ER DIAGRAM

**Step 1: Define Entities and Attributes**

1. **Student**
   * Attributes: Student\_ID (Primary Key), Name, DOB, Gender, Contact, Address
2. **Course**
   * Attributes: Course\_ID (Primary Key), Course\_Name, Credits
3. **Professor**
   * Attributes: Professor\_ID (Primary Key), Name, Department, Contact, Office
4. **Record**
   * This entity represents a relationship between **Student** and **Course**, recording grades and enrollment details.
   * Attributes: Record\_ID (Primary Key), Grade

**Step 2: Define Relationships and Mapping Cardinalities**

1. **Student - Course**:
   * **Relationship**: "Enrolled\_in"
   * **Cardinality**: Many-to-Many (A student can enroll in many courses, and each course can have many students).
   * This requires a separate **Record** entity with attributes to store additional data like Grade.
2. **Professor - Course**:
   * **Relationship**: "Teaches"
   * **Cardinality**: One-to-Many (A professor can teach multiple courses, but each course is taught by only one professor).
3. **Professor - Student**:
   * **Relationship**: "Advises"
   * **Cardinality**: Many-to-Many (Each student can have multiple advisors, and each professor can advise multiple students).

**Step 3: Draw the ER Diagram**

The ER Diagram should represent entities, relationships, cardinalities, and constraints:

1. Draw rectangles for **Student**, **Course**, **Professor**, and **Record**.
2. Draw diamonds for relationships: **Enrolled\_in**, **Teaches**, and **Advises**.
3. Connect entities with relationships using lines:
   * Connect **Student** and **Course** through **Enrolled\_in** with a Many-to-Many relationship.
   * Connect **Professor** and **Course** through **Teaches** with a One-to-Many relationship.
   * Connect **Professor** and **Student** through **Advises** with a Many-to-Many relationship.
4. Label the primary keys and any attributes specific to relationships, such as Grade in **Record**.

**Step 4: Create Tables for the Schema**

Based on the ER diagram, define the tables as follows

CREATE TABLE Student (

Student\_ID INT PRIMARY KEY,

Name VARCHAR(50),

DOB DATE,

Gender CHAR(1),

Contact VARCHAR(15),

Address VARCHAR(100)

);

CREATE TABLE Course (

Course\_ID INT PRIMARY KEY,

Course\_Name VARCHAR(50),

Credits INT

);

CREATE TABLE Professor (

Professor\_ID INT PRIMARY KEY,

Name VARCHAR(50),

Department VARCHAR(50),

Contact VARCHAR(15),

Office VARCHAR(50)

);

CREATE TABLE Record (

Record\_ID INT PRIMARY KEY,

Student\_ID INT,

Course\_ID INT,

Grade CHAR(2),

FOREIGN KEY (Student\_ID) REFERENCES Student(Student\_ID),

FOREIGN KEY (Course\_ID) REFERENCES Course(Course\_ID)

);

CREATE TABLE Teaches (

Professor\_ID INT,

Course\_ID INT,

PRIMARY KEY (Professor\_ID, Course\_ID),

FOREIGN KEY (Professor\_ID) REFERENCES Professor(Professor\_ID),

FOREIGN KEY (Course\_ID) REFERENCES Course(Course\_ID)

);

CREATE TABLE Advises (

Professor\_ID INT,

Student\_ID INT,

PRIMARY KEY (Professor\_ID, Student\_ID),

FOREIGN KEY (Professor\_ID) REFERENCES Professor(Professor\_ID),

FOREIGN KEY (Student\_ID) REFERENCES Student(Student\_ID)

);

STEPS

**Step 1: Open MySQL Workbench**

1. Open MySQL Workbench on your computer.
2. Go to **File** > **New Model**. This opens a new blank model that will hold your ER diagram.

**Step 2: Create a New EER Diagram**

1. In the **Model** window, click on **Add Diagram** or go to **Model** > **Create EER Diagram** from the top menu.
2. A new EER Diagram tab opens where you can start designing your database schema.

**Step 3: Add Entities (Tables)**

1. Use the **Table** tool (represented by a rectangular table icon) on the left sidebar.
2. Click on the **Table** tool, then click anywhere in the diagram workspace to add a new table.
3. A table properties window will open for you to define attributes:
   * **Name the Table** (e.g., "Student", "Course", "Professor").
   * Add columns (attributes) in the **Columns** tab.
   * Define the **Primary Key** by checking the PK checkbox next to the key column.
   * Define any **Foreign Keys** (e.g., Student\_ID in **Record** referencing **Student**).
4. Repeat this step for each entity in your database.

**Step 4: Define Relationships**

1. Use the **1**and **n**relationship tools in the left sidebar to define relationships between entities:
   * **One-to-Many (1  
     )**: Click on the **1**relationship icon, then click the source table (e.g., **Professor**), and drag to the target table (e.g., **Course**).
   * **Many-to-Many (n  
     )**: Click on the **n**relationship icon, click the source table (e.g., **Student**), and drag to the target table (e.g., **Course**). MySQL Workbench automatically creates an intermediary table to manage the Many-to-Many relationship.
2. **Set Foreign Key Constraints**: If you didn’t already set the foreign key constraints, MySQL Workbench will prompt you or allow you to edit them in the **Foreign Keys** tab for each table.

**Step 5: Customize and Refine the Diagram**

1. **Arrange tables and relationships** by dragging them into a clear layout.
2. **Edit relationship lines** to add optional labels and make the cardinality (1  
   , n  
   ) more visually understandable.
3. **Add Notations**: By default, MySQL Workbench uses Crow’s Foot notation for cardinality, but you can change this in the settings.

**Step 6: Save and Export the Diagram**

1. Save your diagram by clicking **File** > **Save Model** or using Ctrl + S.
2. To export the ER diagram as an image, go to **File** > **Export** > **Export as PNG** or **Export to PDF**.

**Step 7: Generate SQL Script (Optional)**

If you want to generate SQL code to create this schema in your database:

1. Go to **Database** > **Forward Engineer**.
2. Follow the prompts to export your ER diagram as SQL statements, which can be run on any MySQL server to create the schema directly.