

Automated Course Management System

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Abstract— Recent developments in computer networks and communications have brought a great change in the E-learning and course management systems. This change has brought the teachers and the learners closer than they were ever before. The traditional teaching methods have been getting replaced by the new technologies and methods. In E-learning, in particular, the course management system plays an important role. As the availability of internet has increased, people have become even more dependent on it. In that context of development, the course management system should be designed in such a way so that the users experience less complexity while using the same. In our work, a hassle-free technique to design a course management system where all the facilities and services needed by the stakeholders are accessible at one place, has been proposed. Stating from the classroom creation to manage and maintain the classroom have been made even more easier and secured.

Keywords - online course management system; e-learning; learning management system; online classroom; course content management

I. INTRODUCTION

In recent years, the rapid development of Computer Aided Instruction (CAI) has been playing an important role in modern teaching management system. Traditional teaching methods (e.g., face-to-face teaching) is not providing enough support for the learners to engage towards the course. Consequently, many online social networking sites and some other course management sites that are based on the platform of WWW applications are getting popular among students and teachers [1]. Social networking sites such as Facebook, Google+, Twitter, etc., in addition to hosting marketing, personal sharing, and/or social events have started to host E-learning services. There are over 1.86 billion active Facebook users according to the report of monthly active users in Facebook till January 2, 2017 [2]. As these social networking sites allow the users to do multiple activities other than E-learning, these sites are not an ideal place for the teachers and students to interact with each other for academic purpose.

In 2013, Student Experience and Expectation of Technology stated in its survey that the twenty-first century students maintain a significant digital engagement. In that survey, it was found that 96% of the students had access to a laptop or a desktop computer at home, and 82% had access to a smartphone [3]. These data stipulate that students utilize these digital devices in almost every aspect of their lives including their learning. It, therefore, is a better and safer undertaking in general to design and develop an online course management system for all educational institutions. Most of the top

universities are using their own course management system. It is not a good idea to share the university data (e.g., student and instructor information) to a third-party web application for a course management service. An institution has its own user (e.g., students, teachers, employees) data and those are private and exclusive in nature. Using these data, an institution can develop and maintain its own online course management system for its users.

An existing online education system in general exhibits integrated network sharing of teaching resources, teaching resource management, video courses, and teacher-student interaction. As of today several virtual learning models have been designed and implemented in different environments [4-8], and these models are being constantly upgraded and improved when used in real-world situations. A course management system is easy to use and is equipped with appropriate teaching aids, and thus, to a large extent, caters for the requirements of both the instructors and students in actual learning environment. For example, it has the capability to introduce syllabus, update bulletin board, preset courses, search for available data and information using search engine, provide abundant reference materials, traditional textbooks and multimedia data, offer simple editing facilities, emerging tools for exhibition and exchange such as built-in blog, and real-time communication tools such as online communication, message board, and BBS, so as to facilitate timely communication between the instructors and students. In addition, it can support teaching assistance modules such as exercise module, homework module, download module, etc. However, the existing models reveal some of the following difficulties:

- An instructor must create a classroom first and generate a corresponding unique classroom code,
- All of the students of a particular class of a particular instructor are required to be enrolled to the classroom using student email address or an unique id, and
- Students need to use their registered email addresses to login and use that unique classroom code to join the class.

To address the above difficulties, a scheme to pursue automation of the classroom creation part has been proposed. Teaching methods, interactions between instructors and students, and course management methodologies vary university to university. In this paper, a design of an online automated course management system (ACMS) is developed for North South University, the first private university in Bangladesh. Most of the private universities have open credit

system for taking courses. The system using which a student takes courses from among all the offered courses in a semester is known as the Advising System. A proposal has been introduced by the authors as a novel hassle-free way to design a course management system which will be integrated with the Student Portal and Teacher Portal accounts so that all the services can be found at one place. The system's structure is based on Windows, Apache, MySQL, and PHP (XAMPP). In addition, jQuery, Ajax, and JavaScript are also used in the front end.

In brief, the major contributions of this work towards developing a ACMS are:

- Introduction of an automated classroom creation methodology
- Integration of all essential classroom management modules
- Establishment of easier communication between instructors and students

The remaining of the paper has been arranged in four distinct sections. Section II briefly discusses about the related previous works in this area. Section III showcases the proposed design in details. Section IV presents the details of implementation of the proposed work and Section V presents the final thoughts on the topic and the suggestions for future work in the related field.

II. RELATED WORKS

Learning and Management System (LMS) is a software application that enable lecturers and system administrator to carry out administration, documentation, tracking, reporting and delivery of E-learning courses [9]. In some literatures, interaction is also described as an essential function that must be provided in LMS [10-12]. In the area of online social networking, some researchers shift their focus from traditional e-learning to social networking based e-learning, due to the belief that it can provide better interaction [13-15].

In a recent work, online learning and course management system have been designed using social networking sites, i.e., Facebook. The teachers and the students interact directly through Facebook without login or registration as the authors used the Facebook API. Users do not need to provide their personal information as the biography is pulled from Facebook [1].

Moodle and Blackboard are two totally different learning management systems when compared to the course management approaches [16]. The full form of Moodle, i.e., Modular Object-Oriented Dynamic Learning Environment, indicates that the course management approach is modeled, and is dynamic and object-oriented. The course manager can add/remove the model of learning activities, which makes it is a very flexible learning management system. Compared to Moodle, most of the functions in Blackboard system are not that flexible [17]. Moodle is a General Public License (GPL) open source learning platform whereas Blackboard is a business package system.

Engrade is an online gradebook and record keeper that allows teachers to manage their classes online as well as post grades, assignments, attendance, and upcoming homework for parents and students to see. The Engrade suite provides a gradebook that automatically calculates grades and provides tools for custom grading scales and weighing assignments, an attendance book that automatically emails parents with absences, a homework calendar for students and parents, and online reports where students can view their grades, homework and attendance in real time [18]. Engrade was free until 2016 when it became a paid service.

III. DESIGN OF ACMS

The database that has been used, was acquired from the Information and Technology Department of North South University (NSU). Only the Advising, Student, Teacher, Course table's schema diagram have been used to prepare the Advising Data.

No individual sign-up system has been kept in the proposed system. Since all the active teachers and enrolled students have their student and teacher portal accounts, no further process step is introduced for classroom creation. The proposed system is designed to integrate the existing students' and teachers' portals of North South University. The concept of one account for all services has been implemented, like Google uses for its services.

An Admin panel has been incorporated for creating new courses, and adding new teachers and students. Admin Panel is responsible for giving the new teachers and students their username and password. Fig. 1 shows the basic system structure.

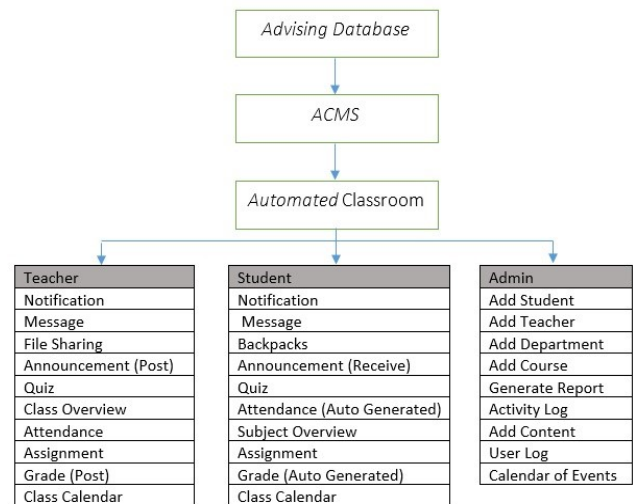
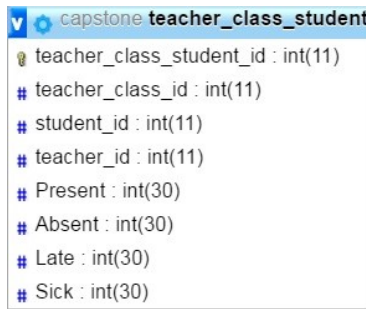


Figure 1. System design flow diagram.

A. The Database

The system is designed based on the Advising Table as one of the major objective was to make the classroom management smoother. At the beginning of a new semester, each student advises his or her own courses by himself or herself. After this advising process, these data are saved to Advising Table of the database. In the developed system, it is named as

teacher_class_student table. Fig. 2 shows the attributes of the teacher_class_student table and also the constraints.



Attribute	Constraint
teacher_class_student_id	int(11)
teacher_class_id	int(11)
student_id	int(11)
teacher_id	int(11)
Present	int(30)
Absent	int(30)
Late	int(30)
Sick	int(30)

Figure 2. A snapshot of the teacher_class_student table's structure.

The aforementioned teacher_class_student table is created by the joining three other tables. They are: teacher_class, student and teacher tables. The structure of these three tables are shown in Fig. 3.

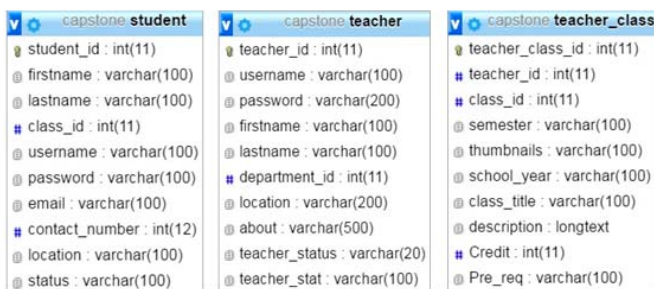


Table	Attribute	Constraint
student	student_id	int(11)
	firstname	varchar(100)
	lastname	varchar(100)
	class_id	int(11)
	username	varchar(100)
	password	varchar(100)
	email	varchar(100)
	contact_number	int(12)
	location	varchar(100)
	status	varchar(100)
teacher	teacher_id	int(11)
	username	varchar(100)
	password	varchar(200)
	firstname	varchar(100)
	lastname	varchar(100)
	department_id	int(11)
	location	varchar(200)
	about	varchar(500)
	teacher_status	varchar(20)
	teacher_stat	varchar(100)
teacher_class	teacher_class_id	int(11)
	teacher_id	int(11)
	class_id	int(11)
	semester	varchar(100)
	thumbnails	varchar(100)
	school_year	varchar(100)
	class_title	varchar(100)
	description	longtext
	Credit	int(11)
	Pre_req	varchar(100)

Figure 3. A snapshot of the student, teacher, teacher_class table's structure.

B. Classroom Creation

The after advising data have been used to make the classroom creation automated. From the aforesaid table (teacher_class_student, student and class table), an SQL query is run to generate classrooms. Fig. 4 is the SQL query for creating the classroom. Each classroom has a dynamic classroom page. This is the unique part of the proposed work which gives the users more relaxation in classroom creation.

```
SELECT * FROM teacher_class_student
LEFT JOIN student ON student.student_id = teacher_class_student.student_id
INNER JOIN class ON class.class_id = student.class_id
where teacher_class_id = '$get_id' order by lastname
```

Figure 4. A snapshot of the SQL query that creates the classroom.

No individual sign up is required to enroll in a classroom as a student or to create any classroom. Teachers will view and manage their classrooms after the student's advising is done. A teacher will be the admin for their each of the courses for posting assignments, grades, announcement etc. After login, teachers have notification, message, backpack, add downloadable, announcement, assignment and quiz module in their home page.

From the student's end, students will have access to their classroom after they complete their advising for the course.

Without entering a classroom students can have the access to notifications, messages, backpacks etc. modules.

C. Core Modules

a) Notification Module

This module is common in both teacher's and student's end. When a teacher posts an announcement, assignment, quiz or share any file all the students within the class get notified. In the student's end, when a student submits an assignment, or a quiz, the teacher of the corresponding class gets the notification.

b) Message Module

A teacher can send message to any class or any individual student. Communication between active teachers is also possible. Student can send message to his or her classmates and teachers only.

c) File Sharing Module

Teachers have only the privilege to share any type of documents (.pdf, .doc, .ppt etc.) and media file (.mp4, .flv, .avi, .wmv etc.). Only students within the class can view and download those materials. This module can be accessed within the classroom and in the teacher's homepage.

d) Announcement Module

Only teachers can post announcements and students can only view them. A teacher can send same announcement to multiple classrooms if the announcement is sent from the home page. If the announcement is sent within a classroom, then the announcement is visible to only that class students.

e) Quiz Module

Teachers can post same quizzes to multiple classrooms if the quiz is created from the home page. For creating a quiz, teachers need to set the quiz title, marks, duration. Teachers are to set questions and answers for each question. Students quizzes count down will start from the time when they open the quiz question.

f) Subject Overview Module

This module is available within each classroom. This module is for the detailed information about each course. Teachers have multiple options to provide the detailed information about a course. They can directly share a course outline file or they can type the course information. Student can view or download the information about the course that from there, they will have the information about the course.

g) Attendance Module

This module is available within each classroom. Four attendance options have been included in the present system (namely, present, absent, late, and sick). These four options ensure the details information about each student. These options have

impacts in the Grading Module too. Attendance is saved in the database on the current daytime. Student can only view their attendance. And there is a count system that counts the number of times each student is absent or present or late etc.

h) Assignment Module

This module is available within each classroom and also in the homepage of the teachers. While posting an assignment to any class a teacher has to provide the deadline, marks, title, and description (if any). Students will get notification for any newly posted assignments. The assignment submission window will remain open until the deadline and there is a countdown counter in the assignment submission page.

i) Class Calendar/ Event Module

A teacher can create any event, such as, Midterm Exam, Quiz etc. and specify a timeline. A calendar system has been incorporated in this module which marks the events on that appointed date. This acts as a reminder for the teachers and students for any particular event of the course. Students within that class can view the event. And prepare themselves for the event.

j) Grade Module

This module can only be accessed within a classroom page. Two other options have been added for this module for the teachers. Teachers can create new poll (Mid 1, Mid 1, Final, Quiz1, Quiz 3, Assignment 2 etc.) with full marks and the poll weight (%) or they can view and update previous polls. Some hand-written quizzes or assignments can be taken by the teachers. That is why assignment, quiz, etc. are also kept as poll items. After creating a new poll, students list is shown with a blank text box against each student where a teacher has to give the mark. Teachers can edit the poll weight, full marks and the students' marks. Students can only view their poll's marks. All the polls are listed in a table in the student's end. Finally, a teacher can generate the final grade according to the grading policy of the university. Attendances, quizzes and assignments marks are taken from their corresponding module.

IV. IMPLEMENTATION AND THE SYSTEM

In this section, the implementation of the system is illustrated with some representative screenshots of the automated course management system. This approach is taken to explain the features of the system.

The desired implementation of the system is based on Codeigniter framework, which is a PHP framework [19], the programming language is PHP for web server-side programming and JavaScript, CSS and JQuery for web front-end programming. The database used in the system is capstone, which is a MySQL database.

The main interface for all type of users is shown in Fig. 5. After successful login, different types of users will be redirected to their own homepages. No sign-up option is available for the users. The reason is already discussed regarding ACMS.

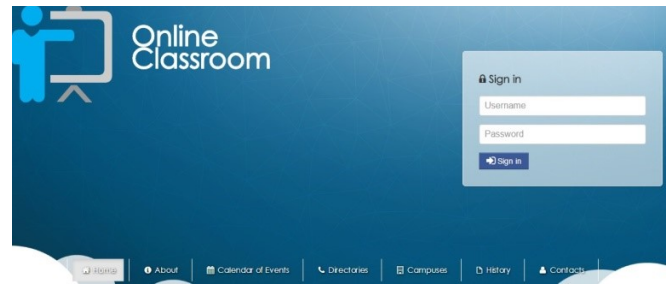


Figure 5. Main interface of ACMS.

Fig. 6 is visible after successful login. In the middle, all the courses of the current users are shown and in the left side, notification, message, backpack, file sharing, announcement, assignment, quiz etc. modules are listed.

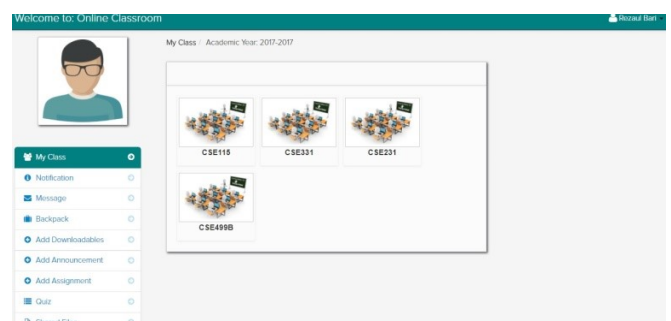


Figure 6. The instructor's homepage.

Fig. 7, is a dynamic page. Students list will be shown after clicking a classroom from the teacher homepage. Subject overview, attendance, file sharing, assignment, announcement, class calendar, grade modules are presented here.

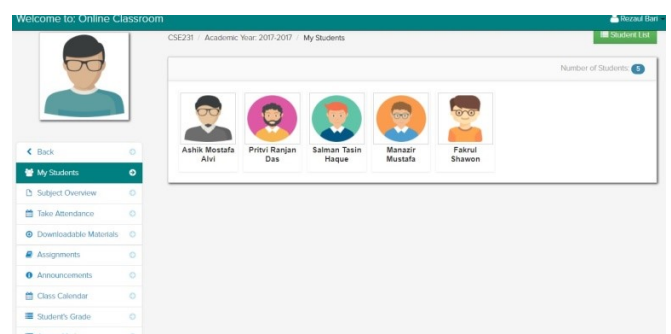


Figure 7. The classroom homepage from the instructor end.

Fig. 8 illustrates the homepage of a student after a successful login. All the courses of the students are listed in the middle and the notification, message, backpack modules are itemized in the left sidebar.



Figure 8. The student homepage.

The classroom homepage is shown in Fig. 9 from the student's end. Classmates list will be shown in the middle with subject overview, attendance, file sharing, assignment, announcement, event, grade modules in the left sidebar.

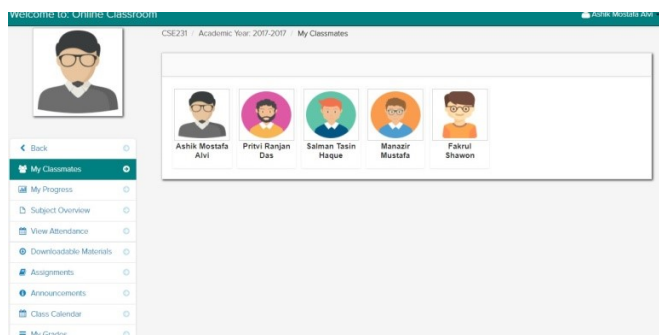


Figure 9. The classroom homepage from the student's end.

Fig. 10 and Fig. 11 demonstrates the attendance module: Fig. 10, is from the teacher's end and Fig. 11, is from student's end.

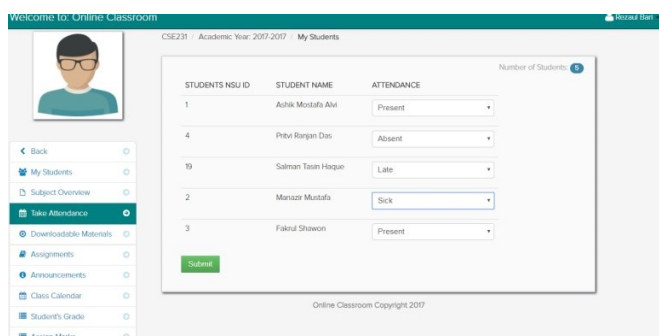


Figure 10. The attendance page from the teacher's end.

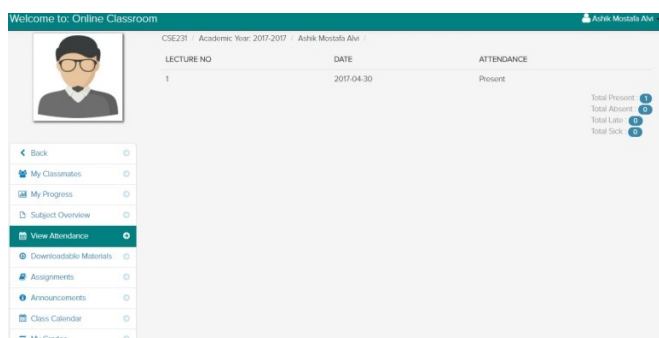


Figure 11. The attendance page from the student's end.

Screenshots (Fig. 12 - Fig. 17) of some of the core modules are given below.

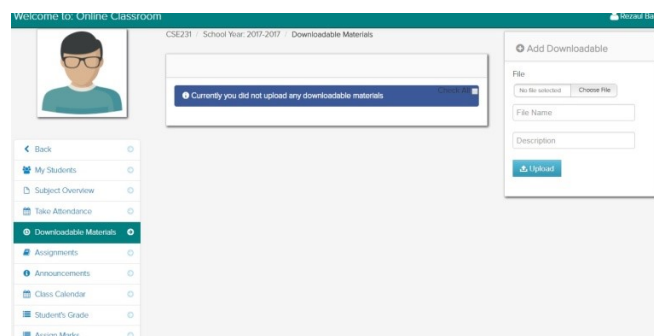


Figure 12. The file sharing page from the teacher's end.

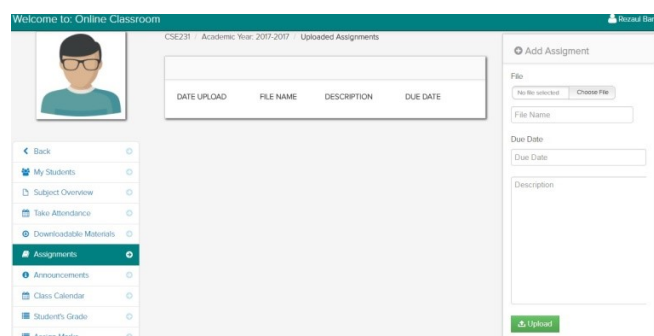


Figure 13. The assignment page from the teacher's end.

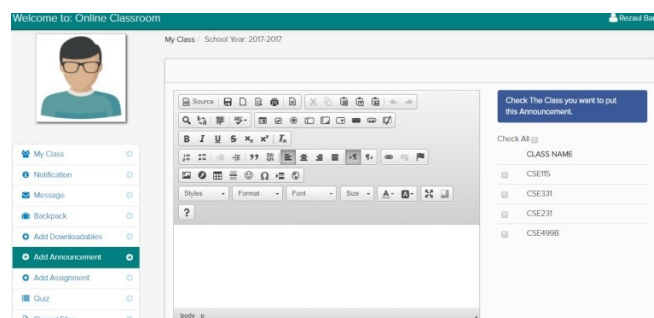


Figure 14. Screenshot of the announcement from teacher's end.

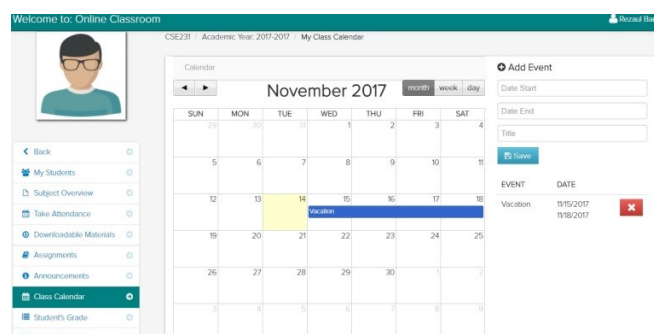


Figure 15. The event creation page from the teacher's end.

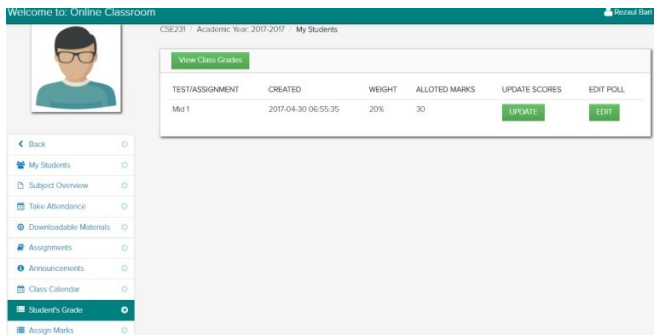


Figure 16. The poll viewing and editing page from the teacher's end.

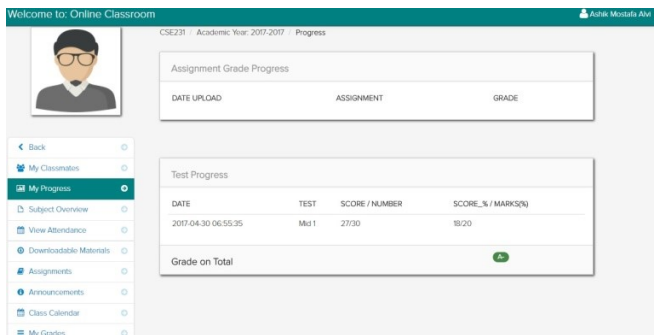


Figure 17. The final grade page from the student's end.

V. CONCLUSION AND FUTURE WORK

From the description of the above designed and developed system, it can be concluded that the proposed system is a hassle-free automated classroom management system with all the LMS features. It is a highly secured system as there is no outside or third-part involvement in the system. It uses the central database of the university and, as such, creation and maintenance of an additional database is not required.

Most of the world's top universities are using their own classroom management system to address concerns of security and privacy. An idea has been introduced in this paper to design an automated but simple course management system for universities offering open credits without condoning the security and privacy issues.

In the future, the central Advising System can be integrated in the existing system so that the course management system can circumvent dependence on the advising database. The online tutorial sharing and online examination taking modules can also be integrated in the system. These works would make the designed system even more complete.

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