# CS 564 DBMS

## - Assignment 1: ER Diagram & Translation

Group 22: TSAO-CHING KAO, TAN HUANG, KEFAN ZHENG

09.27.2023

—

## 1. Brief Introduction

The course enrollment system involves multiple entities such as students, teachers, courses, and classrooms, and the relationships between them are rich and diverse, making it very suitable for using relational databases to manage data. Students can browse various courses and enroll in courses of interest. At the same time, teachers can manage courses and record student grades. The system also includes classroom and building information, ensuring the reasonable allocation and utilization of teaching resources.

## 2. ER Diagram

This ER diagram is the overview of our course enrollment system.

Starting from the left, we have a hierarchy relationship. Both the Student and Instructor entities belong to the Person entity.

In the middle, we have the Section entity. It is connected to the Instructor entity by a one-to-many relationship, meaning an instructor can teach multiple courses, but a course can only be conducted by one instructor. Right next to the Section entity, we have the Room entity connected to the  Section entity with a one-to-many relationship, showing a room can be used by many classes, but a class can only be in a room.

As for the weak entity downright, we have a one-to-many relationship between the Room weak entity and the Building entity, expressing that a room is always affiliated to exactly one building, but a building can have many rooms. The reason why we make Room entity a weak entity is because a room can not be uniquely identified without knowing the building.

In the top middle part, we have the Course entity, Student entity, and Section entity, which are connected directly by a ternary relationship. It means a student can take multiple courses and

multiple sections. However, taking multiple sections of the same class is not allowed. Right next to it is the one-to-one relationship between course and website, showing a course can only have one unique website, and a website has the information of only one course.

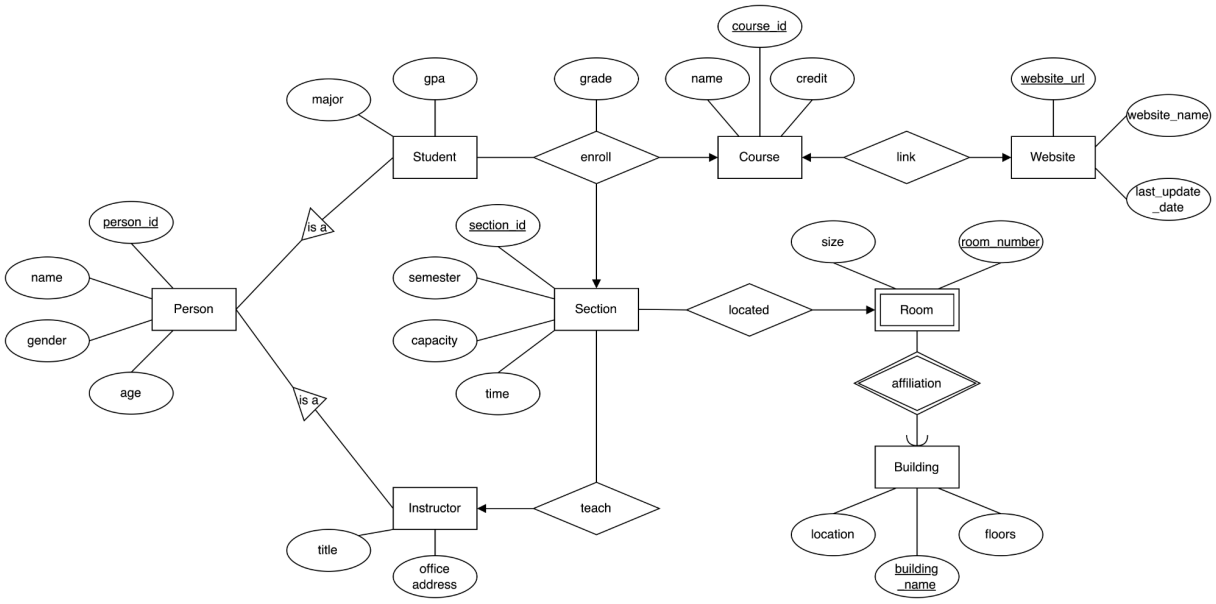


**Figure 1: ER Diagram of Course Enrollment System**

## 3. Table Schemas

- Person (person_id, name, gender, age)
- Student (person_id, name, gender, age, major, gpa)
- Instructor (person_id, name, gender, age, title, office_address)
- Building (building_name, location, floors)
- Room (room_number, building_name, size)
- Course (course_id, name, credit, website_url)
- Section (section_id, semester, capacity, time, person_id, room_number, building_name)
- Enroll (person_id, course_id, section_id)
- Website (website_url, website_name, last_update_date)

We choose the Object-oriented approach to translate subclass entities in our ER diagram. This approach trades very little redundancy for many advantages: 1- It avoids NULL, keeps the data compact and regular, and avoids many potential risks. 2- It can avoid table joins during queries

and improve query performance. 3- Each table focuses on a specific subclass entity, making it easy to understand and maintain. 4- It is more scalable because when we want to add a new subclass entity, we only need to create a new table without modifying the existing table. 5- Indexes can be created specifically for each subcategory according to specific business needs to improve query performance.