

## **CZ2007 Example Class 1 (ER Diagram)**

### ***Discussion***

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*In this discussion, we are going to look at the different aspects of the ER diagram and explain why certain properties are modelled in certain ways. In particular, we are going to elaborate on our choice of subclasses, weak entity sets, relationship types, referential integrity and how we resolved the dilemma of choosing between 3-binary and ternary relationships.*

#### **Subclasses**

- We first establish the entity set Person, and from there we derived the 4 subclasses, Stakeholder, Professor, Staff and Student – since these four entity sets inherit the attributes of Person. We also note that a Person can be part of one or more of the subclasses.
- We also established subclasses for Staff, namely Admin\_Staff and Technical\_Staff, since they also inherit the attributes of staff.
- Technical\_Staff are assigned to Lab, and Lab can be further classified into the subclasses Teaching\_Lab and Research\_Lab.
- Student can be classified into the subclasses Undergraduate and Graduate.

#### **Weak entity sets**

- The Lab contains Equipment which can only be identified if provided the name and school of the Lab. As such, Equipment is a weak entity set which depends on the attribute name and school of the entity Lab.
- We created an entity set called Experiment, which is done by Undergraduate. Experiment can be linked to the Course associated with it as well as the Teaching\_Lab. Experiment is considered a weak entity set because we cannot uniquely identify it just based on its date – this entity set depends on the Undergraduate and the Teaching\_Lab.
- The entity set Comment/Suggestion is to keep record of the comments and suggestions made by Stakeholder. As it cannot be uniquely identified just based on its topic and date, this is also a weak entity set and it depends on the identity of the Stakeholder who made the comment. We added the attribute status to keep track of whether or not the comment is resolved.

#### **Relationships**

- Most of the relationships are many-to-many relationship such as the relationship between Professor and Graduate. An Undergraduate can take many Course, and a Course can be taken by many Student.
- Similarly, a Professor can supervise many Graduate, and a Graduate can be supervised by many Professor (i.e. co-supervision is possible). In fact, there is a degree constraint  $\geq$  where there should be at least one Professor to supervise.
- Some relationships must keep the many-to-one relationship. For example, a Technical\_Staff can only be assigned to one Lab.

#### **Referential integrity**

- We keep the referential integrity of relationships where one of the entity sets must have at least one or exactly one. For instance, a Teaching\_Record must be taught by at least one Professor. Similarly, an Equipment must be contained in at least one of the Lab.

#### **The dilemma of 3-binary or ternary relationships**

- We are faced with the dilemma of choosing between the two. The relationship “performs experiment” involving Undergraduate, Course and Teaching\_Lab is a 3-binary relationship by creating a new weak entity set called Experiment. This is because an undergraduate can perform an experiment carried out in the teaching lab but not as part of the course.
- However, for the relationship “teach”, we decided on using a ternary relationship because the relationship requires a professor must teach as part of a course, and this requires a certain timetable to be followed.