

While Banner is a useful tool for viewing various student information from classes taken to grade point average, it doesn't always tell the student important information that they want to know. Some things that Banner does not tell the student is classes that they need to complete to graduate from their respective programs, their GPAs in a certain subject area, their major/non-major GPAs, and the GPAs from the past few years. Some of this information is not only important to the student, but also requested by future employers or prospective graduate schools. The motivation for this project is to extend upon the Banner system to include these features to help the student get all the information they can get out of their Banner transcripts.

In order to do this, utilizing both lexical and syntax analysis is important. A Banner transcript contains information about a student's major as well as the classes they have taken (subject, course number, and title) and their respective letter grades, credit hours, and quality points. A transcript is also broken up into sections by each semester and contains the GPA for that semester and the cumulative GPA since they started attending the institution. For the majority of this project only lines in the transcript pertaining to the courses taken are relevant and thus the rest can be safely ignored. This is possible by utilizing syntax and lexical analysis. Each line in the transcript pertaining to courses taken follows a set syntax; that is, subject, course, level, title, grade, credit hours, and quality points (i.e. CSCI 387 U Data Structures A 3.000 12.000). Using lexical analysis on these lines assigns each lexeme a token category, which in this case is a string literal for each lexeme. Once each line in the transcript has been parsed and analyzed the relevant course information is stored into an object and added to an array list for later use.

Each feature of this project takes the array list of class objects and uses that information to perform the various tasks. The first feature; checking what classes the student needs to meet the curriculum's requirements, compares the list of courses taken with another list of required courses that is stored within another class. It does this by comparing the subject and course numbers of each taken class to each required class to see if the student has already taken it. However it is sometimes possible for a student to substitute another class for a required class if those two classes are similar. This project also accounts for some of those cases; however not all due to the number of courses that could possibly be substituted. Elective classes are another possibility that has to be accounted for. There is no set course that must be used for electives so the code must be able to recognize which courses are acceptable for each elective. This project does that by looking at the subject of the course in question. For instance, if the required course is a literature elective the code must accept classes with the subject "ENGL". Once a required course has been met it is removed from the list so another course cannot satisfy the same requirement. Once all of the student's classes have been analyzed, the program outputs which courses the student needs to take as well as the courses that the student is currently taking.

The next feature; calculating the student's cumulative GPA in each subject area, takes the list of classes the student has taken and analyzes the subject, credit hours, and quality points of each class. If a subject hasn't been encountered before, the subject, credit hours, and quality points are added to a list; if a subject has been encountered before, that subject's index is updated to include the new courses' credit hours and quality points. After the list of classes has been completely parsed the program calculates the GPA for each subject area and outputs them for the user.

Another feature of the project is calculating the student's GPA in both their major and non-major courses. This is done by parsing the list of the student's classes and looking at each classes' subject to determine if that subject is the student's major. If the class is a major course, the credit hours and quality points are added to one list. If the class is not a major course, the credit hours and quality points are added to another list. After each class has been parsed, the program calculates the GPA for both the major and non-major courses and outputs them for the user.

The last feature of the project is calculating the student's GPA for the previous 1-x number of years (x being how many years the student has attended the institution). It does this by analyzing the number of credit hours and quality points earned in each semester and adding them to a list. Once the number of semesters parsed is equal to an even number (2 semesters per year) the GPA is calculated and output for the user. This continues until all of the classes have been parsed and the student knows their GPA for the x-number of years they have attended the institution.

To test this project I used my own transcript as a test case. Being that I am a transfer student helps me test the code because transferred classes are omitted from an institution's GPA. My transcript also contains both a 'W' (withdrawn) course and an 'I' (incomplete) course. These non-normal grades helped me to test for all variables that could be possible with a student's transcript. I also have not taken a few required courses, but instead have other courses substituted for them. This also helped me prepare my code for all possibilities that could come when analyzing other transcripts. Below are some screenshots of my project when executed with my transcript.

```
Option 1: What classes do I need to take to meet the requirement of a given curriculum?
Option 2: What is my cumulative GPA for each subject area?
Option 3: What is my cumulative GPA in major/non-major courses
Option 4: What is my cumulative GPA within last x amount of years?
Option 0: Exit program.
```

```
Please enter a number (Options 0-4): 1
```

```
Remaining Courses:
CSCI 101: Introduction to the CS Profession
CSCI 151: Programming I Lab
CSCI 251: Programming II Lab
CSCI 485: Programming Languages
CSCI 494: Senior Project II
BIOL/CHEM/PHYS LABORATORY SCIENCE
LITERATURE ELECTIVE
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Courses in Progress:
BIOL 313: General Zoology Lab
BIOL 313: General Zoology
CSCI 453: Digital Image Processing
CSCI 485: Programming Languages
CSCI 494: Senior Project II
```

Please enter a number (Options 0-4): 2

Subject GPAs:

CSCI: 3.927

MATH: 3.765

ENGL: 4

Please enter a number (Options 0-4): 3

Subject GPAs:

Major Courses: 3.927

Non-Major Courses: 3.8

Please enter a number (Options 0-4): 4

GPA for the past 1 years: 4

GPA for the past 2 years: 3.885