**CLIPS Exercise 7: Putting It Together Part 2**

***Complete ALL of the following sections.***

# Scenario (same as in Exercise #6):

**Task:**

* Students need a system to be able to assist them in planning their classes for their degree.
* Create an expert system to work for planning the IT classes for a student who is earning an [AS in CIT (program #3504) for the current catalog year](https://ss2.sfcollege.edu/eSantaFe?hptAppId=AA4465E&hptExec=Y&hptRecord=AA4465UI1&MAJOR-CD=3504&GUEST_FL=P&hptUIRecordPackage=aa4465e.pkg&hptUIRecordPackage=aa4465e.pkg).

**Knowledge Requirements:**

* The student must take all classes required in the degree.
* The appropriate prereqs for classes must have been scheduled before the system can schedule the class.
* The student can only take a limited number of classes each semester (i.e. a constant number of classes)
* The student will only take classes in the degree (since financial aid only pays for those classes).

**Simplifications:**

* General education classes will be generic (such as GenEd1, GenEd2, etc.).
* IT Electives will be generic (such as ITElective1, ITElective2, etc.)
* The student must take the same number of classes each semester (i.e. a constant number).

**Assumptions:**

1. Your program should accept all of the courses (by course ID) required for the degree along with their prereqs.   It should then schedule the first semester (assuming the student will take a full course load).
2. Remember the design of the system is intended to work for ANY program so you need to use facts for the different classes and the rules manipulate the facts (i.e. don't hard-code classes in all over the place).  You should also NOT use any salience.

**Name:**

**Make sure to READ everything carefully as quite a portion of this assignment is a mental exercise in representing the knowledge and NOT writing the rules for the expert system. Remember facts are how the knowledge of what is known is represented.**

# Section 1: Creating the Schedule

*Program in CLIPS (provide the created program). At this point, the end-user (your instructor) does not provide any input to the program when it runs. Build on your program from Exercise #6.*

1. Rule(s) to create the first semester of courses according to the constraints in the scenario (such as the number of classes the student wants to take each semester). Remember the system should determine the classes the student will take (i.e. it should not be hard-coded in).

Text

Description automatically generated

1. Rule(s) to print each semester of courses scheduled. Make sure it is clear which semester is which (i.e. semester 1 versus semester 2, etc.). Note: If you can’t get #1 to work, you could still create a fact that shows the scheduled semester of courses and use it to create the printout of the scheduled semester of courses (Make sure to state that’s what you’re doing here in this document).

Graphical user interface, text, application, email

Description automatically generated

1. Rule(s) to create the second semester of courses according to the constraints in the scenario (such as the number of classes the student wants to take each semester). Remember the system should determine the classes the student will take (i.e. it should not be hard-coded in).

Graphical user interface, text

Description automatically generated

1. BONUS: Rule(s) to create the entire sequence of courses required for the degree and also print them. If Depending upon how you do questions #1-3, it could be used to schedule and print all of the classes across the semesters.

# Section 2: Specifying the IT Elective and General Education Classes

*Answer the following questions underneath each question. For each of the following, provide specific examples of what the fact originally looked like (such as in Exercise #6) and what it would look like to handle this change (i.e. provide a before and after of what the fact would look like with explanation of what is represented in it).*

1. Suppose we want to make the IT Elective classes to be the specific classes they could take. Explain what would need to change in how facts are represented to accommodate this change. Consider what new facts would be needed and how previous facts would need to be modified.

In order to specify what classes a student can take instead of using a catch all ?COURSEID, we can specify that one of the classes has to be ITElective1. If you want all it electives to be specified then you can type either all of the ITElective in the semester.

1. Explain what would need to be done to the rules to accommodate the IT Elective classes. What new rules would need to be implemented and how existing rules would be modified? Make sure it provides an idea of what kind of patterns would be needed on the LHS of the rule and what kind of commands would be needed on the RHS. If you feel more comfortable writing the actual rule(s) before and after than providing a textual explanation of it, that is acceptable.

To accommodate to the elective classes the left hand side will have to take DEGREE, NUM-Courses, PREREQS and SEMESTER. Then on the right hand side you will have it print out the degree, semester, number of classes, ?ITElective.

1. Suppose we want to make the General Education classes to be the specific classes they could take. Explain what would need to change in how facts are represented to accommodate this change. Consider what new facts would be needed and how previous facts would need to be modified.

Same thing as electives. You would have to specify that they want to take the classes, use a prereq or semester to filter out which classes that can be taken. Then when you print it out they will have to specify either ?GenED, or GenEd1.

1. Explain what would need to be done to the rules to accommodate the General Education classes. What new rules would need to be implemented and how existing rules would be modified. Make sure it provides an idea of what kind of patterns would be needed on the LHS of the rule and what kind of commands would be needed on the RHS. If you feel more comfortable writing the actual rule(s) before and after than providing a textual explanation of it, that is acceptable.

To accommodate to the GenEd classes the left hand side will have to take DEGREE, NUM-Courses, PREREQS and SEMESTER. Then on the right hand side you will have it print out the degree, semester, number of classes, ?GenED.

# Section 3: Expanding the System’s Tasks

*Answer the following questions underneath each question. For each of the following, provide specific examples of what the fact originally looked like (such as in Exercise #6) and what it would look like to handle this change (i.e. provide a before and after of what the fact would look like with explanation of what is represented in it).*

1. In addition to the CIT degree, suppose we want this system to handle any IT Degree SF offers (AS in IT Security, AS in Networking, AS in Programming, BAS in Security, BAS in Networking and BAS in Programming) yet each student only majors in one degree at a time. Explain what would need to change in how facts are represented to accommodate this change. Consider what new facts would be needed and how previous facts would need to be modified.

You would have to implement facts that relate to the specific degree and classes that are particular to that degree. If they all take the same classes but have some degree specific classes, then we can use prereqs and degree to filter out which classes are allowed to be taken.

1. Different types of students have different requirements for the type of classes they can take. For example, veterans and international students must have a certain percentage of their classes on-site. What facts would be needed to be able to accommodate these kinds of students so they can meet their requirements?

We would need a fact like StudentClass1 or StudentClass2 to specify which type of student the person is. With those fields we can filter out online classes.

1. Other than the examples provided above, what additional ways could this system be expanded to be more useful? Provide at least four different concrete ways.
2. Using the system to recognize if the student is an employee of Santa Fe College.
3. A new Rule can be implemented to assign the student an Advisor
4. Student who has taken classes could be assigned to Honor roll classes or advanced placements.
5. Can divide semesters into smaller categories like flex, part A part B or define them as season (Fall, Winter).
6. BONUS: Give 5 examples of different ways expert systems have or could be used.
7. Take all input and devise battle plans
8. Can be used to strategize in games like chess.
9. Identifying illnesses based on symptoms
10. Determining chemical compositions
11. Can be used backwards to identify like things. Give an example and the system will take that and find common rules.
12. Economical advisement.