IS0020 Program Design and Software Tools
Final Programming Assignment (Project)
Due: Dec 17, 2004 - Total Points 250

You may do your project in groups of two. If you decide to do that, then you get equal scores – so you may want to make sure that you share your responsibilities well. If you do the project alone, your score will be 1.2 times the original score. In essence, it is to reward those who do the project alone with extra points.

In this assignment, you will extend the implementation of 10.12 (the facility that we included for this problem should still be there too), to create a sort of database for a university. You will prepare a report to indicate your class design and indicate issues that you addressed, some of which are indicated below.

First, you will extend the hierarchy and restructure with new classes indicate as follows:

- Instead of Employee as the main base class, introduce UniversityMember as the main base class. That is Employee and its derived classes as in 10.12 will now be derived from UniversityMember.
- Introduce a class called Course to indicate what courses are available for registration. You will have a course number, title and level (graduate/undergraduate) for each course. You should also indicate who is teaching it if it is currently offered – you are free to implement this part as you prefer.
- Introduce following new classes
  1. Student class
     - A Student is a UniversityMember.
     - Allow a student to be registered for upto 3 courses
     - Indicate the level of the student
  2. GraduateStudentAssistant class
     - A GraduateStudentAssistant is a Student as well as a SalariedEmployee (multiple inheritance)
     - A graduate should can be employed for 20-hours or 10-hours. In the first case he gets full salary, say, between 12K and 16K, and in the second case, it will be half of that.
     - A GSA has either a teaching or a research assignment, which should be indicated, and has a Professor as a mentor.
     - Although not necessary if you prefer you can derive new classes to make it better
  3. UnderGraduateStudentAssistant class
     - An UnderGraduateStudentAssistant is a Student as well as a HourlyEmployee (multiple inheritance)
     - An UnderGraduateStudentAssistant can work for upto 20 hours/week.
     - There is minimum wage that should be used to indicate his earnings.
  4. TeachingStaff class
     - A TeachingStaff “is a” SalariedEmployee
     - Each teaching staff teaches 3 courses
5. **ResearchStaff class**
   - A ResearchStaff “is a” SalariedEmployee
   - A ResearchStaff only does research. Indicate the research areas by listing up to 5 research project titles

6. **Professor class**
   - Professor “is a” a TeachingStaff as well as a ResearchStaff
   - A professor teaches 3 classes if he has less than or equal to 3 active research projects. He teaches 2 classes if he has 4 active research projects, and only one if he has 5 active research projects.
   - For each class he teaches there is a GSA. The GSA appointment can be either 20-hour or 10-hour per week
   - For each project, there are up to 3 GSAs

You will develop a nice interface with following menus:
- **Main Menu**: Should list following three submenus to go to:
  1. **Record Management Menu** that allows
     - Reading from and writing to appropriate files. You will design a set of files to appropriately store created objects – for instance, you may have a `course.dat`, `student.dat` to store course objects and student objects.
     - Creating and deleting objects and appropriately updating the associated files. You have to make sure that when you delete a particular object, you should update other objects. For instance, if you delete a course, you want to make sure that that course is not listed for any student or any teacher. Identify such cases clearly in your report.
  2. **Query Menu**: Should facilitate asking for particular type of information and return results. You need to implement the following, and can add more.
     - Queries from 10.12 related to earnings/income
     - Printing sorted information according to each class type.
     - List of teachers for a particular course
     - List of professors and their projects and courses they are teaching
     - Student list for a particular course
     - List the GSAs with teaching assignments and indicate the associated courses and the professor
     - List the GSAs with research assignments and indicate the professors they are assisting
     - Search for particular UniversityMember based on UID

You will use appropriate file-processing and STL features, besides other things you have learned in this course.

You are required to write a short report that contains complete UML class diagram and indicate your design choices and experiences (why random access or sequential access? Why vector/list/set? etc.). Your report should be properly formatted, and describe the class design with short description of the functions.