## **Homework #1:** **ER Diagram Creation and Analysis**

**Issued:** Wednesday, September 3, 2025

**Due:** Sunday, September 14, 2025, by 11:59 PM EDT (Submission via Brightspace)

**Total Points:** 50

### Objective

The purpose of this assignment is to provide you with hands-on experience in designing a conceptual database model using an Entity-Relationship (ER) diagram. You will analyze business requirements, identify key entities and their attributes, define the relationships between them, and determine the correct cardinalities. This assignment will test your understanding of the fundamental components of ER modeling.

#### Background

An Entity-Relationship Diagram (ERD) is a visual representation of the data requirements for a system. It serves as the blueprint for our database. Key components include:

* **Entities:** Nouns representing objects or concepts about which we want to store data (e.g., Student, Course).
* **Attributes:** Properties or characteristics of an entity (e.g., a Student has a StudentID, FirstName, and LastName). One or more attributes will serve as the **Primary Key (PK)** to uniquely identify each instance of the entity.
* **Relationships:** Verbs that describe how entities are associated with one another (e.g., a Student*enrolls in* a Course).
* **Cardinality:** The rule that defines the number of instances of one entity that can be associated with instances of another entity (e.g., one-to-one, one-to-many, many-to-many).

For this assignment, you are required to use **Crow's Foot Notation** for your diagrams.

#### Instructions

1. Read the two business scenarios described below.
2. For each scenario, create a complete ER diagram using Crow's Foot notation. Your diagram must clearly show all entities, their attributes, primary keys (indicated with "PK"), and the relationships between entities with correct cardinality.
3. You may use any diagramming tool you prefer (e.g., Lucidchart, draw.io, Microsoft Visio, Figma) or you may draw the diagrams neatly by hand and take a photo.
4. After creating each diagram, answer the analysis questions that follow the scenario.
5. Submit the diagrams and the typed analysis to Brightspace.

### **University Library System**

Scenario:

The PFW library needs a system to track its books and the members who borrow them. Each book has a unique ISBN, a title, a publication year, and a genre. The library also stores information about authors, including a unique author ID, first name, and last name. A book can be written by one or more authors, and an author may write many books.

Library members have a unique member ID, first and last names, and an email address. A member can borrow multiple books. To track borrowings, the system records each loan. A loan record must contain the date the book was borrowed and the date it is due. The system should also be able to track which specific book was borrowed by which member. Assume a single copy of any book is what is being loaned.

**Tasks:**

1. **Create an ER Diagram** that models the entities, attributes, and relationships for this library system. Be sure to identify primary keys and resolve any many-to-many relationships with an associative entity.
2. Answer the following analysis questions:

a. List all the primary keys in your diagram and the entity they belong to.

b. List at least two foreign keys from your diagram. For each foreign key, identify the entity it resides in and the entity it refers to.

c. Explain the cardinality of the relationship between the Author and Book entities and describe why an associative entity is necessary to model it correctly.

d. If the library changed its policy so that a member could only have one book checked out at any given time, how might your ER diagram change? Describe the specific relationship that would be affected.

#### **Grading Criteria (50 Points Total)**

* **ER Diagram (30 points):** Correctness of entities, attributes, primary keys, relationships, and cardinalities.
* **Analysis (20 points):** Accuracy and clarity of answers.

Please begin working on this early. Building a solid conceptual model takes time and careful thought. I look forward to reviewing your work.