# CS 377: Database Systems

Homework #2

Due: Wednesday, February 10, 2016 IN CLASS

**SUBMISSION**: Please submit a hard-copy of your homework in class. You can use any software to draw the relational tables or do it by hand, but make sure it is legible. Questions about the homework can be asked in office hours or posted on Piazza. Also, make sure the work you submit is YOUR OWN.

1. **Emory College University Database** (35 points): Map the ER diagram from homework 1 for the Emory College database into a relational database. Underline the primary key in each relation table and draw an arrow from a foreign key to the relation that the foreign key is pointing to (i.e., its home relation). The ER diagram is shown below (Figure 1):

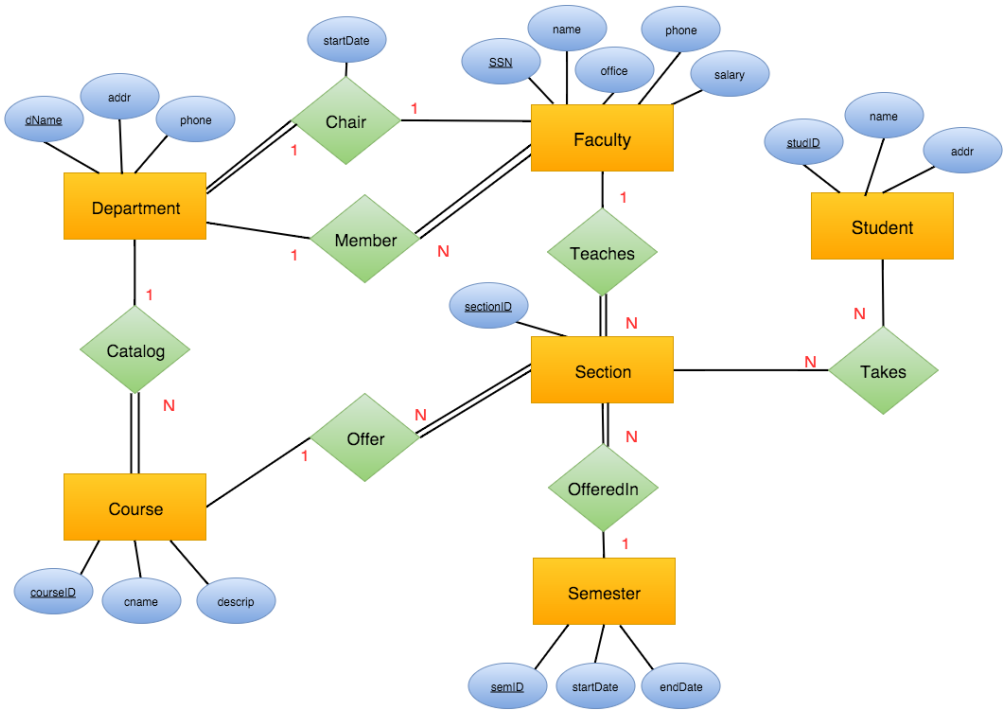


Figure 1: ER diagram for Emory College Database

2. **Library** (20 points): Consider the following relational schema for a library:

```
member(member_no, name, dob)
books(isbn, title, authors, publisher)
borrowed(memb_no, isbn, date)
```

Express the following queries in Relational Algebra:

(a) Find the names of members who have borrowed any book published by "McGraw-Hill".

(b) Find the name of members who have borrowed all books published by "McGraw-Hill".

(c) Find the name and membership number of members who have borrowed more than five different books published by "McGraw-Hill".

(d) For each publisher, find the name and membership number of members who have borrowed more than five books of that publisher.

3. **Company Database Queries** (45 points): Consider the company database relational data model discussed in class and shown below. Formulate the following queries in Relational Algebra:

(a) Find the name of the projects in Atlanta that have been worked on at least a total of 100 person hours.

(b) Find the name of the department(s) that pay the highest salary.

(c) Find the fname & lname of the employee(s) who work the highest total number of hours.

(d) For each department, find the department name and the total salary paid to employees in the department.

(e) Find the department(s) in which *all* employees in the department have at least one dependent.

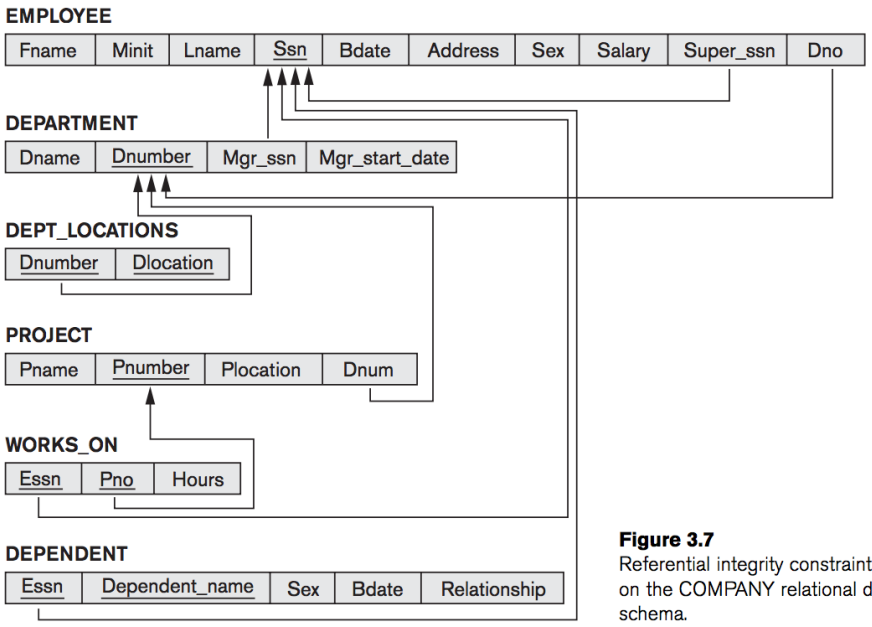


**Figure 3.7**
Referential integrity constraints displayed on the COMPANY relational database schema.

Figure 2: Company Database Relational Model