Homework 10

Re-submit Assignment

Due Apr 8 by 10pm **Points** 100 **Submitting** a file upload

This week you'll continue to add new features to the student data repository you created last week. One of the most popular features is knowing what classes have been completed when signing up for classes for next semester. However, users point out that it would be nice if your system also reported the remaining required courses and the student's current Grade Point Average (GPA).

Your assignment this week has three components:

1. Create a GitHub repository to manage your growing software and store your HW09 solution in your repository.

2. Add a new feature to your Student class to calculate each student's cumulative grade point average (GPA) and display the GPA in the Student prettytable.

A student's GPA is calculated by mapping the grade associated with each course to a numeric value. The student's GPA is the average of scores from all completed courses, i.e. the sum of all grade values divided by the number of courses. The mapping of grades to scores is as follows:

Grade	Value
A	4.0
A-	3.75
B+	3.25
B	3.0
B-	2.75
C+	2.25
C	2.0
C-	0
D+	0
D	0
D-	0
F	0

3. Add a new feature to your solution to update the Student prettytable to show the remaining required and elective courses for each student. This requires information about required courses and electives for each major.

Each major has a set of required courses that are required of all students. Furthermore, a student must earn a grade of at least a 'C' for a course to count toward graduation. (Valid grades include 'A', 'A-', 'B+', 'B', 'B-', 'C+', and 'C') Any student earning less than a 'C' must repeat the course until earning at least a 'C'.

Along with a set of required courses that every student must complete successfully, each major defines a set of electives and each student must successfully **at least one** of the electives associated with that major. Students may take more than one elective, but they must take at least one of the electives associated with their major.

As frequently happens in real life, the format of the data files has changed since last week. You'll need to download new copies of the data files from Canvas. Good thing you used your file reader from HW08 which makes it trivial for you to read the new data files with their new formats and possible headers. If you didn't use your file reader, then you should refactor your code to use your HW08 file reader function.

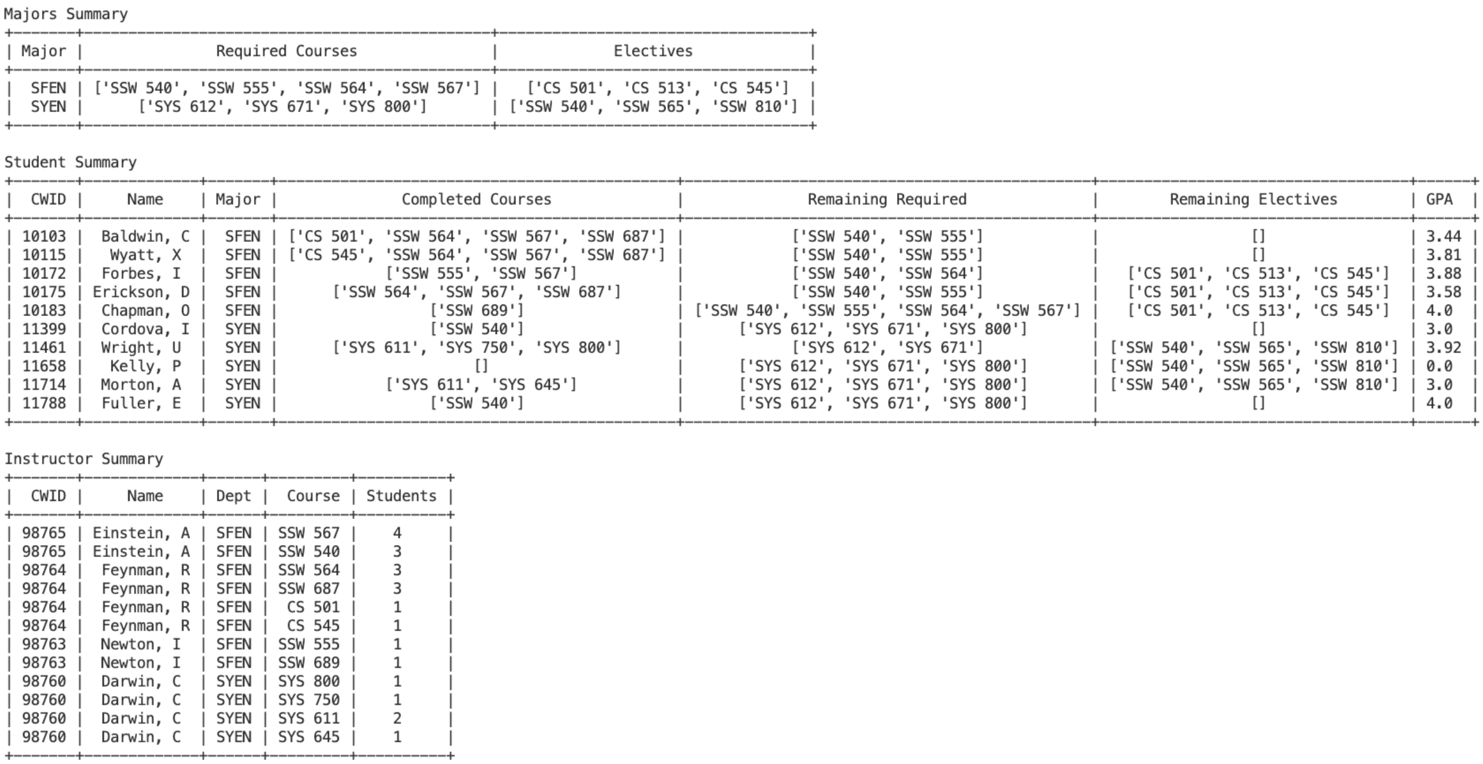
- **students.txt** now has a header row that should be skipped and the separator has changed from '\t' to ';'. Each row now looks like 'CWID;Name;Major'
- **instructors.txt** now has a header row that should be skipped and the separator has changed from '\t' to '|'. Each row now looks like 'CWID|Instructor|Dept'
- **grades.txt** now has a header row that should be skipped and the separator has changed from '\t' to '|'. Each row now looks like 'StudentCWID|Course|Grade|InstructorCWID'
- **majors.txt** is a new data file with a header row that should be skipped and each field is separated by '\t'. Each row has the format

  major\tflag\tcourse

where the flag has the value 'R' if the course is a required course or 'E' if the course is an elective for that major. You'll need to read the information about majors and use it to update your students summary table to add columns for "Remaining Required" and "Remaining Electives" and then calculate the required courses that each student must take to graduate along with the remaining electives. Note that students must take **all** of the required courses and **at least one** of the electives to graduate.

You should also include a new summary prettytable of majors including the name of the major, the required courses, and elective courses.

Here's the output of my implementation as a guideline. Note that everything from HW09 is still present, I've just added the new Major summary prettytable and the Students prettytable adds fields for remaining required courses and remaining electives.



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Majors Summary
+-------+----------------------------------------------+-----------------------------------+
| Major |               Required Courses               |             Electives             |
+-------+----------------------------------------------+-----------------------------------+
|  SFEN | ['SSW 540', 'SSW 555', 'SSW 564', 'SSW 567'] |   ['CS 501', 'CS 513', 'CS 545']  |
|  SYEN |      ['SYS 612', 'SYS 671', 'SYS 800']       | ['SSW 540', 'SSW 565', 'SSW 810'] |
+-------+----------------------------------------------+-----------------------------------+

Student Summary
+-------+-------------+-------+----------------------------------------------+----------------------------------------------+-----------------------------------+------+
|  CWID |     Name    | Major |              Completed Courses               |              Remaining Required              |        Remaining Electives        | GPA  |
+-------+-------------+-------+----------------------------------------------+----------------------------------------------+-----------------------------------+------+
| 10103 |  Baldwin, C |  SFEN | ['CS 501', 'SSW 564', 'SSW 567', 'SSW 687']  |            ['SSW 540', 'SSW 555']            |                 []                | 3.44 |
| 10115 |   Wyatt, X  |  SFEN | ['CS 545', 'SSW 564', 'SSW 567', 'SSW 687']  |            ['SSW 540', 'SSW 555']            |                 []                | 3.81 |
| 10172 |  Forbes, I  |  SFEN |            ['SSW 555', 'SSW 567']            |            ['SSW 540', 'SSW 564']            |   ['CS 501', 'CS 513', 'CS 545']  | 3.88 |
| 10175 | Erickson, D |  SFEN |      ['SSW 564', 'SSW 567', 'SSW 687']       |            ['SSW 540', 'SSW 555']            |   ['CS 501', 'CS 513', 'CS 545']  | 3.58 |
| 10183 |  Chapman, O |  SFEN |                 ['SSW 689']                  | ['SSW 540', 'SSW 555', 'SSW 564', 'SSW 567'] |   ['CS 501', 'CS 513', 'CS 545']  | 4.0  |
| 11399 |  Cordova, I |  SYEN |                 ['SSW 540']                  |      ['SYS 612', 'SYS 671', 'SYS 800']       |                 []                | 3.0  |
| 11461 |  Wright, U  |  SYEN |      ['SYS 611', 'SYS 750', 'SYS 800']       |            ['SYS 612', 'SYS 671']            | ['SSW 540', 'SSW 565', 'SSW 810'] | 3.92 |
| 11658 |   Kelly, P  |  SYEN |                      []                      |      ['SYS 612', 'SYS 671', 'SYS 800']       | ['SSW 540', 'SSW 565', 'SSW 810'] | 0.0  |
| 11714 |  Morton, A  |  SYEN |            ['SYS 611', 'SYS 645']            |      ['SYS 612', 'SYS 671', 'SYS 800']       | ['SSW 540', 'SSW 565', 'SSW 810'] | 3.0  |
| 11788 |  Fuller, E  |  SYEN |                 ['SSW 540']                  |      ['SYS 612', 'SYS 671', 'SYS 800']       |                 []                | 4.0  |
+-------+-------------+-------+----------------------------------------------+----------------------------------------------+-----------------------------------+------+

Instructor Summary
+-------+-------------+------+---------+----------+
|  CWID |     Name    | Dept |  Course | Students |
+-------+-------------+------+---------+----------+
| 98765 | Einstein, A | SFEN | SSW 567 |    4     |
| 98765 | Einstein, A | SFEN | SSW 540 |    3     |
| 98764 |  Feynman, R | SFEN | SSW 564 |    3     |
| 98764 |  Feynman, R | SFEN | SSW 687 |    3     |
| 98764 |  Feynman, R | SFEN |  CS 501 |    1     |
| 98764 |  Feynman, R | SFEN |  CS 545 |    1     |
| 98763 |  Newton, I  | SFEN | SSW 555 |    1     |
| 98763 |  Newton, I  | SFEN | SSW 689 |    1     |
| 98760 |  Darwin, C  | SYEN | SYS 800 |    1     |
| 98760 |  Darwin, C  | SYEN | SYS 750 |    1     |
| 98760 |  Darwin, C  | SYEN | SYS 611 |    2     |
| 98760 |  Darwin, C  | SYEN | SYS 645 |    1     |
+-------+-------------+------+---------+----------+
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To Do:

1. Create a GitHub repository for your Student Repository. This requires several steps:
    - Create a free GitHub account on github.com
    - Create a "Student Repository" GitHub repository
    - Rename your HW09_Your_Name.py to Student_Repository_Your_Name.py and rename your HW09_Test_Your_Name.py to Student_Repository_Your_Name.py
    - Create a new "HW09" branch in your "Student Repository" GitHub repository
    - Add Student_Repository_Your_Name.py and Student_Repository_Your_Name.py to the "HW09" branch in your new GitHub repository.
    - Do a pull request from github.com to merge the "HW09" branch into the "Master" branch. Do NOT delete the HW09 branch after the merge. We'll create separate branches for each of the next few assignments.
    - Create a new "HW10" branch for this week's assignment
2. Download the new students.txt, instructors.txt, grades.txt, and majors.txt from Canvas
3. Update your HW09 code to use the new HW10 data files
4. Add the new functionality to compute the student's GPA
5. Add new functionality to read the majors file and calculate the remaining required and elective classes for each student
6. Add a new Majors prettytable
7. Update the Student prettytable to include the student's GPA and remaining classes and electives for each student
8. Implement automated tests to verify that the data in the prettytables matches the data from the input data files.

- You **do NOT** need to implement automated tests to catch all possible error conditions but your program should print relevant error messages when invalid or missing data is detected.
- Your solution MAY print error messages and warnings to the user about inconsistent or bad data, e.g. a data file with the wrong number of fields or a grade for an unknown student or instructor.

Deliverables

1. The URL of your GitHub repository showing two branches: one for the HW09 code and this week's HW10 code. Your repository should include all of the data files needed to run your solution. Just include the URL in your submission comments.
2. An updated Student summary table with the student's CWID, name, major, completed courses, remaining courses, and remaining electives, and GPA
3. An instructor summary table (no changes from HW09)
4. A Major summary table with the name of the major, the required courses, and the electives for that major

Test your program and upload your program files to Canvas when ready.   Be sure to handle unexpected cases, e.g. a student from the students.txt file who has no grades yet (she might be a first semester student), or student with a major that doesn't have a corresponding major in majors.txt. You can be sure that your testing group (Prof JR) will have some curious test cases to try against your solution.