# CISC637 Fall 2016, Homework 1

Due date Friday, September 16, at 11:55pm on Sakai. The work you turn in must be done by you alone, not with any other student, and not copied from any source. Please refer to the course academic honesty policy on the syllabus and the Lecture 1 slides for details.

You will need to install MySQL on your own computer. You can download it from `http://dev.mysql.com/downloads/` (choose the "MySQL Community Server"), and there are installation instructions for various platforms at `http://dev.mysql.com/doc/refman/5.7/en/installing.html`. You may also want to install the MySQL Workbench GUI available at `http://dev.mysql.com/downloads/workbench/`.

The following diagram represents a relational schema for a university (from the textbook).
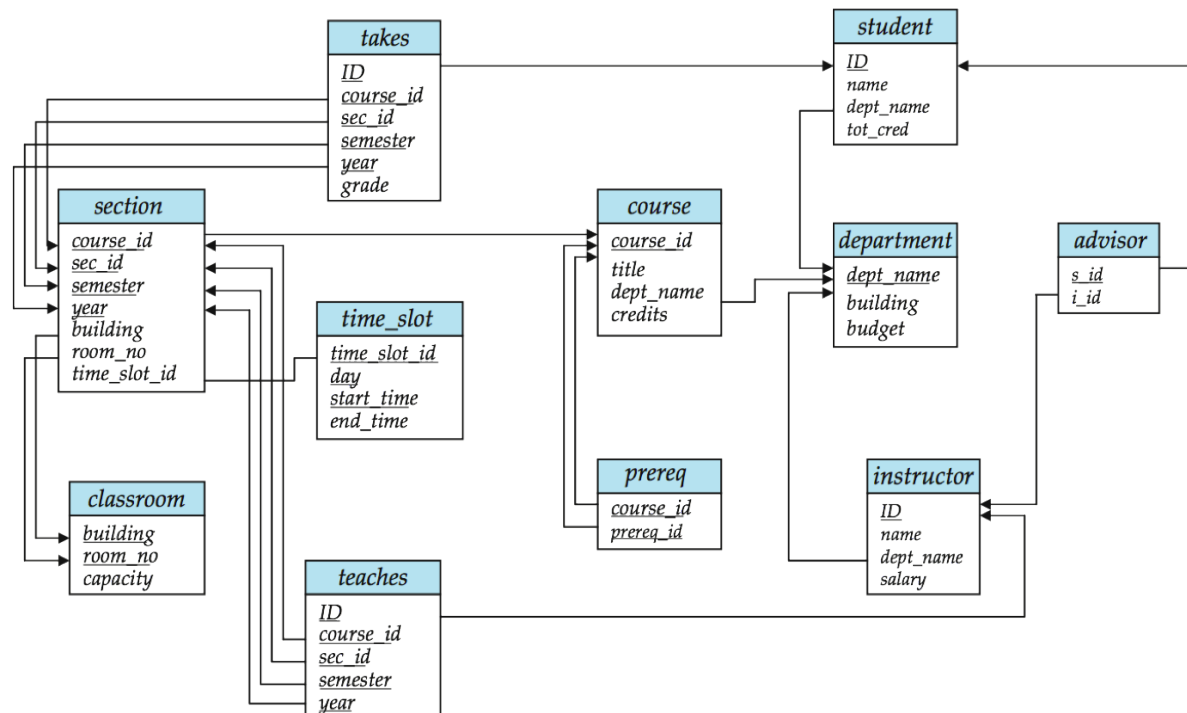
Underlined attributes indicate primary keys; arrows between tables indicate foreign keys. The arrow from `section.time_slot_id` to `time_slot.time_slot_id` should have an arrowhead pointing to `time_slot`.

For this homework you will implement this schematic in your MySQL database, add some data to it, and formulate SQL queries.

1. **35 pts.** Create all the tables shown above in your MySQL database. You may use whatever field domains you think are appropriate, as long as they conform to example queries below. Define *all* primary key and foreign key constraints.

    For each foreign key, be sure to define the actions to take ON DELETE and ON UPDATE to maintain referential integrity.

2. **40 pts.** Formulate SQL queries to answer each of the following questions. Turn in the queries on Sakai.

- What are the names of students majoring in electrical engineering? (Assume `dept_name` refers to major. You may abbreviate the name of the department/major.)
- What are the titles and credit hours of courses that have been taught by Professor Bell?
- What course sections are being taught in Sharp Lab in Fall 2016?
- Suppose some courses are on MW and some are on MWF, and this data is stored in the `time_slot` table. What times are courses being taught on Mondays in Smith Hall?
- What are the titles and departments of courses that are prerequisites for 400-level computer science courses?
- What is the GPA of the student with ID=1? (Assume there are only five letter grades with values A=4, B=3, C=2, D=1, and F=0, and GPA is the sum of course credits $\times$ course grade value divided by total credits.)
- What unique courses (titles only) were taught in either Spring of 2016 or Fall of 2016?
- What unique courses (titles only) were taught in *both* Spring of 2016 and Fall of 2016?
- What are the average salaries of instructors in each department?
- How many open seats are there in section 011 of CISC220 in Fall 2016?
- How many students does each instructor in mathematics advise?
- What are the average GPAs for students by department?

3. **15 pts.** Insert data into tables as necessary to test the queries you wrote above. Make sure to insert relevant data as well as irrelevant data into each table involved in each query. The values can be whatever you want as long as the queries are answered correctly.

4. **10 pts.** On data consistency.

   (a) Why are *semester* and *year* part of the primary key of the *teaches*, *takes*, and *section* relations? If they were not part of the key, how would that change the data that could be stored?

   (b) Suppose we want to store information about university buildings (such as address, abbreviated name, full name, year built, etc.). How could we add this information? What would we have to change in the database schema and foreign key constraints?

   (c) Find three places in the university database diagram that allow the storage of data that would be considered *invalid* in a real university. Give examples of data that is valid for the database but invalid in reality.

What to turn in on Sakai:

1. your SQL queries for #2 in a document (PDF or Word) or inline on Sakai;

2. your answer to #4 in the *same document* or inline on Sakai;

3. a dump of your MySQL database (with a `.sql` suffix, produced by the `mysqldump` command) containing all the tables from #1 and all the data from #3 as an attachment.

Please *do not* turn in a separate document listing all of your `CREATE TABLE` queries from #1 or `INSERT` queries from #3. We only want the database dump.