Description of the Class Diagram:

The Class Diagram depicts the static structure of the College Management System, illustrating the system's classes, their attributes, methods, and the relationships between them.

1. Generalization (Inheritance) Structure: The system utilizes a Generalization relationship to optimize code reusability.

- **User Class:** Acts as the **Superclass** (Parent). It encapsulates common attributes shared by all actors, such as id, name, email, phone, and address, along with common methods like login() and updateProfile().
- **Subclasses:** Admin, Instructor, and Student inherit from the User class. This means they automatically possess all user attributes but extend them with specific roles:
    - **Admin:** Has a role attribute and methods to manage the system entities (e.g., addStudent(), addInstructor()).
    - **Instructor:** Includes specific attributes like salary and degree, and methods to uploadGrades() and manageCourse().
    - **Student:** Includes academic data like studentLevel and GPA, with capabilities to registerCourse() and viewGrades().

2. Key Classes and Associations:

- **Department Class:** This is a central entity that groups other elements.
    - It has a **One-to-Many (1..*)** relationship with Student, Instructor, and Course. This implies that one Department acts as a container for multiple students, instructors, and courses.
- **Course Class:** Represents the academic subjects.
    - It is associated with the Instructor in a **Many-to-One (*..1)** relationship, indicating that a specific course instance is managed/taught by one instructor.
    - It has a **Many-to-Many (*..*)** relationship with the Student class (represented by the association line connecting them), meaning a student can register for multiple courses, and a course contains multiple students.

3. Design Justification: The design separates concerns effectively. The Admin handles the structural data setup, while the academic interaction happens directly between Instructor and Student through the Course entity (materials and grades).