Database Systems

Requirements Document for Student Registration System (Data and Constraints)

1. Introduction

The objectives of the Student Registration System of a university are to allow

1. students to register and deregister for classes and to obtain reports on their status;
2. the staff at the registration office to obtain student status report, to enter student grades, and to maintain information about students, courses and registrations.

Note: This system is not meant to be a complete student registration system but it is complete enough to make the project reasonably realistic.

2. Information to be contained

The following information will be stored in the Student Registration System.

1. ***Student information***. For each student, we keep the following information (suggested attribute names are in parentheses): an id number (B#), a name (name, including first name (first_name) and last name (last_name)), a status (status), i.e., whether a student is a freshman, a sophomore, etc., a GPA (gpa), a birth date (bdate), and an email address (email). The GPA of a student is computed from the number grades the student has received and it is a value between 0 and 4. It is the sum of the number grades divided by the number of courses (excluding those with letter grade I) the student has completed. Valid values for status are limited to {freshman, sophomore, junior, senior, MS, PhD}. Students are uniquely identified by B#. In addition, students have unique email addresses.
2. ***Course information***. For each course, we have: a course id (cid), a title (title), and the number of credit hours (credits). Courses are uniquely identified by cid. Each cid consists of a department code (dept_code, e.g., CS for Computer Science and Math for Mathematics) and a 3-digit course number (course#, like 532). All undergraduate courses have course# between 100 and 499 and all graduate courses have course# between 500 and 799. For simplicity, it is assumed that all graduate courses have three credit hours and all undergraduate courses have four credit hours.
3. ***Prerequisite information***. Each course has up to three (i.e., 0-3) pre-specified prerequisite courses.
4. ***Class information***. A class is an implementation of a course for a particular offering and it corresponds to a course section in a semester. Each course may have zero or more sections in a given semester (zero section means it is not offered). For each class, we keep: a section number (sect#), the year of offering (year), the semester of offering (semester), the maximum number of students allowed (limit), the actual size of the class (size), the time of the class (time) with starting time (start_time) and ending time (end_time), the days of the

class (days) within each week (i.e., the values of days are limited to {Monday, Tuesday, Wednesday, Thursday, Friday}), and the classroom (room). The values of semester are limited to {Spring, Fall, Summer 1, Summer 2}. It is required that each undergraduate class must have at least 10 students and each graduate class must have at least 5 students. (Hint: Class should be a weak entity set of Courses.)

5. ***Enrollment information***. We keep track of who is registered in what classes. A student receives a letter grade (lgrade) for each class the student is enrolled in and completes. Only {A, A-, B+, B, B-, C+, C, C-, D, F, I, null} are valid letter grades. We also maintain a number grade (ngrade) for each letter grade and the correspondences between letter number grades and number grades are: A ←→ 4, A- ←→ 3.7, B+ ←→3.3, B ←→ 3, B- ←→ 2.7, C+ ←→ 2.3, C ←→ 2, C- ←→ 1.7, D ←→ 1, F ←→ 0 and I ←→ null. "null" is a special value that is usually used in database systems to indicate that a normal value is not available. Each student must enroll in at least one class but no more than five classes in the same semester. No student is allowed to enroll in different classes of the same course more than once.

6. ***Department information***. For each department, we have: a name (deptname), a telephone number (phone#) and an office location (office). Departments are uniquely identified by name. Departments also have unique phone numbers and offices.

3. ***Faculty information***. For each faculty member, we keep: an id number (B#), a name (name), including first name and last name, an office (office), a rank (rank), a telephone number (phone#), and an email address (email). Valid values for faculty rank are {adjunct, lecturer, assistant professor, associate professor, professor}. Faculty members are uniquely identified by B#. Faculty members also have unique email addresses but multiple faculty members may share the same office and telephone number.

7. ***Teaching assignment information***. We keep track of which faculty member teaches what classes. A class may be taught by up to two faculty members and a faculty member may teach up to three classes in a semester.

8. ***TA information***. For each teaching assistant, we have: an id (B#), a name with first name (first_name) and last name (last_name), level (level), which is either MS or PhD, office (office), office hours (office_hours), email address (email), and pay rate (pay_rate). TAs are uniquely identified by B# and they also have unique email addresses. Office hours have values of the format: starting time (start_time), ending time (end_time) and days (days) within a week (the values of days are limited to {Monday, Tuesday, Wednesday, Thursday, Friday}).

9. ***TA assignment information***. We keep track of which TA assists what classes. It is assumed that each TA assists one class in a semester and each class may have at most one TA.

10. ***Student major***. Each student majors in one department and one department may have zero or more students.

11. ***Faculty affiliation information***. Each faculty member belongs to one department and one department may have one or more faculty members.

12. ***Course offering***. Each course is offered by exactly one department and one department may offer zero or more courses.

4. Integrity Constraints

Many constraints have already been included in the description in Section 2. The following are additional constraints that need to be maintained.

5. Courses and their prerequisite courses do not form cycles. For example, we cannot have: A is B's prerequisite, B is C's prerequisite and C is A's prerequisite.
6. Classes are uniquely identified by the combination of the following attributes: cid, sect#, year, semester.
7. The starting time of a class or an office hour must be earlier than the ending time of the class or the office hour.
8. The actual size of a class must not exceed the limit of the class.
9. The pay rate of a TA depends on their level.
10. No faculty member can teach classes with overlapping times.
11. For a student to be successfully registered in a class, the following conditions must all be satisfied:
    a. The class still has room for new students, i.e., size < limit.
    b. The student has not been registered in a different section of the same course.
    c. The student has completed all the prerequisite courses with a grade of at least C.
    d. The student has not already enrolled in more than four other classes, i.e., no student can enroll in more than five classes in the same semester.
    e. The time of the class does not overlap with the times of the classes the student has already enrolled in.