A WEB BASED COURSE MANAGEMENT SYSTEM

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by
Mohan Kumar Rajagopal
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The Undersigned Faculty Committee Approves the

Thesis of Mohan Kumar Rajagopal:

A Web Based Course Management System

[Signatures]

Alan Riggins, Chair
Department of Computer Science

Joseph Lewis
Department of Computer Science

Kamal Haddad
Department of Finance

July 7, 2011
Approval Date
DEDICATION

I would like to dedicate this thesis to my parents, who have been an everlasting source of inspiration in my life. I would not have been able to achieve what I have without their support.
ABSTRACT OF THE THESIS

A Web Based Course Management System
by
Mohan Kumar Rajagopal
Master of Science in Computer Science
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The Course Management System web portal has been developed to facilitate a rich collaborative environment among students for online exams, assignments, reports generation and obtaining more knowledge on the courses in which they are currently enrolled. The web portal allows students to share documents, generate reports, take online quizzes/exams and evaluate themselves by accessing the grading system where they can view their current standing in the class. This advanced Course Management System enables the interaction among students and faculty to be enhanced and taken to a higher level from the technical standpoint. Research areas mainly involve the Reports Generation where faculty can customize the data and statistics and can easily generate reports in the various formats like pdf, rtf, docx, doc, html, xls, csv, etc. The online exams are provided with a rich User Interface (UI) where the students access their scores and the exams keys. This helps the students to know the solutions and to know more about the subject.
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CHAPTER 1

BACKGROUND

Many faculty have been continuously striving for an advanced course management system that facilitates an enhanced learning experience. Course Management Systems (CMS) fit the organization well when they can be easily customized and designed for the various scenarios and problems an organization may have. The use of Web based technology for developing course management systems has helped the students and faculty to become subject matter experts. Effective CMS are always in the technological forefront of universities as they help in delivering the subjects easily to the students.

A well developed Course Management System has all the features integrated so that the students have a single source to know everything about the courses in which they are currently enrolled. CMS help the students to upload/download documents which may include exercises, assignments, case studies, strategic papers, etc., and take online exams/quizzes, check grades, and generate reports. Online exams reduce the time of manually correcting papers and returning them to the students. Web based course management systems display the scores immediately to the students with the keys and feedback for the students which displays the comparison between the keys and the solutions that they submitted.

Online exams give faculty the flexibility to easily create new exams and assign them to the students. Automated correction benefits faculty in saving the time involved in manually correcting the papers and posting the results. Effectively, students get to know their results immediately and this helps them to focus more on their courses, based on the outcome of the exams. Additionally, Reports Generation always forms part of the latest and advanced course management systems. Faculty has to spend substantial time plotting the statistics of the class and querying the results based on input for the entire semester, and this proves to be a major commitment for the instructors. Reports generation tools help the faculty to customize the reports and select the data input based on which format the report can be generated in; the various available formats include pdf, rtf, xls, csv, docx, etc. Faculty
benefit from the customized web based report generation tools which help them to maintain semester records with much more precision and accuracy.

Course Management Systems should be designed and developed so that they have all the features well integrated and can be easily customized. This project aims to develop an advanced course management system that supports the facility to upload/download documents, online exams/quizzes, grade book and reports generation. This Course Management System reduces the time commitment for the faculty and students and helps them to easily handle multiple courses simultaneously. Faculty can focus more on creating challenging assignments and exams rather than giving the substantial time commitment needed with the traditional approach of manually correcting exams and generating reports.
CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The widespread use of Course Management Systems (CMS) has motivated educational researchers to find how CMS impact the students and faculty in order to improve the performance of these systems. In their investigative analysis, Harrington, Staffo and Wright found that there are five main categories concerning the use of an effective Course Management System: faculty motivations, benefits, perspectives, differing class formats, and issues and needs [7]. Firstly, CMS increase student efficiency as the students have online access to the course content and the learning persists outside the class 24/7. Secondly, the interaction among students and between students and faculty is enhanced. Thirdly, the student’s use of CMS helps the faculty to focus on advanced course designs. Faculty considers CMS as a tool with innovative teaching techniques. Additionally, the CMS have to be customized for different disciplines and course modules. This is proving to be a difficult task as every course has a different layout and grading assessment model. Lastly, learning the technical aspects of the CMS has always been a challenging task for the faculty and it would be even more difficult for them to implement it without technical support [7]. All the analysis clearly implies that an effective Course Management System has a positive impact on students’ performance and helps the faculty to focus on advanced problems and course curriculum during the traditional class hours.

2.2 LIMITATION OF TRADITIONAL APPROACH

The traditional approach to learning relied on aids such as basic power point presentations and manual lecture notes. Whereas, the web based CMS have all the lecture notes, course materials, exams/quizzes delivered online. Faculty need to have a lot of commitment and time to prepare the power point slides and evaluate the paper-based exams. This also means much more time for the students before they know their results when compared to the web based approach where the students get instant feedback on their exam
scores and the grades are available online. In their research, both Weber and Lennon found that Web based CMS provided similar or higher performance than the traditional approach [19]. The traditional approach lacks student interaction, and as a result student performance is hindered. In a Web based approach, students’ interaction is greatly enhanced with the usage of discussion boards where they can get their issues resolved by their peers and have online access 24/7. Faculty also can reply to issues which gives students an opportunity to work with a wide range of problems. The traditional approach does not have a centralized repository of all the course materials, whereas a Web based Course Management System has a centralized repository where all the lectures, assignments, and exercises are maintained and students have access to all these materials easily. Web based systems thus provide an organized access to all the course related documents which helps in improving student efficiency. With the web based technology, students get to take mock exams and sample quizzes before the exams, and this helps them to know the exam patterns and gain more knowledge on the subject. Additionally, McCarthy and Anderson found that instructors need to focus more on intellectual problems which help the students to increase their understanding and that web based systems can be employed to concentrate on the basics, and the traditional class approach can be used to focus on advanced problems [13]. The traditional class approach involving faculty lectures doesn’t focus on improving the students’ interaction with each other, whereas an advanced web based Course Management System is required for collaborative peer-peer learning.

### 2.3 Effectiveness of Web Based CMS

According to the research conducted by Donna Patterson on encouraging and assisting faculty in incorporating innovative classroom technologies: “Students felt that technology helps them feel more organized, absorb more material, and decipher the information with greater ease. The number one response from the student surveys was that they find learning with technology more interesting than sitting in a classroom with a dry erase board” [15]. Web based CMS provide instant feedback to the students and help them to analyze the results immediately. Communication between the students and faculty is greatly enhanced as students get a chance to resolve issues posted by other students and instructors. Web based CMS increase the efficiency of distance learning as students across
different locations can work collaboratively on their projects and come up with innovative ideas. CMS provide a variety of assessment models that include assignments, projects, strategic papers, and case studies when compared to the traditional option based exams and assignments. In their research, Bradford, Porciello, Balkon and Backus stated that a Course Management System like Blackboard possessed the following benefits: (1) Increased availability, (2) Quick feedback, (3) Improved Communication, (4) Tracking, and (5) Skill building [4].

Phipps and Merisotis cited three broad effectiveness measures for online course delivery: “student learning outcomes such as grades; student attitudes towards learning through distance (or technology-mediated) education; and overall student satisfaction with online delivery” [17]. Webster and Hackley found the following measures of effectiveness: “student involvement/participation; cognitive engagement; technology self-efficacy (belief in one’s own technological capabilities); perceived usefulness of the technology; and the relative advantage of online delivery” [20]. Students’ course involvement is greatly enhanced with the increase in the use of latest technologies for delivering course materials. Distance learning is easily accomplished with the usage of an effective Course Management System. External students tend to use online course materials more than the internal students who prefer classroom interaction and the traditional lectures.

Kekkonen-Moneta and Moneta reported on findings that using email and newsgroups for communication, online quizzes and participation in bulletin board discussions, and supplementing lectures with online practice quizzes have resulted in improved learning outcomes [11]. Discussion boards form an important part of an effective Course Management System. Instructors can grade their class participation percentage by tracking students’ participation in posting issues and resolving issues posted by other students. Online exams and quizzes help the students to take practice exams and get familiar with more topics. Instructors also use the online exams model as part of their grading assessments. Instructors can select from a variety of exam models including option based, essay type, short answers, etc.

McFarland, Herrington, Oliver and Hirschbuhl found that “carefully designed e-learning modules facilitate engaging interactions with the content materials and, in turn, foster higher-order learning outcomes” [9,10,14]. Instructors can track whether a student has
understood the e-learning module and can use this information for grading purposes. E-learning modules are carefully designed to cover every part of the lecture, and exercise questions are available as an integral part of the e-learning modules to help the students to have profound understanding of the concepts. E-learning modules also reduce the time for the instructors to prepare presentations and lecture materials as the e-learning modules can be reused and changed easily.

A web based Course Management System like Blackboard allows the instructors to accomplish effective online teaching principles. The seven principles of effective teaching that can be accomplished with a web based Course Management System include:

1. good practice encourages student-faculty contact;
2. good practice encourages cooperation among students;
3. good practice encourages active learning;
4. good practice gives prompt feedback;
5. good practice emphasizes time on task;
6. good practice communicates high expectations; and
7. good practice respects diverse talents and ways of learning. [6]

According to Roblyer, “Many students enroll in online programs to take advanced courses or to accelerate the pace of their study” [18]. Michael Klebl stated that a Course Management System like Moodle when implemented successfully “proved the possibility to support mixed mode learning scenarios” [12]. Students get their issues resolved through the CMS forums or discussion boards and this helps them to explore advanced topics with ease. Hybrid learning methodologies prove to be very effective for students and faculty and help them to pace their studies in an organized manner.

In their research about using Moodle to improve classroom communication, Perkins and Pfaffman found some key factors:

1. Moodle has improved and enhanced student performance by promoting and organizing communication among parents, students, teachers, administrators and the community;
2. Moodle has a robust online testing system that provides not only for automatic grading but also gives student formative feedback;
3. managing courses online has also helped teachers working on different sections of the same course synchronize their lesson planning;
4. using an online CMS can help to reduce distractions and roadblocks to science learning and improve communication with colleagues, students and parents;
5. for students, managing the course online prevents the usual misunderstandings about assignments, due dates, and other course requirements; and
6. important course information and materials can never be lost because they are online. [16]

Effective CMS like Moodle have achieved great success because of the fact that they are an available open source. An interesting innovation in software development has been
the Open Source Software (OSS) movement. OSS such as Moodle is free in the sense that people may not only use OSS freely but also study, change and redistribute it [16]. Open Source Software allows the programmers to access the source code and add their own customized functionalities. Moodle is the kind of OSS that allows the faculty of the educational institutions to customize the features that they want to use in their courses. Technical support is required for faculty to resolve the issues related with the usage of Course Management Systems. The use of CMS for pure online courses seems to be a little bleak. However, CMS when used with hybrid learning systems or blended methodologies provide equivalent or higher positive results on students’ performances. With the advent of the latest technologies and knowledge empowerment, well trained faculty can effectively use a Course Management System and deliver robust features to all the students which, in turn, will help them to be competent individuals and increase their technical expertise.

2.4 Course Management System and Student Performance

Student performances are measured in terms of the grades they obtain in the courses. Course grades are calculated based on several parameters that include assignments, quizzes/exams, projects and class participation. With the technological advancements, instructors have the flexibility of using the latest and most advanced Course Management Systems for measuring the various parameters on which a student can be assessed. Instructors can use the email options for communicating with the students, and important announcements are updated in the home pages of a Course Management System. Reports generation has been incorporated as part of the latest CMS, and it helps the instructors to analyze and generate statistical results.

Research in the field of advanced web applications has resulted in the development of many frameworks. Usage of these frameworks to develop CMS has facilitated a rich user interface which helps the instructors to easily learn and navigate through the application. In his research, Alavi reported that the final grades of students using computer mediated collaborative learning were significantly higher than students who did not use computer-mediated collaborative learning [1]. Hartman, Dziuban, and Moskal found that students in media-enhanced courses succeeded at a higher rate than students in traditional courses [8].
In his analysis, Arbaugh suggested that courses with content that can be presented in a collaborative learning structure might be better suited for web-based courses delivery than courses with more technical content [3]. Web-Enhanced courses are hybrid courses that combine elements of both traditional and online classes [2]. CMS help the instructors to have better access to the students as they get a chance to address every student’s issues through the collaborative learning approach. Some of the major Course Management Systems that are in use for improving student performance are listed below.

**Blackboard:** Blackboard is an advanced Course Management System which was developed and licensed by Blackboard LLC in 1997. The core of the academic suite is the Blackboard learning system, the Course Management System for classroom and online educational assistance. Blackboard offers Blackboard Commerce suite for financial institutions and Blackboard Academic suite which contains the Blackboard learning system. Blackboard is an easy to use system for educational instruction, communication and assessment.

**Moodle:** Moodle stands for Modular Object Oriented Dynamic Learning Environment and also a colloquial verb that describes the process of creative, non-linear tinkering that often is characteristic of online learning. Like all CMS, Moodle provides teachers with a variety of tools to support student learning and parental communication [16]. An important advantage of Moodle is that it is Open Source Software (OSS). Developers not only have access to the source code but also have the authorization to customize the software by adding their own functionalities.

### 2.5 Course Management System Features

Key features of a Course Management System include the following:

- **Documents Sharing:** Instructors using CMS have the option of uploading course materials in different formats including audio, video, and presentations, etc. The instructors’ login with the administrator credentials and when they select the documents page in the Course Management System, they are presented with the option of Upload Documents button which is not available for students. Instructors click in the Upload Documents button and are prompted to select the type of file they are uploading and a browse button to select the actual file to be uploaded. Instructors select the file and click upload. The file name and the type of the file are retrieved and a server script processes the data and writes the file onto the respective location. The server side script, after uploading the file in the location, also displays a link to
the file in the UI with which the students can download or open the documents uploaded by the instructors. Students are given a unique username and password for individual identities. All the list of documents uploaded by the instructors are categorized based on their types and are retrieved and displayed in an HTML form by the server side processing. Students can easily download or view their documents by clicking on the file link.

- **Online Exams/Quizzes:** Instructors have the flexibility to assign online exams for the students. Instructors select the number of questions and the quiz name for the quiz. After submitting this information, the responses are retrieved and the instructors are presented with a screen that has text boxes for typing the questions and the answer options. Every question is followed by four options from which the student can select the solutions. The instructors submit the questions and the solutions by clicking in the submit button. The questions are retrieved and a server side script presents the types of questions in a quiz format with the option to select the right solution for every question. After selecting the correct solution for every question, the questions and the correct solution for every question are retrieved and stored in the database. The instructors are given a confirmation page with the message that the exam has been created successfully and a link to the exam is displayed. Students can see the list of posted exams and they are presented with information which explains that the exam is taken/not taken. Students can take the exams by clicking on the appropriate links after which they are presented with the list of questions and their options in an HTML browser. Students complete their exam by clicking the submit exam button. The responses of the students are retrieved and the server side processing evaluates the student’s options with the right solutions given by the instructors and a final score is displayed to the student. Students are also presented with instantaneous feedback where the students get the final scores, keys for the exams and also the options that they selected.

- **Grade Book:** Administrator credentials are used by the instructors to enter grades for the students enrolled in their courses. Instructors are provided with an option to enter grades. Instructors get the list of students enrolled in their courses and they can enter the grades by manually typing in the values for every student which corresponds to a record in the database. Instructors have the flexibility to set the course parameters which determines the split up for the course grading. Students can view their grades from the grade book, but they are prevented from accessing the records of other students.

- **Reports Generation:** Instructors get two options for generating reports: Predefined reports and Customized reports. Predefined reports are generated from existing layouts defined by the developers. Instructors can generate reports for student grades and login information which is already configured for general course purposes. Customized reports are much more flexible by providing a UI for the instructors to select the data for which they want to generate reports. Instructors are also provided with the various options for sorting the data to be used for generating reports. Instructors can generate reports from a wide variety of different formats that include pdf, rtf, docx, doc, xls, and html. Customized report generation prove to be a
powerful tool for faculty as a considerable amount of time is saved in the statistical analysis of the entire course.

2.6 Disadvantages of a Course Management System

The technical expertise involved with web based CMS makes it difficult for instructors from non-IT background to create exams/quizzes and upload documents. Some of the major issues from student performance and internet security perspectives are discussed in the following sections.

2.7 Difficulty in Learning Software

As per a survey conducted in the University of Wisconsin system, inexperienced students from non-IT background find it difficult to use advanced CMS [5].

The study also found that instructors find CMS time consuming and inflexible. There is always a learning curve associated with the instructors and students in using web-based CMS which have been developed using the latest technologies and rich user interface design.

2.8 Compatibility Issues

Course Management Systems are not compatible with all the operating systems and in most cases are developed specifically for operating systems like Linux and Windows. Users find it difficult when configuring CMS in cross platforms. Open Source Technologies has an added advantage wherein users are free to customize the software and use it across different platforms as per their requirements.

2.9 System Inefficiencies

Bandwidth usage is a great concern with Course Management Systems as uploading/downloading documents, taking exams simultaneously, and generating reports takes a considerable amount of internet bandwidth. Systems tend to get slower with an increased number of users and parallel processing. Database maintenance is also an issue under consideration with the usage of Course Management Systems.

2.10 Cost

Costs associated with Course Management Systems are proportional to the number of features that are customized and integrated. Educational institutions allocate high budgets in
configuring and managing CMS. An effective Course Management System like Blackboard, with an average set of features integrated, is estimated to cost $200,000 to $400,000 per year.

2.11 CONCLUSION

This literature survey demonstrates a comparison between traditional learning and web based learning methodologies using CMS. Effective analysis and studies indicate a positive approach and increasing demand for web based CMS as the integrated features solve the major limitations involved with traditional classroom learning. However, because of the technical difficulties and costs involved with CMS, students and instructors find it time consuming and often they are inflexible in learning the technology involved. Improved training and customized features with rich and easy to use user interface design for the latest web based Course Management Systems may improve student performance and reduce instructors’ time in managing coursework.
CHAPTER 3

IMPLEMENTATION

This chapter gives the implementation details of the Web-Based Course Management System. Java/J2EE Technologies involving JSP and Servlets are used for developing the Course Management System. Implementation using JSP and Servlets helps in achieving complete dynamic content of the CMS. It facilitates easy access to the Databases through the RTJDBC calls.

The following features are implemented as part of the thesis:
1. Upload Documents (Admin/Faculty).
2. Download Documents (Student/Admin).
3. Create Quiz (Admin/Faculty).
4. Edit Quiz (Admin/Faculty).
5. Delete Quiz (Admin/Faculty).
6. Take Quiz (Student).
7. Create Course Plan (Admin/Faculty).
8. Edit Course Plan (Admin/Faculty).
9. Add/Edit Grades (Admin/Faculty).
10. View Grades (Admin/Faculty).
11. Create Pre-Defined Reports (Admin/Faculty).
12. Create Customized Reports (Admin/Faculty).

3.1 DATABASE

The project requires ten tables to be created in the database on the server on which the application is hosted. Table 3.1 describes the tables used in the project. MySQL is used as the backend database as it is easier and more flexible to implement it with JSP and Servlets. All these tables facilitate the implementation of four different modules resulting in multiple Entity Relationship Diagrams.
### Table 3.1 Descriptions of Tables Used

<table>
<thead>
<tr>
<th>Table Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UserInfo</td>
<td>This table is used to store the login information of every user added by the administrator.</td>
</tr>
<tr>
<td>Quiz</td>
<td>This table is used to store information about a quiz created by the administrator and includes the following data: Quiz Name, No of questions and course information</td>
</tr>
<tr>
<td>Questions</td>
<td>This table saves the questions entered by the administrator for each quiz and is a child table of the Quiz Table.</td>
</tr>
<tr>
<td>Solutions</td>
<td>This table is used to hold the solutions of each question entered by the administrator and is a child table of Questions.</td>
</tr>
<tr>
<td>Student_Quiz</td>
<td>This table saves the information of every student's exam scores.</td>
</tr>
<tr>
<td>Student_Submitted_Answers</td>
<td>This table is used to save all the solutions entered by the students and is used for verification purposes.</td>
</tr>
<tr>
<td>Course</td>
<td>This table holds the course information.</td>
</tr>
<tr>
<td>Columns</td>
<td>This table is used to save all the different course parameter information for different courses.</td>
</tr>
<tr>
<td>CourseColumns</td>
<td>This is an associative entity between the Course and Columns table and holds the course parameters associated with every course.</td>
</tr>
<tr>
<td>StudentGrade</td>
<td>This table is used to save the scores obtained by students in different course parameters.</td>
</tr>
</tbody>
</table>
3.2 Upload Documents

Administrators have the privilege to upload documents that can be used by the students. Administrators generally upload lecture documents, assignment materials, exercises and power point presentations. The upload document button is available under the documents tab in the application software only for the administrators. User role is evaluated by the application to check for administrators and then the administrator is allowed to select a file and specify the type of file to be uploaded. Validation is performed to ensure that the file name is selected and file type is specified before uploading the document. A confirmation message displaying “Document is successfully uploaded” is displayed to the administrator and the uploaded document is listed under the corresponding file sections for download by the students. Figure 3.1 explains the scenario involved in uploading documents to the application.

Figure 3.1. Upload document.
### 3.3 Download Documents

Students have the option to download documents uploaded by the administrators. The application software validates the user role and then students are allowed to download the documents. All the uploaded documents are displayed in a list and categorized based on the file types specified by the administrators. Students can download files by simply clicking on the file names from the list. An operating system dialog box is displayed after clicking the file names, and students can select from open or save file options to download the file in the specified locations. The Download Documents scenario is explained in the diagram shown in Figure 3.2.

![Download Document Diagram](image)

**Figure 3.2. Download document.**

### 3.4 Add Quiz/Exam

The system administrator has the Add Quiz option to create new exams for the students. The application software validates for an existing quiz and allows the administrator
to add new exams. After the validation, the administrator is presented with a list of text boxes to type in the questions and options associated with each question. Every question has 4 subtext boxes to type in the multiple options. The number of question text boxes is the same as the number of questions entered by the administrator while giving the quiz name. The application software also validates for duplicate questions within the same quiz and duplicate solution for the same question. After entering the questions and options for every question, the system administrator is presented with the questions and options he or she entered in the actual exam format. The administrator will select the right solution for every question by clicking in the correct option and then submits the quiz. The questions, options and the right solution associated with the questions are retrieved and stored in the database for later evaluation. Figure 3.3 clearly explains the scenario associated with Add Quiz/Exam.

3.5 **Edit Quiz/Exam**

After creating the quiz, the system administrator has the option to change the questions, options and the right solutions associated with the questions in the created quiz. The administrator is presented with the list of created quizzes and he or she can edit the quiz by simply clicking on the corresponding quiz names. After clicking the quiz name to be edited, the system administrator is presented with the added questions and the solutions associated with the questions in an editable format. The administrator can update the questions, solutions and then submit the quiz again. All the changes are retrieved and saved in the database. Students who take the edited quiz are presented with the updated questions and solutions of the quiz. Figure 3.4 explains the edit quiz scenario associated with the administrator.

3.6 **Delete Quiz/Exam**

The system administrator can delete the quiz which is outdated or no longer required for the course. The system administrator can simply click the delete button displayed next to every quiz. After clicking the delete button, a confirmation pop-up is displayed with the quiz name and quiz ID to be deleted. The quiz is deleted only upon the confirmation of the system administrator. Figure 3.5 explains the delete quiz/exam scenario in detail.
Figure 3.3. Create quiz/exam.
Figure 3.4. Edit quiz/exam.
Figure 3.5. Delete quiz/exam.
3.7 **TAKE QUIZ/EXAM**

Students are presented with the list of exams created by the administrator. Quiz status is displayed next to every quiz which informs the students that the quiz has been taken/Not taken by them before. Students can start taking the exam by simply clicking the exam name after which they are presented with the list of questions and multiple choice options. Students can submit the exam by simply clicking the submit button. All the answers specified by the students are retrieved and evaluated with the correct solutions in the database. The scores are displayed instantaneously to the students on the top left corner of the submitted quiz. Students are also presented with the keys for the exams and the solutions that they answered so that they can understand their mistakes and the rationale for their scores. The exam status is changed so that the students are not allowed to take the exams again. Figure 3.6 clearly explains the take exam scenario associated with the student.

3.8 **CREATE COURSE PLAN**

System administrators can create course plans as part of the grade book feature. Application software verifies the user role and the create course plan option is available for the administrators. The number of course parameters is specified and then the user is directed to the course setup user interface where the different course parameters are entered. Possible points per parameter, type name and the number of each type is validated. All the values are retrieved and saved in the MySQL database. Figure 3.7 explains the create course plan scenario in detail.

3.9 **EDIT COURSE PLAN**

Once the course plan is created, the application software provides the flexibility to edit or change the course parameters at any given point of time. System administrators navigate to the grade book feature in the application and select edit course parameters option. They are presented with a window/pop-up which allows updating the number of course parameters. The course setup screen retrieves all the added course parameters in an editable format and the administrators can change them by simply updating the parameters and submitting them. All the changed values are retrieved and updated in the database. Figure 3.8 describes the edit course plan scenario in detail.
Figure 3.6. Take quiz/exam.
Figure 3.7. Create course plan.
Figure 3.8. Edit course plan.
3.10 Add/Edit Grades

Once the course plan is created by the system administrator, all the course parameters are retrieved and displayed in the grade book. The grade book displays all the student names enrolled in the course in rows with their corresponding course parameters in columns. System administrators can now enter the scores obtained by the respective students in different course modules. After entering the scores, the system administrator can save them by clicking the submit button. All the scores are retrieved and stored in the database for the corresponding students by means of one to one mapping. Figure 3.9 explains the add/edit grades scenario.

![Figure 3.9. Add/Edit grades.](image)
3.11 View Grades

Students have the view grades option in the grade book feature where they can access their grades/scores entered by the instructors. They navigate to the grade book feature and select view grades options which will display all the scores related to different course modules. Grades not entered are usually indicated by hyphens (-). Students are restricted from accessing their peers’ grades and therefore they can see only a single row displaying their scores. Students cannot edit, change or delete scores submitted by the administrators. Figure 3.10 describes the view grades scenario in detail.

Figure 3.10. View grades.
3.12 CREATE PRE-DEFINED REPORTS

The Reports Generation form is an important part of this thesis. Instructors perform the statistical analysis on an exam, calculate class average and generate individual results for analyzing student performances. Jasper Reports, advanced reports generation frameworks, are used for generating multi format reports. The reports layout are specified in terms of xml files and the data related to the corresponding reports are retrieved from the databases and filled into the xml specified layout and displayed to the administrators in a browser. The administrators can then save the generated reports in different formats including pdf, xls, doc, docx, csv, html, etc. Administrators can select from a set of pre-defined reports for analysis. Figure 3.11 clearly describes the report generation scenario in detail.

Figure 3.11. Generate pre-defined reports.
3.13 CREATE CUSTOMIZED REPORTS

The second set of reports generation is classified as customized reports. Administrators can generate reports by specifying different inputs for the same Jasper Report xml format. System Administrators select customized reports from the reports engine feature and they are presented with a user interface for customization. They can select the different user names; sort by fields, exam names or in general, all for generating reports. After customizing the inputs required for report generation, all the values are retrieved from the user interface and results are queried from the database based on the collected values. Different reports are thus produced for the same xml layout and the number of reports that can be generated is proportional to the input combinations. Generating customized reports prove to be an important tool for the instructors as they can easily generate individual statistics by simply selecting different options in the user interface. Jasper Reports allow this sort of customization and helps the users to achieve greater flexibility with multiple format designs. Figure 3.12 explains the customize report generation.

Figure 3.12. Generate customized reports.
CHAPTER 4

GRAPHICAL USER INTERFACE

The application software is developed using Jsp, html, JQuery to ensure rich GUI and allow instructors to add exams and course plans easily. This chapter explains the graphical user interface of the entire application. See Figures 4.1 to 4.21 for the graphical user interface. The customized report shown in Figure 4.21 is generated by selecting username as kumar and sorted by the ascending order of the exam scores.

Figure 4.1. Login.
Figure 4.2. Upload documents.

Figure 4.3. Download documents.
Figure 4.4. Quizzes.

Figure 4.5. Quiz setup.
Figure 4.6. Create quiz.

Figure 4.7. Specify solutions.
Figure 4.8. Quiz confirmation.

Figure 4.9. Edit quiz.
Figure 4.10. Take quiz/grading.

Figure 4.11. Delete quiz.
Figure 4.12. Grade book.

Figure 4.13. Create course plan.
Figure 4.14. Edit course plan.

Figure 4.15. Add/Edit grades.
Figure 4.16. View grades.

Figure 4.17. Reports engine.
Figure 4.18. Select pre-defined reports.

Figure 4.19. Pre-defined report generation.
Figure 4.20. Customized report generation UI.

Figure 4.21. Customized report generation.
CHAPTER 5

CONCLUSION

5.1 FUTURE ENHANCEMENTS

The application software has well-integrated features and could prove to be an important software tool for instructors. However, there are a few areas which can be focused on for future enhancements in this project. Research areas may involve customizing the user interface, which when implemented should be capable of generating xml files required for generating multi format reports using jasper reports frameworks. Currently, IReports application software is used for generating xml files. IReports require the users to have software knowledge which might be a critical issue for instructors from non-computer science backgrounds. A suitable user interface when developed should provide a simple drag and drop with java swing widgets suitable for generating xml layouts, thus handling the IReports technical issues. Emails and discussion boards when integrated with this effective web based Course Management System can provide greater flexibility to instructors and can result in increased student performances.

5.2 CONCLUSION

This web based Course Management System was developed with the objective to build a rich user interface which facilitates easy access for instructors and students. Instructors require less technical expertise to use the application software and they can easily create exams, upload documents, set up course parameters and use the grade book feature to add/edit grades for the students. This effective Course Management System when put into use will have a positive impact on student performance and when integrated with extended features will prove to be a valuable tool for advanced learning methodologies.
BIBLIOGRAPHY


