Requirements Specification

Automated Grading System
for Microsoft Excel Spreadsheets

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Section 1: Product Overview and Summary

The Computer Science Department at Siena College offers two courses which include Microsoft Excel as part of the teaching curriculum. With just these two courses, Introduction to Computer Applications and Problem Solving with Spreadsheets, there are eleven different lab sections that students are enrolled in. Because of the numerous sections of these two courses, it is not even necessary that students be enrolled in a lab with the same instructor that they attend their lectures with. This situation makes for much confusion in grading between Lecturers and Graders, as well as a difficult position for Lecturers, as they do not necessarily know what material their own students are grasping through class, as they don’t have all of them in lab. On top of this disorder among grading, the tedious work it takes to grade these Excel spreadsheets for each lab by hand is not only resource wasteful, but also repetitive and time consuming for Graders. For these reasons, our clients, Dr. Hunter and Ms. Cotler, have approached our team about creating an automated Excel grading system that will compare the labs to a key lab submitted by the Administrator and allow Graders to grade them automatically in this manner.

The Automated Grading System for Microsoft Excel Spreadsheets will allow for students to submit their completed labs through the internet from any computer location, including their very own personal computers. In doing so, there will not be any necessary hard copies to be printed off and handed in. The system will grade the submitted labs, and both Graders and Lecturers will have the ability to access these grades as well as class statistics to help them understand problem areas for each assignment.

Section 2: Development, Operating, and Maintenance Environments

The Automated Grading System for Microsoft Excel Spreadsheets will be created on workstations in the Software Engineering Lab. Development of the system will be a continuous process throughout the year which will include the wants and needs of our Clients, Dr. Hunter and Ms. Cotler. Operation of the system will include Students logging in and submitting their assignments, Graders logging in to request grading, accept/decline grades, and view submitted labs, make comments, and examine statistical reports for their individual lecture and lab classes. Lecturers will also log in and obtain the grades for the students in their lecture classes. Maintenance will be governed by an Administrator account, which will be necessary to create all other accounts, as well as to submit lab keys for grading.
Section 3: External Interfaces and Data Flows

Prototypes:

This prototype is the initial login screen for students. They will choose their lab and lecture section from two drop down lists. They will only be asked to enter this information upon first login. They also have the capabilities to log off or to change their password in the lower left corner of the screen.
This prototype is the view of a student screen once he/she has logged into the system. It contains each assignment for the whole semester and the files that are required of each assignment. By clicking on the date submitted the student can access any of these files. It also indicates whether the student has submitted each of these files. It displays the student’ individual scores for each file, as well as the lecture class average and lab class average.
This prototype is a screen displayed for the Lecturer users. It contains a list of all their students, separated by lecture sections. For each student the Lecturer can view his/her lab section, overall lab grade, and the scores for each individual lab file.
This prototype is the view of the Administrator. The Administrator will have the option of selecting any of the assignments. For each of the assignments he/she will be able to submit multiple keys for each file necessary. The Administrator will also have the capability of deleting or editing any assignment, as well as viewing the statistics of all students in all classes. Finally, he/she will be able to add or remove users from the system.
This prototype is the screen showing what the Grader will see upon login. The Graders will be able to select any of their lab sections, in which there will be a list of all the students in that section. For each student the Grader will be able to view his/her lecture section, total lab score, as well as lab scores for each separate file submitted by the student. By clicking on the date submitted the Grader can view any of these files.
This prototype is another screen for the Grader. He/she chooses what assignments he/she wants graded by clicking in the boxes. There is an option to select all of the available files for grading. After grading he/she can view the graded assignments to check and examine work.
Data Flows:

Context Free Diagram
Level 1 Diagram
System

Student

Lecturer

Administrator

Grader

Excel Grading System

System Database

Assignment
Grade Info

Graded Info
Key

Verified Grade Info
Unverified Grade Info
Grade Info

Results
Key

Assignments
Section 4: Functional Requirements

The Automated Grading System for Microsoft Excel Spreadsheets will allow for four different types of users. These include, Students, Graders, Lecturers, and the Administrator. A log in screen will be required for each of the authorized users. The user name and password will automatically log each user in under the account type that the entered user name and password were initialized as. Student accounts will be created by the Administrator, and upon first login Students will have to choose their Lab and Lecture sections in order to assign them to their particular instructors for grading purposes. Students will have the ability to submit labs and view them once submitted, as well as access the graded labs and view scores. Lecturers will be able to view their students’ submitted assignments and the grades they received, and see statistical reports for their students as a whole. Graders will have the same capabilities as Lecturers, as well as having the ability to grade and comment on the submitted labs of their lab students. Finally, the Administrator will also have these same capabilities for any of his/her classes, and also the capacity to create or remove accounts and submit the keys to grade the submitted labs with.

Section 5: Performance Requirements

The online file submission and grade review interface for the Automated Grading System for Microsoft Excel will be available through most major browsers, including Microsoft Internet Explorer 6.0, Netscape Navigator v8.0.4, Mozilla Firefox 1.0.7, and Safari 2.0.1.

The online interface will be designed with a resolution of 800x600 pixels, so as to best accommodate all users.

The Grading Software will be designed to run on a PC running Microsoft Windows XP and having Microsoft Office 2003.

Section 6: Exception Handling

There are situations that could occur in the system that are not originally planned for assuming the users do everything as expected. For this reason, the system will be prepared to handle the following exceptions:

- If an incorrect log in name or password is entered the user will be informed and asked to re-enter his/her user name and password
- To clarify that a Student’s submission went through properly the Student will be able to view all assignments that he/she has submitted.

Section 7: Early Subsets and Implementation Priorities

The most essential components to this software will be:
• An easy to use system which allows all users access to grades and assignments in the most straightforward way possible.
• Students’ ability to submit assignments without confusion or difficulty.
• Graders’ ability to grade and post submitted assignments quickly and simply.

Section 8: Foreseeable Modifications and Enhancements

Possible enhancements that could be made to this system in the future include Lecturers being able to submit other course grades in order for students to access their entire course grades rather than just their lab scores. Also, it may be modified to accept other types of files, instead of just Microsoft Excel files, to be taken for grading.

Section 9: Acceptance Criteria

The Excel Grading System will contain:

1. GUI
2. Grading Engine
3. System Database

The Excel Grading System GUI will be broken up into two parts:

1. The Web Interface
2. The Grading System Software

The Web Interface will carry on interactions between the different classes of users with the Excel Grading System. The Grading System Software will only be used for interactions between the grader and the Excel Grading System to generate and approve results.

The Excel Grading System will have four classes of users, each with their own privileges and roles in the system:

1. Administrator
2. Lecturer
3. Grader
4. Student

The Administrator will log into the system via the Web Interface and provide the various grading keys to the System Database. These keys will then be used by the Grading Engine to grade the various laboratory assignments.

The Lecturer will have the ability to log into the system via the Web Interface and view assignments and graded info for all of their students.
The Grader may log into the system via the Web Interface and view assignments and graded info for all of their laboratory students. Using the Grading System Software, the Grader may choose to grade all of the assignments and output these results to the System Database. This process will incorporate the ability to choose how they would like the assignments graded and also allow them to grade certain assignments manually if needed.

The Student will be able to log in via the web interface, submit their Excel files and view their graded assignments from the System Database.

The Grading Engine will handle all of the computations between the grading keys provided by the Administrator and the criteria submitted by the individual graders via the Grading System Software. It will accurately compare the keys to the assignments and return results to the Grading System Software where the grader will be able to approve these results and output them to the System Database.

The System Database will be broken up into three separate tables:

1. User Table
2. Assignment Table
3. Key Table
4. Results Table

The User Table will contain a list of all of the users involved with the system. This includes Administrator, Lecturer, Grader, and Student. This table will contain the privileges assigned to each class of user and will provide them with their corresponding abilities in a dynamically generated Web Interface. The User Table will also be used with the Grading System Software to ensure that the user of the software is of the grader class and will only allow them access to their laboratories assignments.

The Assignment Table will contain all assignments submitted by the students. These assignments will not be graded and will be made available for complete access by the Lecturer, individual laboratory access by the Grader and only by the individual in the Student class.

The Key Table will contain all of the keys submitted by the Administrator. These keys will be used per assignment to grade them. The Grading Engine will make comparisons between the keys, their corresponding assignments, and criteria established by the Grader to formulate results.

The Results Table will contain all of the approved results generated by the Grading Engine, which is triggered by the Grading System Software. These results then can
be accessed in whole by the Lecturer, by individual laboratory by the Grader and only by the individual in the Student class.

Section 10: Testing Requirements

The system will be tested with a sample set of Excel files pulled from previous semesters in addition to ones generated by our team to test specific aspects of the system for accuracy. We will test the Administrators ability to submit a key to the System Database, the Students ability to submit Excel laboratory files to the System Database, the Graders ability to access the assignments for their laboratories and to interact with the System Database using the Grading System Software and the Lecturer’s ability to access results from the System Database for their classes. In addition to these tests the Grading System Software’s ability to access the Grading Engine in order to produce accurate results and output these results to the System Database where the Administrator, Lecturer, and Graders should have access to the results will be thoroughly examined. Finally, security must be tested to ensure that the System Database is secure and that all user accounts are only allowed to perform the actions they are intended to be limited to.

Section 11: Design Hints and Guidelines

The Excel Grading System will assume that the format of all Excel files are the same and comparisons between the Key Table and the Assignment Table will only compare for the correct answer and will not be searching to discover that the student may have formatted the file incorrectly. This will be an area where the Grader may recognize the error and take over manually.

Section 12: Sources of Information

Our information was gathered from meetings with our clients, Ms. Jami Cotler and Dr. Scott Hunter in addition to Dr. Lederman’s class lectures, the Software Engineering class textbook Software Engineering: A Practitioner’s Approach by Roger S. Pressman, and various Software Engineering teams’ projects from previous years located at:

http://www.cs.siena.edu/~lederman/csis410/csis410.html
Section 13: Glossary of Terms

**Code:**
A system of symbols and rules used to represent instructions to a computer.

**Database:**
A collection of data arranged for ease and speed of search and retrieval.

**Gantt Chart:**
A chart that depicts progress in relation to time, often used in planning and tracking a project.

**GUI - Graphical User Interface:**
A user interface based on graphics (icons, pictures, and menus) instead of text; uses a mouse as well as a keyboard as an input device.

**Internet:**
An interconnected system of networks that connects computers around the world via the TCP/IP protocol.

**Software:**
Written programs, procedures, or rules and associated documentation pertaining to the operation of a computer system and that are stored in read/write memory.

**System:**
A group of independent but interrelated elements comprising a unified whole.

Section 14: Gantt Chart