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**Waterfall Model**

**Requirement definition:**

The goal of the system is to have three types of users: student, instructor and admin. The student can register, can see available courses and their own schedule. The instructor can see available courses and their own course roster. The admin can see everything, can edit courses/user/schedules. The system should include multiple semesters, print-out of schedule, and have scheduling preferences. Additionally, there should be two types of databases for users and courses. The database for users should work for 100 students, 10 instructors and 1 admin. The database for courses should contain information such as the CRN, course name, times, and instructor. A constraint would be that the system cannot contain more than three types of users. For example, if there was a guidance counselor then there would not be a user type that would fit this description in the database.

**Total Time**: To create the whole system it would take approximately 14 weeks.

**System and software design:**

The system will have a base class user with attributes and methods. The attributes will contain first name, last name, and ID. The methods will include set functions for each attribute, and a function to print all info for the object. Additionally, there will be three derived classes that contain additional attributes and appropriate set/get functions. The three derived classes will be student, instructor and admin. Inside the student derived class it will contain functions that allow the user to search courses, add/drop course, and print their schedule. Inside the instructor derived class, it will contain functions that allow them to print their schedule, print their class list, and search for courses. Inside the admin derived class, it will contain functions that allow them to add courses to the system, remove courses from the system, add/remove users, add/remove student from a course, search and print rosters and courses.

**Expected time**: To create the system and software design for the system it would take approximately 8 weeks.

**Implementation and unit testing:**

The code will be written in C++ and the functions used will differ for each user. The main user class will have functions to set each attribute and to print all. The derived student class will have functions to search courses, add/drop courses, and print their schedule. The derived instructor class will have functions to print their schedule, print their class list, and search for courses. The derived admin class will have functions to add courses, remove courses, add/remove users, add/remove student, and search and print rosters and courses.

**Expected time**: To write the functions for the system, it would take approximately 2 weeks.

**Integration and system testing:**

Using the functions from the implementation and unit testing phase, integrate them into the main C++ file and test to make sure that they do what is needed which is displayed on the user interface. There are debugging tools that can be used to find if a function is not properly called, if there are bugs, or many other problems that will be solved in the operation and maintenance phase. Test the system by running the code to see if there are any bugs in the program or if it is not what is expected. Keep track of these problems that are found through the testing phase and debug or solve them in the operation and maintenance phase.

**Expected time**: To implement the functions into the system and to test the system, it would take approximately 2 weeks.

**Operation and maintenance:**

Bugs can be fixed by using the debugging tools in Visual Studio such as breakpoints, step over, step into, etc. If there is something that is not expected or if there are problems/bugs found in the code that were found in the integration and system testing stage, it can easily be solved by using the debugging tools. Once these bugs are solved, update the system and code to make sure it is ready for the user.

**Expected time:** To debug and update the system, it will take approximately 2 weeks.

**Total Time: 14 weeks.**