

## W2: Database design exercises

### Exercise 1

Design a database to keep track of university records. Consider the following simplified description:

The university keeps track of each student's name, student number, address and phone, birthdate, class (First Year, Second Year, Third Year, Fourth Year) and department. The "Student number" has unique values for each student. Each department is described by a name, department code, office number, office phone, and faculty. Both name and code have unique values for each department. Each course has a course name, description, course number, number of lecture hours, and offering department. The value of course number is unique for each course. A grade report has information about a student, a course, and a grade.

1. Design the E/R diagram
2. How would you modify the design if the students were allowed to take a course more than once, and have of course one grade for each time they take the course?

## Exercise 2

1. Suppose we wish to keep a genealogy. We shall have one entity set, *Person*. The information we wish to record about persons includes their name (an attribute) and the following relationships: mother, father, and children. Give an E/R diagram involving the *Person* entity set and all the relationships in which it is involved. Include relationships for mother, father, and children. Mark multiplicities.
2. Modify your "people" database design to include the following special types of people:
  - a. Females.
  - b. Males.
  - c. People who are parents.

### Exercise 3

Suppose we have two kinds of doctors: hospital doctors and family physicians. In addition to the SIN, name, specialty, and years of experience, we want to record the hospital name for the hospital doctors, and the office address for the family physicians. There can be doctors that are working in a hospital who are at the same time family physicians in their free time. Also there can be doctors for whom we don't know whether they are working in a hospital and/or whether they are family physicians or whether they are not working at all.

1. Create Entity Relationship diagram
2. Convert the E/R diagram into relational schema using Object-oriented approach

## Exercise 4

Consider a database system for a baseball organization. The data requirements are summarized as follows:

- The personnel involved include players, coaches, managers, and umpires. Each is identified by a unique personnel id. They are also described by their first and last names along with the date and place of birth.
  - Players are further described by other attributes such as their batting orientation (left, right, or switch) and have a lifetime batting average (BA).
  - Within the players group is a subset of players called pitchers. Pitchers have a lifetime ERA (earned run average) associated with them.
  - Teams are uniquely identified by their names. Teams are also described by the city in which they are located and the division and league in which they play.
  - Teams have one manager, a number of coaches, and a number of players.
  - Games are played between two teams with one designated as the home team and the other the visiting team on a particular date. The score (runs, hits, and errors) are recorded for each team. The team with the most runs is declared the winner of the game.
  - With each finished game, a winning pitcher and a losing pitcher are recorded. In case there is a save awarded, the save pitcher is also recorded.
  - With each finished game, the number of hits (singles, doubles, triples, and home runs) obtained by each player is also recorded.
1. Design an Entity-Relationship diagram for the baseball database.
  2. Translate the E/R design for your previous exercise into a relational schema using the OO approach.