

CS348: Introduction to Database Systems

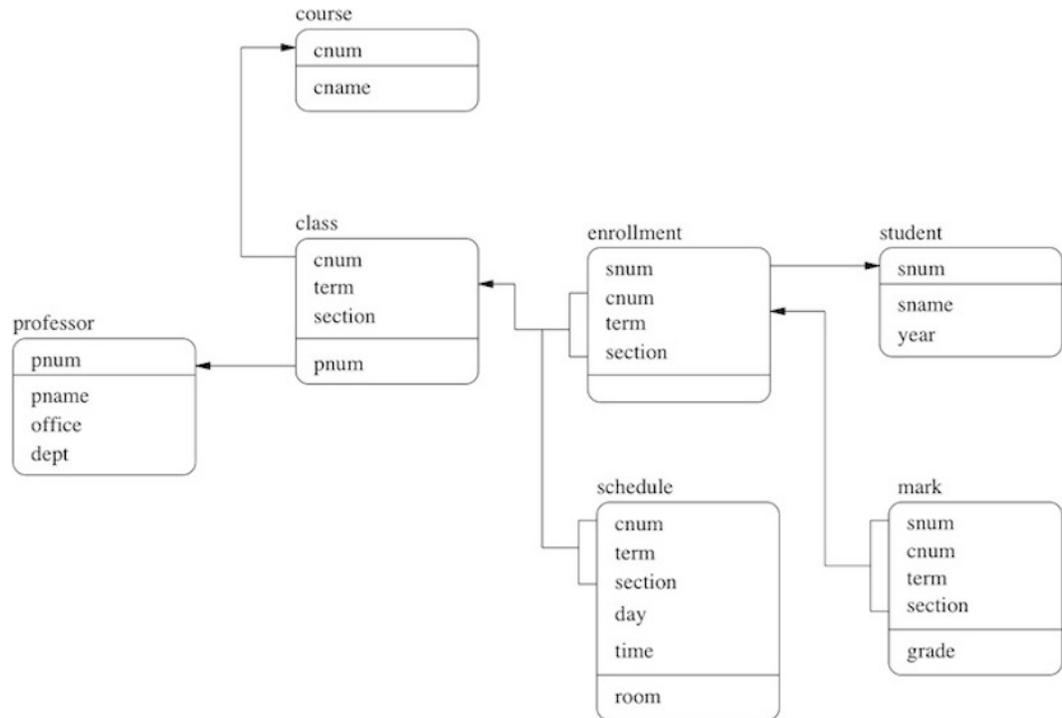
(Winter 2017)

Assignment 1 (due by 5pm on Thursday, February 2nd)

Overview: For the first question, you must use your Unix accounts and DB2 to compose and evaluate a number of SQL queries for a database that records information about courses. The conceptual view of the database (and also the single external view) is illustrated by the following relational database schema. Note that this includes an indication of primary and foreign key constraints in the manner discussed in class. The SQL commands for defining the base tables for this schema and for inserting sample test data should be downloaded from the course web site.

The schema stores information about both ongoing and past classes for a course. In particular, this means two things: (1) *no* marks are recorded for any enrollment of an ongoing class, and (2) for a past class, a mark is recorded for *each* of its enrollments. Also, see the above-mentioned SQL commands for samples of data values, in particular, values for attributes `cnum` and `term`. Finally, you may assume that each class has at least one enrollment and that a

department has at least one professor.



Assignment submission: By 5pm on Thursday, February 3rd, you must have used the `submit` command to submit a file containing SQL queries that implement each of the requests for information given in Question 1. You are also to have submitted written or typed answers to Question 2 in the course assignment submission box. For the online submission, put *all* your queries (in numerical order) in one file named `a1.sql`. We should be able to run the queries using the command `db2 -f a1.sql`. Assume a database connection already exists (i.e., you do not need `connect` or `disconnect` statements in your submitted file). To submit your assignment use the following: `submit cs348 a1` .

Question 1: Write SQL queries that implement each of the following specifications.

1. The student number and name of second year students who have obtained a grade lower than 65 in at least two first year *computer science* (CS) courses.

2. The number and name of professors who are not in the PM department and who are teaching CS245 for the first time.
3. The number, name and year of students who have obtained a grade in CS240 that is within 5 marks of the highest ever grades recorded for that course.
4. The number and name of students who have completed two years, who have a final grade of at least 85 in every computer science course that they have taken, and who have never been taught by a professor in the *combinatorics and optimization* (CO) department.
5. A sorted list of all departments who have a professor who is currently teaching on Mondays before noon and on Fridays after noon.
6. The ratio of professors in pure math to professors in computer science who have taught a class in which the lowest grade obtained in the class was less than 65.
7. The number, name and department of professors together with the average enrollment count and average final grade for each course that they have taught. (In the case of professors who have never taught a course, the average enrollment count and average final grade should be zero.)
8. The number of different students in each term for a course that has been taught by either a computer science (CS) or pure math (PM) professor. Each result should include a department, a course number, a term and said count, and should also be sorted in a descending order by the said count.
9. The minimum and maximum final grade for each class taught in the past on either Mondays or Fridays by a professor in the computer science department. The result should include the number and name of the professor, and the course name and primary key of the class.
10. The percentage of professors in computer science who are neither currently teaching nor have ever taught in the past two classes for two different courses in the same term.

Question 2: Write queries in the relational algebra for each of the above specifications for which this is possible.