Marks Management System an Interactive Web-Based Approach for Academic Advising

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Abstract- A student's performance is measured in terms of his marks. It is one of the indicators of a student's academic progress. Guiding students properly in terms of academic advising is of paramount importance. Doing so will enable the student to achieve his/her goal of earning a degree. Thus, in order for this goal to be achieved, a very useful tool for advisers is needed. One that can monitor student's courses and can clearly project scenarios that will allow students to clear a particular academic level or allow them to clear academic probation. This tool will greatly ease up the adviser's job as well as minimize, if not eliminate advising errors. This, in turn will be of great help to any academic institution implementing the Grade Point Average system. This paper illustrates the implementation of a web-based advising tool called Marks Management System (MMS) which features the following: GPA calculation, determination of Academic Probation Level, Course Monitoring as well as management of records. The study uses Bootstrap 3.4 framework for the web page development, PHP 5.5.12 as the scripting language and MySQL as the backend database. The system accepts the student's transcript in Excel format and parses the data before it is saved to the database. This data is then mapped against the student's Degree Audit taking his/her current level and specialization into consideration. The computation of the Semester GPA (SGPA), Cumulative GPA (CGPA) and Over-all CGPA (OCGPA) is computed by iterative functions. This, in conjunction with the student's history of Academic Probation level per semester, enables advisor to efficiently prepare course projections/scenarios that will show the required marks to achieve the desired GPA.

Keywords-mark management; CGPA calculator; bootstrap

I. INTRODUCTION

Academic advising plays a vital role for students to successfully finish their studies, especially for the students who are critical, those who are near the border of clearing probation, exiting or moving to the next academic level. It has been observed that most Academic Advisors(AA) do their computation and verification of GPAs and determination probation levels using the paper-based manual system or by using Excel templates, which are work intensive, prone to errors, and yields lower productivity. Retrieval of previous records of advisees is not efficient and the collection and consolidation of critical cases information from AA is very time consuming. In finding solution to these problems, the researchers have developed a web-based tool that enables AA to compute GPAs, determine academic probation level and create mark projection. The system made use of PHP programming language as scripting language, Bootstrap and front-end development framework, wampserver as the web server platform and mySql as database server.

The [1] describes Hypertext Preprocessor (PHP) as a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML. What distinguishes PHP from something like client-side JavaScript is that the code is executed on the server, generating HTML which is then sent to the client. The client would receive the results of running that script, but would not know what the underlying code was. Programmers can even configure the web server to process all HTML files with PHP. According to [2] bootstrap is a free and open-source Javascript framework developed by the team at Twitter. It is a combination of HTML, CSS, and Javascript code designed to help build user interface components for websites and web applications. Bootstrap was also programmed to support both HTML5 and CSS3.

Here are some reasons why programmers prefer using Bootstrap as their front-end development framework:
1. Easy to get started
2. Great grid system
3. Base styling for most HTML elements
4. Extensive list of components
5. Bundled Javascript plugins

This paper tries to document the implementation of the computation of GPAs, determination of academic probation level, and mark projection in accordance with the current business rules and requirements of Salalah College of Technology(SCT). The rest of the paper is organized with literature survey in section II followed by description of designed grading system along with block diagram in section III. Then experimental results are presented in section IV followed by comparison with other system and conclusion respectively.

II. LITERATURE SURVEY

In [3] Kansham Angphun Maring et al. Grade processing system using Visual Basic presented how to develop software in Microsoft Visual Basic 6.0 programming language and Microsoft Access as the backend. The system provided a platform to calculate GPA and CGPA of students. However the system does not provide printout of the computation. It also made use of textboxes thus typing manually the marks form the keyboard instead of dropdown list enabling the user to select from the list. In [4] Zlatko J Kovacic et al. developed GPA calculator using Microsoft Excel user-define functions. The system aimed to reduce the lecturers' workload and to balance the student-to-lecturer ratio because of the growing number of distance learning population. However, since it is in excel format, each student calculation must be saved in each file, thus making it hard to maintain. In O. Marques et al. [5] study presented the design and development of a Web-based advising system that supplemented the conventional

advising process within their university. The system's goals aimed to minimize repetitive tasks performed by advisors, to encourage students to adopt a proactive attitude towards advising, to make advising-related information available to remote students in a single place, in electronic format, and to minimize inconsistencies in the advising process. The system supports three different types of users (advisors, supervisors and admins), each of which had different privileges and allowed operations.

III. DESIGN OF THE SYSTEM

A. System Block Diagram

The block diagram of the designed marks management system is given in figure 1. The system accepts excel file as input. There are eight major processes that an AA can do in the system as shown below. All processes refer to a single database which holds the entire data of advisees, advisors, transcript and degree audit. The system produces PDF reports.
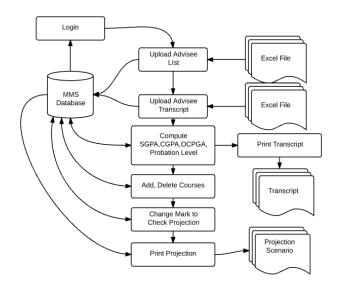

Figure 1. MMS Block Diagram for AA

B. SCT GPA Calculation

SCT Information Technology student brochure [6] explains the process of calculating GPA. It is basically the product of grade point and course credit hours as shown in the formula below:

$GPA = Grade\ Point\ x\ Credit\ Hours$

GPAs are rounded to the nearest 2 decimal points. GPA is calculated per semester, level and as a whole commonly termed as overall. Below are the formula used in calculating each GPA. Currently, the college has three academic levels, diploma, advanced diploma, and bachelor.

$$Semester\ GPA = \frac{Total\ Semester\ GPA}{Total\ Semeter\ Credit\ Hours}$$

$$Cumulative\ GPA = \frac{Total\ Level\ GPA}{Total\ Level\ Credit\ Hours}$$

$$Overall\ GPA = \frac{Total\ GPA}{Total\ Credit\ Hours}$$

Pure Math, College Algebra and Applied Math are non-credit (NC) courses. Student just needs to clear these courses. NC courses and transferred courses are not included in the computation of GPA. On the other hand, credit hours for withdrawn and failed courses are zero. Courses that do not belong to particular degree audit are also excluded in the GPA computation. Any student may repeat the course to get a better grade if he/she earns C, C-, D or F in the course for the first time. Accordingly, the old grade will be replaced by the new grade irrespective of the latter being lower or higher. The second attempt and the attempts that follow will be considered for calculating the GPA. The table below shows the grading which are considered in the calculation of student's GPA as mentioned in the brochure:

Table 1. Grading Scheme

Mark	Grade	Point
90 – 100	A	4.0
85 – 89	A-	3.7
80 – 84	B+	3.3
76 – 79	B	3.0
73 – 75	B-	2.7
70 – 72	C+	2.3
67 – 69	C	2.0
60 – 66	C-	1.7
55 – 59	D	1.0
0 – 54	F	0.0

The college uses Student Management System commonly known as the TCMS system. This provides capabilities for registering courses of students, keeping students' transcripts, building students' schedules, tracking of students' attendances, and managing many other student-related data needed by the college. However, the system does not provide tool for creating projection. Also, as mentioned earlier in this paper, there is no known standard tool that automates the verification of the TCMS's GPA computation and academic probation level identification.

C. SCT Probation Level Identification

Student will be under probation if his/her GPA is less than 2.0. Identification may vary based on the semester the probation is considered. For semester 1 and 2, the following pseudocode applies:

- If SGPA >= 2.0 and CGPA >= 2.0 then clears the probation
- Else if SGPA < 2.0 and CGPA < 2.0 probation level increases
- Else if SGPA < 2.0 and CGPA >= 2.0 student will go to probation 1 regardless of the current probation level.
- Else if SGPA >= 2.0 and CGPA < 2.0 Probation level increases

Semester 3 is probation freeze semester. Probation level does not increase regardless of the SGPA of the student. The following pseudocode applies:

- If CGPA >= 2.0 regardless of the SGPA, the student CLEARS the probation
- If CGPA < 2.0 regardless of the SGPA, the student RETAINS the probation level

D. MMS Projection Algorithm

The researchers started with a complex algorithm to calculate the projected SGPA, CGPA, OCGPA and probation level. Consider the first algorithm as listed below assuming that the transcript of the student has been uploaded in the transcript table.

1. Read the transcript information from the transcript table.
2. Compute and display the SGPA, CGPA, OCGPA and probation level.
3. Accept the courses to be projected.
4. Save the projected courses projection table.
5. Initiate a union command between the transcript table and the projection table and get the projected SGPA, CGPA, OCGPA and probation level.

With this approach, the system was returning correct computed values for short transcripts. However, for transcripts with more courses, like those students in advanced diploma and bachelor, the algorithm returns incorrect CGPA and OCGPA computation. It was also noted that there was system delay in terms of displaying the results. With these problems, the researchers revised the algorithm as follows:
1. Read the transcript information from the transcript table.
2. Compute and display the SGPA, CGPA, OCGPA and probation level.
3. Accept the courses to be projected.
4. Append the courses projected in the same transcript table and get the projected SGPA, CGPA, OCGPA and probation level.

The second algorithm works well and was returning correct computation. There was remarkable run time improvement in terms of displaying the results.

E. Graphical User Interface
Figure 2 shows the home page of the system. It contains a bootstrap carousel of three pictures. According to [7] carousel is an image slider. It is a plugin component and enables dynamic presentation of contents where text and images are made visible or accessible to the user. It can showcase huge amount of contents within a small space on the web pages.

Figure 2. MMS Home Page

Figure 3 shows the login page of the system. It contains two textboxes for the ID and the password of the user, and two buttons, submit and reset respectively. The system checks the login credentials of the user in the database. If the login is successful then, the user is directed to the advisee list of the AA, otherwise, an error message is shown.

Figure 4 shows the main page which contains the list of advisees of the user in a form of table, where student number, name, academic level, specialization, gender, mobile number, status and probation number are displayed. The system queries in the student details table to pullout the record that corresponds to the current user id and semester. Using PHP code, it displays the information in the page. The user can

update any advisee information, delete or add advisee by uploading the advisee list using a pre-defined excel format available by downloading from the existing TCMS system. The excel file can be in any name. The system validates the file before iteratively reading the columns and rows of the file. The system uses sentinel values to clean the data before saving in database. The researchers used PHPExcel class[8] which provides set of classes and methods that allows to write and to read from different spreadsheet file formats.
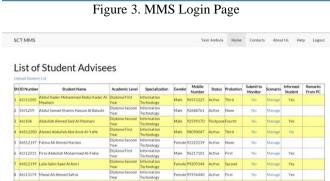

Figure 3. MMS Login Page

Figure 4. MMS Main Page

Figure 5 further gives the advisee details. It displays the student ID, student name, the name of the advisor, academic level, specialization, TOFLE/IELTS mark, GPAs and the probation level. In this form, advisor can upload the transcript of the student based on the pre-defined excel format, same concept was used in uploading advisee list. Once the system is able to read the courses from the transcript, the system will automatically computes the semester GPA, CGPA, OCGPA and the probation level of the student. Now the AA can compare the computed GPAs versus the GPAs that was uploaded earlier. If there are discrepancies between these values then, a manual computation is recommended.
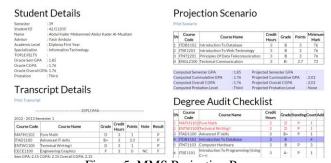

Figure 5. MMS Projection Page

The system maps the degree audit of the student based on his specialization and academic level. The system assigns corresponding colors and disables the add button based on the

mapping of the transcript and the degree audit. The system also calculates the total remaining courses per level. Below is the color legend used in the system:

Figure 6. MMS Degree Audit Color Legend

The advisor can now create scenario by adding courses to the projection. Alongside, the system checks the pre-requisite and equivalent of the courses. For AA to do projection, he needs to adjust the grade combo box and change the combination until he can get the desired projected GPA. The AA can remove the course from the projection by clicking the delete button. Figure 7 shows the printable report of the projection scenario which will be verified by the advisor and confirmed by the students.
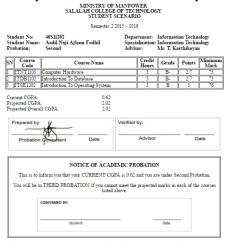

Figure 7. MMS Projection Scenario Report

IV. EXPERIMENTAL RESULTS

To check the validity and reliability of the system, the researchers conducted two stages of testing as listed below:

A. Stage 1 Alpha Testing
The researchers made use of test case to verify the compliance of MMS against specific requirement of the college. It consists of 56 test cases which includes preconditions, expected results and post-conditions. The researchers ran 20 test data. The system passed all 56 test cases with 3 recommendations for improvement. The recommendations were considered in the release of the system for the next testing.

B. Stage 2 Beta Testing
The website was hosted in SCT and was accessible in the internet. The system was launched from one department of the college of about 50 advisors and 700 advisees. Session variables, simultaneous access, website threshold were tested. GPAs computation worked well and probation level identification is perfectly fine. There were no issues in simultaneous access and session variables.

V. MMS VERSUS OTHER SYSTEM

The table below summarizes the differences of the old and the existing student management system the college to technology uses. Table 2. Comparison of MMS to Other Similar Systems

Indicator	Oracle System	CIMS / TCMS	MMS
1. Creating student course projection	No	Yes	Yes
2. Web-based system	No	Yes	Yes
3. Printing of course projection	No	No	Yes
4. Course projection records management	No	No	Yes

VI. CONCLUSION

The system clearly shows its capability to compute the GPA, determine the probation level of the student based on the courses he finished, and calculate projection based on the courses he will register. Since the college operates in the same way as the other technical colleges in the Sultanate, the system can be implemented in the other technical colleges too. The proposed system can also be used by the registration and time table committees to assess how many sections for a particular course they can be opened since the system holds those courses the student will be registering for the term.

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