(i) [75 points] Design an EER diagram for the CS Program and enter the design using any data modeling tool? Be sure to identify entities, key attributes, mapping cardinalities, participation constraints, and so on.

The Computer Science (CS) Program of MU would like to create a new database. We are only interested in a database for the CS rather than the University as a whole. After four weeks of meetings with the department head, the Database administrator includes the following entities in her design:

- Students
- Professors
- Courses
- Offices
- ResearchAreas

Your task will be to produce an enhanced entity relationship model that reflects all the requirements listed in parts a through g below. You are free to make reasonable assumptions (as long as they do not conflict with any stated requirements.), and if you do, you need to list them in your document.

a) Create an E/R diagram with the following:
   - Persons(firstName CHAR(20), lastName CHAR(20), loginID CHAR(10), website CHAR(30))
   - Offices(phoneNo CHAR(13), roomNo INTEGER)
   - ResearchAreas(name CHAR(30))
   - Courses(semester CHAR(12), room INTEGER, beginTime TIME, endTime TIME, daysOfWeek CHAR(6), title CHAR(30) courseNo INTEGER)

   Please note that the a valid value for the attribute semester would be 'Fall 2001' and a valid value for attribute courseNo would be 311, not CS311. An example of a value for daysOfWeek would be 'MWF', meaning a course meets Monday, Wednesday, and Friday. Lastly, an example of a title of a course would be 'Database Systems'.

b. The DBA decides to distinguish between different members of the department by adding three subclasses for Persons: Professors, Students, and Staff. In addition, Students have a date of initial enrollment and a GPA (grade point average), Staff have an hourlyWage, and Professors have nineMonthSalaries.

c. There can be a further division amongst the students into the following subclasses Graduate, Undergraduate, and NonDegree. In addition, all Graduate students have an undergraduate institution as an attribute.

d. Graduate students should be divided into the following subclasses: TAs, RAs, GAs, Fellows, Independents

e. Include the following relationships in your E/R diagram:

   1. TAs, RAs, GAs, and Professors have Offices

   2. TAs teach Sections.
3. Professors teach *Courses*.

4. Professors have *ResearchAreas*.

5. Graduates are assigned Advisors who are Professors.

6. Undergraduates, Graduates, and NonDegree students take *Courses*.

f. Each Professor has exactly one office.

g. If a Graduate student is assigned an office, they are only assigned *one* office; however, each office can be occupied by *more* than one GraduateStudent.

(ii) [25 points] Identify any constraints that were given in the specifications but you were unable to capture using ER modeling constructs. State them in natural language (plain English). For each constraint, give a brief explanation why you need the constraint and why you cannot express it in the ER schema diagram.

**Submission:** Submit the assignment electronically using [http://d2l.mu.edu](http://d2l.mu.edu). Please submit electronic copies in one of the following formats: .vsd, .png, .jpg. Also hand in the hard copy of the assignment at the beginning of the class on the due date.