CSC430/530 – Database Management Systems
Assignment #1 – EER diagram

Suppose that a database is needed to keep track of students and their majors, transcripts, and registration as well as of the university's course offerings. The database also keeps track of the sponsored research projects of faculty and graduate students.

After analyzing the mini-world rules and the users' needs, the requirements for this database were determined to be as follows:

For each PERSON, the database maintains information on the person's Name [Name], Social Security number [Ssn], address [Address], sex [Sex], and birth date [Bdate]. Two *subclasses* of the PERSON entity type are identified: FACULTY and STUDENT.

Specific attributes of FACULTY are rank [Rank] (assistant, associate, adjunct, research, visiting, and so on), office [Foffice], office phone [Fphone], and salary [Salary]. All faculty members are related to the academic DEPARTMENT(s) with which they are affiliated [BELONGS] (a faculty member can be associated with several departments).

A specific attribute of STUDENT is [Class] (freshman = 1, sophomore = 2, … , graduate = 5). Each STUDENT is also related to his or her major and minor departments (if known) [MAJOR] and [MINOR], to the course SECTIONs he or she is currently attending [REGISTERED], and to the course SECTIONs completed [TRANSCRIPT]. Each TRANSCRIPT instance includes the grade the student received [Grade] in a section of a course.

GRAD_STUDENT is a subclass of STUDENT, with the defining predicate (Class = 5). For each graduate student, we keep a list of previous degrees in a composite, multivalued attribute [Degrees]. We also relate the graduate student to a faculty advisor [ADVISOR] and to a thesis committee [COMMITTEE], if one exists.

An academic DEPARTMENT has the attributes name [Dname], telephone [Dphone], and office number [Office] and is related to the faculty member who is its chairperson [CHAIRS] and to the COLLEGE to which it belongs [CD]. Each COLLEGE has attributes college name [Cname], office number [Coffice], and the name of its dean [Dean].

A COURSE has attributes course number [C#], course name [Cname], and course description [Cdesc]. Several SECTIONs of each course are offered, with each SECTION having the attributes section number [Sec#] and the year and quarter in which the section was offered ([Year] and [Qtr]). Section numbers uniquely identify each section. The sections being offered during the current quarter are in a subclass CURRENT_SECTION of SECTION, with the defining predicate Qtr = Current_qtr and Year = Current_year. Each section is related to the instructor who taught or is teaching it ([TEACH]), if that instructor is in the database.

The category INSTRUCTOR_RESEARCHER is a subset of the union of FACULTY and GRAD_STUDENT and includes all faculty, as well as graduate students who are supported by teaching or research.

Finally, the entity type GRANT keeps track of research grants and contracts awarded to the university. Each GRANT has attributes grant title [Title], grant number [No], the awarding agency [Agency], and the starting date [St_date]. A grant is related to one principal investigator [PI] and to all researchers it supports [SUPPORT]. Each instance of support has as attributes the starting date of support [Start], the ending date of the support (if known) [End], and the percentage of time being spent on the project [Time] by the researcher being supported.

Your task is to **(1)** design an **EER diagram** that represents a *conceptual schema* for the described mini-world.

Make sure you use following EER design concepts:
- Entity types.
    - Attributes of entity types.
    - Types of attributes (e.g. key, composite, multivalued).
- Relationship types.
    - Attributes of relationship types (if applicable).
    - Role names (if applicable).
    - **Cardinality ratio** and **participation constraints** of relationship types.
- Classes and subclasses.
    - Specializations.
        - **Disjoint** and **overlapping** constraints.
        - **Partial** and **total** constraints.
    - Categories (union types).

In addition to the EER diagram, **(2)** provide a short **write-up** explaining design choices for each <u>relationship type</u>, including **cardinality ratio** & **participation constraints**, and each <u>specialization</u>, including **disjointness** & **completeness constraints**.

For example:

BELONGS relationship between FACULTY and DEPARTMENT entity types has many-to-many (M:N) cardinality ratio, since a faculty member can be associated with multiple departments and a department will have multiple faculty members that belong to it. FACULTY participation is total since a faculty member cannot exist without being assigned to a department. DEPARTMENT participation is total since a department cannot exist without having faculty members belonging to it.

Solution
(1) <u>EER diagram:</u>

(2) Write-up