# CS 500: Fundamentals of Databases

*Assignment #3*

Your task is to design a database for a university. The database must recognize students, departments, faculty members, courses, course sections and teaching assistants. The database design must follow the version of the ER model we studied in class and to obey the following specifications:

Student

* Information about a student includes the name, email and university id (uid).
* The university id (uid) is assumed to be unique and not to be shared amongst students.
* A student is either an undergraduate or a graduate student but not both.
* Each student is associated with exactly one department, the department to which they are admitted and enrolled in.
* Undergraduate students have a defined major.
* Graduate students have at most one faculty advisor.
* A student can enroll in multiple courses for which they get grades.
* A student must enroll in at least one course.
* A student can enroll in courses from any department.
* A student can enroll in exactly one section of a course.

Department

* Information about a department includes the name and address.
* Each department has a single faculty member acting as the department head.
* The name of the department is assumed to be uniquely identifying each department.

Faculty Member

* Information about a faculty member includes the name and focus area of research.
* The name is assumed to be uniquely identifying each faculty member.
* We need to be able to associate each faculty member with the department that they are appointed to.
* Sometimes faculty members are cross-listed in more than one department.
* Each faculty member teaches zero, one or more courses.

Course

* Information about a course includes the number (“cs461”) and name (“Database Systems”).
* We need to be able to know the unique department that offers each course.
* Every course is offered by a single department. No cross-listing of courses across departments is allowed.
* Each course can have at least one course section.
* The same course can be taught by multiple faculty members.
* For a course to be offered at least one student must be enrolled in it and at least one professor must teach it.

Course Section

* Information about course sections include the section number, room assignment and class size.
* You cannot assume that the section number uniquely identifies a section.
* You cannot assume that the section number, room assignment and class size uniquely identify a section.
* You can assume that the section number uniquely identifies a section within a course.
* Each class section is taught by a single faculty member.

Teaching Assistants

* Only graduate students can be teaching assistants.
* A student can be a teaching assistant for at most one course.
* A teaching assistant TAs all sections of a course.

Explanation of relationships:

Student - Undergraduate/Graduate: Student entity is split into two entities, Undergraduate and Graduate, based on their type of student status.

Student - Department: Each student is associated with exactly one department, represented by a one-to-one relationship between Student and Department entities.

Graduate - Faculty Advisor: A graduate student has at most one faculty advisor, represented by a one-to-one relationship between Graduate and Faculty entities.

Student - Course: A student can enroll in multiple courses, represented by a many-to-many relationship between Student and Course entities, linked by an intermediary entity, Enrollment.

Course - Department: Each course is offered by exactly one department, represented by a one-to-one relationship between Course and Department entities.

Faculty Member - Department: Each faculty member is appointed to exactly one department, represented by a one-to-one relationship between Faculty Member and Department entities.

Faculty Member - Course: Each faculty member can teach zero or more courses, represented by a many-to-many relationship between Faculty Member and Course entities, linked by an intermediary entity, Teaches.

Course - Course Section: A course can have one or more course sections, represented by a one-to-many relationship between Course and Course Section entities.

Faculty Member - Course Section: Each course section is taught by a single faculty member, represented by a one-to-one relationship between Faculty Member and Course Section entities.

Graduate - Teaching Assistant: Only graduate students can be teaching assistants, represented by a one-to-one relationship between Graduate and Teaching Assistant entities.

Teaching Assistant - Course: A graduate student can be a teaching assistant for at most one course, represented by a one-to-one relationship between Teaching Assistant and Course entities.

**How to submit**

1. Draw an ER diagram by hand or by using an application of your choice (e.g., Powerpoint, Visio, etc.) with the constraints and requirements specified above.
2. Make sure you write your name at the top of the diagram.
3. Take a picture, or screenshot of your work.
4. Submit the picture to Blackboard.