

CS532 : Homework 1

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1. **Design an ER diagram for the Student Registration System based on the provided Requirements Document. Remember to indicate the key for each entity set and the connectivity of each relationship; 2% will be deducted every time a key is not underlined. Use (min, max) format to indicate connectivity. (Note: Many constraints cannot be represented in the ER diagram and they will be represented at later stages of the design.**

Answer - Please find attached E-R diagram.

2. **Discuss whether it is a good idea to create a super entity set for Students and Faculty in the ER diagram for the Student Registration System or not.**

Answer - It is not good idea to create a super entity set for Students and Faculty.

We create Super Entity set when two or more entities have many common attributes and they share same relationship. Here, the common attributes between Student and Faculty entity are only name and email and all other attributes are different, hence the super entity set will have only few attributes.

Also, they do not share any common relationships. Faculty belongs to Department with different relationships and relationship constraints as that of students, similarly, the relationship between Classes and Faculty is different than the relationship between Student and Classes. Hence, we will not be able to derive any relationship from super entity set to any other entities.

Hence, it is not worth to create super entity set for Students and Faculty entity sets.

3. **Identify and discuss constraints in the Requirements Document for the Student Registration System that cannot be expressed using the ER model we discussed in class. First list the constraints not represented in the ER diagram for each entity set separately. Then list the constraints involving multiple entity sets.**

Answer - Please find below list of constraints that are not mentioned in the E-R diagram -

Entity level constraints -

- student -
 - status of the student must belong to any one of these {freshman, sophomore, junior, senior, graduate}
 - email should be unique for every student
 - gpa is decimal number between 0 and 4
- course -
 - course# should be of 3 digits.
 - All undergraduate courses must have course# between 100 and 499.
 - All graduate courses must have course# between 500 and 799.
 - All graduate courses will have 3 credit hours.
 - All undergraduate courses will have 4 credits hours.
 - courses and their pre-requisites do not form any cycle.

- department -
 - Different departments have different offices
- class -
 - Classes are uniquely identified by the combination of the following attributes - cid, sect#, year, semester
 - The values of days are limited to {Monday, Tuesday, Wednesday, Thursday, Friday}.
 - The values of semester are limited to {Spring, Fall, Summer 1, Summer 2}.
 - The actual size of a class must not exceed the limit of the class.
 - The limit of a class must not exceed the capacity of the assigned classroom.
 - No classes of overlapping times can be assigned to the same classroom.
- faculty -
 - Different faculty members must have different offices.
 - Different faculty members must have different email addresses.
 - faculty rank must be any of one these - {lecturer, assistant professor, associate professor, professor}

Other constraints -

- Grading constraints -
 - A student receives grades for each class that he has registered and completed
 - Only {A, B, C, D, E, F, I, null} are valid lgrades
 - Only {4, 3, 2, 1, 0, null} are valid ngrades
 - Corresponding grades are - $A \leftrightarrow 4$, $B \leftrightarrow 3$, $C \leftrightarrow 2$, $D \leftrightarrow 1$, $F \leftrightarrow 0$ and $I \leftrightarrow \text{null}$.
 - gpa of student should be calculated from the student grades
- faculty and class constraints -
 - No faculty member can teach classes with overlapping times.
- student and class constraints -
 - No student is allowed to enroll in different classes of the same course more than once
- Enrolling student in class constraints -
 - The student must have completed all the prerequisite courses with a grade of at least C
 - Student can not be registered for the classes with overlapping timings
 - The class should have room for student i.e. size < limit
 - The student should not already been registered for the same course in different section
 - The student should be enrolled in minimum 0 and maximum 4 classes at the time of enrolling in new class