PG Software Lab - CS 509
Homework 4
Due date: 26 Oct, 2022 11:55pm
Total Weightage 20%

Instructions:

- TAs would be quizzing you on your code. You must understand each and every line of your submitted code. Also the implementation specifications mentioned in the questions need to be strictly followed. Failure to adhere to these requirements would result in substantial loss of points.
- Also pay attention to the scalability of the code. Your code would be tested on large datasets.
- Very Important: Your code should not have a directory structure. All files (code + dataset + written material for questions) should be present in just one folder. Note that this is absolutely crucial for grading this assignment.
- **Allowed team size:** 2 members or 3 members. Projects from teams of size 3 would be significantly more complicated.
- Students may use the given idea and develop it into a full-scale project proposal. We are just giving a just high level idea of the project and by no means a full specification.
- You are allowed C/ C++, JAVA and Python for these projects. For any other language, you should first get an approval.

Application Description (Compulsory section for both size-2 and size-3 teams):
In this assignment, you are required to design and implement a multi-user database application for managing the academics of an academic institute. You should be able to encode several of the real world concepts into the application. For sake of convenience, we would be focusing on creating a command line interface to interact with the database. The functionalities to be supported are based on the academic policies of our institute. As you are already aware, our academic eco-system for PG programs basically consists of the following stakeholders.

- Students
- Faculty
- Academics Office

Design a database which comprises of the following concepts:

1. Course Catalog: This contains all the list of courses which can be offered in IIT Ropar. For each course, we have information on its credit structure (L-T-P) and list of prerequisites (if any).
2. Course Offerings: Each semester, a faculty offers one or multiple courses. These courses should be present in the course catalog. With each course offering, the instructors may define constraints on CGPA (e.g., CGPA > 7.0).

3. Student Course Registration: A student registers for one or more courses. However, the number of credits he/she is allowed is governed by the scheme governed by the institute (1.25 times the average of the credits earned in the previous two semesters.
4. Report Generation: Staff in the academic office need to generate various kinds of reports (e.g., transcripts of students)
5. Grade entry by Course Instructors: Instructors upload the grades of students in a course via a file.
6. User Authentication: All the users must be authenticated before login

Various Checks to be implemented:

1. A Student must be able to:
    a. Register/deregister for a course:
        i. not allowed to register for a course without clearing the pre-req.
        ii. not allowed to register for more than the allowed credit limit.
    b. View only their grades.
    c. Compute their current CGPA.
2. Academic office must be able to:
    a. Edit the course catalog (with username Staff Dean's office)
    b. View grade of all students.
    c. Generate transcript (Preferably a .txt file) of students. (Return file path)
3. Faculty must be able to:
    a. View grade of all students.
    b. Register/deregister courses they would like to offer.
    c. Must be able to update course grades via .csv files. Input would be a filepath and the file contents must be updated in the database.

Functions to be Implemented:

- Each of the key entities such as student, faculty and academic office should have a menu screen to undertake their regular duties.
- The CLI must be interactive and must have proper navigation controls. For example, after a student registers to a course he must be returned to the screen where he must be presented with all the functionalities he can perform.
- Each user must be able to:
    - Login/logout from their accounts.
    - Update profile to save contact details, batch, joining date etc.
- All data such as course catalog, registration records, grades, etc. must be saved in the database.

Extra Work for Size-3 Teams:

1. Implement the concept of PG curriculum into the application.
2. You should maintain a list of Program Cores and Program Electives and information about MTP thesis.
3. Note that information in item 2 may change with time. For e.g., a course which was PC for a batch may no longer be a PC for their junior batch.
4. In summary you would have to maintain enough information to track his progress through the PG curriculum.
5. Implement a procedure to check for graduation check. A student is allowed to check if he/she has completed all the Program Core courses, minimum number of program electives and passed the MTP credits.