainApp.java: Main application demonstrating CRUD operations.
5. persistence.xml: Configuration file for ObjectDB.

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## 9. How to Run the Project

1. Setup Environment:
- Install Java JDK.
- Add objectdb.jar to the project classpath.

2. Run MainApp.java:
- Compile and run the main class.

3. Expected Output:

The system displays students, courses, enrollments, and total course count.

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## 10. Conclusion

This project successfully demonstrates the use of an object-oriented database system with JPA and ObjectDB. It highlights entity relationships, CRUD operations, and querying techniques.

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