MIS for Blended MOOCs on IITBombayX

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by

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Abstract

Multiple Institutes are partnering with IIT Bombay to offer blended MOOCs. Students will study the online course on IITBombayX, and will also study the same course normally in their Institute. Final grade will be based on the composite performance of students, in the online assessment, and in the tests/exams at the Institute. This system will help teachers of engineering colleges in India for assessment of blended MOOCs. The teachers from various institutes participating in the blended MOOCs, will be able to generate a composite mark sheet for the particular course by giving certain weightage to online assessment along with their regular university assessment. For example, a certain portion of online assessment, say 20% to 30% can get incorporated in final university exam grading. This system can also be integrated with Moodle for generation of the grade report.

Chapter 1

Introduction

1.1 Definitions and Abbreviations

- Admin: Administrator, responsible for the efficient maintenance of the system.
- Instructor: Teaching course in engineering institute.
- CMS: Course Management System.
- LMS: Learning Management System.

1.2 Classroom Models

1.2.1 Conventional Classroom

Conventional Classroom is concerned with the teacher being the controller of the learning environment. This provides face to face group interaction, permitting discussions, spontaneous questions, and synchronized attention of all students. This environment allows the instructor to precisely determine the aims, content, organization, pace and direction of a presentation. The instructor can arouse interest in a subject by giving some real life examples. Today in engineering education, a course is typically taught in a semester long duration, ending with a final examination. Scheme of marking/grading is predefined. Encourages one-way communication, therefore, the lecturer must make a conscious effort to become aware of student problems and student understanding of content without verbal feedback.

1.2.2 Flipped Classroom

Flipped classroom is an instructional strategy and a type of blended learning that reverses the traditional educational arrangement. The flipped classroom intentionally shifts instruction to a learner-centered model in which class time explores topics in greater depth and creates meaningful learning opportunities, while educational technologies such as online videos are used to deliver content outside of the classroom. Problem solving happens at in lecture hour inside class room. One of the most prominent issues is the necessity for students to have access to a computer and Internet in order to view the lectures. This is particularly hard on students from low-income districts who already have limited access to resources.

1.2.3 MOOCs

MOOCs stand for massive open online courses which aim for large scale interactive learning that is equivalent to classroom learning providing all the resources related to the classroom learning that includes videos,slides handouts and quizzes [1]. The MOOCs are a good way to reach a huge number of students and help them in learning online through a variety of interactive resources. It is aimed at open access and unlimited participation. Some example of MOOCs are Coursera, edX, IITBombayX, etc.

1.2.4 Blended MOOCs

Blended MOOCs takes advantage of all the learning techniques mentioned above [2]. The Blended MOOCs can be used in engineering level institutions in India, where the course running in the institute will take some part of content and assessment of a parallel running course on MOOCs. The teacher in an institute may ask student to view video lecture on a specific topic in a syllabus and the institute will consider the marks of assessment conducted by MOOCs, the teacher can also conduct the assessment for that particular content cover on MOOCs.

1.3 Need for a comprehensive information system

Multiple Institutes are partnering with IIT Bombay to offer blended MOOCs. Students will study the online course on IITBombayX, and will also study the same course normally in their Institute. Final grade will be based on the composite performance of students, in the online assessment, and in the tests/exams at the Institute.

Design and implement MIS to support teachers in participating institute:

- To maintain information of students, and synchronize it with IITBombayX.
- To define parameter and weightage of all assessment, and calculate final grades.
- To interface with Moodle, if used locally, to import and export relevant data.

1.4 Problem statement

Implementation of an automated system which keeps a record of students marks and generate the grades of students and also generate the composite mark sheet of blended MOOCs and of institute.

The goal of this thesis is to allow the participating institute faculty to access the online assessment marks of their students, and to factor the portion /percentage of marks in their regular university grades. Further, the system will allow the instructor to generate composite mark sheet, based on uploaded local assessments and online MOOC assessment.

Chapter 2

Literature Survey

2.1 Open source LMS/CMSs

The improvement in information and communication technologies and in the use of internet brought lots of opportunities in field of education. The conventional classroom has taken many form with the help of these technologies like flipped classroom, MOOCs, etc. To support these new methodology, Learning Management Systems (LMSs) came in to existence. We will discuss few of open source LMS like Moodle, ATutor, etc.

These LMS provide creation of content in different ways like audio, video, pdf, csv, etc. They also have multiple language support for the different group of people in world, that facility extend the reach of LMS on the globe. These LMS support different kinds of online exams for the evaluation of students, and also provide a space for student interaction called chat tool in which they can interact one-to-one or by forming groups.

2.2 LMS interoperability

LMSs are built on extensible frameworks where it can modify according to suitability of users [3]. LMS is the backbone of e-learning.

- **First generation** At this time LMS design platform concentrated on the delivery and interoperability of content designed for a specific purpose, such as a particular course. At that time, a range of standards emerged one of the standards was interoperability at content level.

- **Second generation** During this generation the architecture of LMS design became modular, where it can share the content and also share with other tool or LMS.
- **Next generation** In coming generation, the service oriented LMS will be built. Which will provide integration with other service tools, and various kinds of environments to work with. The next generation will not be monolithic, it will provide many solutions in one product.

2.3 Moodle

Moodle is a learning and course management system for online learning. The name Moodle stands for Modular Object-Oriented Dynamic Learning Environment. Moodle is written in PHP and runs on any OS like Unix, Windows, etc. It supports database like MySQL and PostgreSQL, DB2, Microsoft SQL, etc. Moodle also supports Interoperability with other web-based systems [4].

2.3.1 Integration with Moodle

Many institutes use Moodle internally to store academic records of students. Goal is to integrate Moodle with our system, such that data import/export can be done through it. For example, the student's marks are stored in Moodle database, then system will import marks of students from Moodle and generate a composite mark sheet of local assessment and online MOOC assessment. In this way teachers won't have to fill the marks again on our system manually or create new CSV file for update. Moodle integration will provide flexibility of data exchange.

2.3.1.1 Data Integration

Moodle and our system will share the common data format. Data will be given in form of CSV file containing grade policy of course, marks of students, etc. Marks obtained by students on MOOC can be downloaded by teacher from IITBpmbayX in form of CSV file. Then, teacher will be able to upload these marks using our system to generate composite mark sheet [5].

2.4 Open edX

According to definition in open edx documentation- "The Open edX platform is a free– and open source–course management system (CMS) that was originally developed by edX. The Open edX platform is used all over the world to host Massive Open Online Courses (MOOCs) as well as smaller classes and training modules" [6]

2.4.1 Open edX LMS

Open edx LMS is a place where learners can view course contents like video, quizzes, slides, handouts, etc. On the other hand instructor can view the progress of students. In this part students in interacts with the system and view the content, quizzes, etc. It also has a discussion forum where students discuss on some topic.

2.4.2 Open edX CMS

"This is course authoring tool and studio authoring system. This is the system that an instructor uses to build an online course. EdX studio is a CMS. A Django application that uses MongoDB for content and MySQL/SQLite for other contents [6]."

2.5 IITBombayX platform

IITBombayX is built on the top of open edX to provide blended MOOCs, Where other engineering colleges can participate in the blended MOOCs offered on the platform.The feature that will content by well known professor online discussion groups, regular assessment of learning as a learner progresses through a course, and online laboratories [7]. IITBombayX has been created for learners and institutions that that do not have quality resource like teacher, environment, etc. The goal of of IITBombayX to provide quality education, advance teaching and learning and expand access to education in engineering institute in India [8]. IITBombayX will offer MOOCs through online medium.

2.6 Current education system in India and how blended model will help

In recent years, the number of engineering colleges in India is increasing with very high rate. But, the quality of education is missing due to some constraints like a fixed syllabus of course by the university. Due to a fixed syllabus, teacher is bound to teach predefined topics and conduct predefined set of internal exams. Another reason may be lack of academic exposure to the students due to not having a quality teacher or may be technological hindrance. The quality of exams conducted by the university is also not efficient, the majority of students mug up and write the exam and get marks without understanding concepts.

2.7 Blended MOOCs from IIT Bombay

Providing the quality education in engineering colleges in India, IIT Bombay proposed a blended MOOCs model where student will be part of their regular university course as well as the blended MOOC. Practical sessions, exams, etc. will be conducted under supervision of local teacher. Students will also complete the same course offered on IITBombayX [2]. The blended MOOCs also provides quizzes, programming assignments, etc. Teachers in institutes will have freedom to include marks of these online quizzes, assignments, etc. in their final grade sheet by giving some weightage [9].

2.8 Assessing Effectiveness of MIS

One of the main goals of the MIS is to develop information systems that will increase efficiency to achieve this, MIS eases the process of any tedious task, and development takes hierarchical approach to determine effectiveness of system.

- **Level 0:** This level deals with initial phase of development, for example complains in database design, documentation quality, programming standards, etc. [10]
- **Level 1:** This level deals with resource allocation to project, for example time difference, budget difference, etc.

- **Level 2:** This level deals with production capability of human resource assigns to MIS development.

2.9 System evaluation

In blended model, teachers will have to combine marks of students for both class room and MOOC. Currently they use Excel sheets to do this, which is not an efficient method. To ease this process, an efficient system is needed which can generate composite mark sheet by taking grades from both modes in some predefined format. This system should run locally. In addition to that, integration with Moodle is also required. So, teachers who already have local marks on Moodle, can directly enter them on new system. Our goal is to build a system to cater above needs.

Chapter 3

Functional Requirements of Proposed System

3.1 Main objective

Given the course marks of students, the system will generate an automated grade sheet based on the course policy. Along with this, it has the option of integrating Blended MOOCs marks based on instructor's choice.

3.2 Consolidation of proposed functionality

3.2.1 Admin's Role

- Admin will be created at the time of system installation.
- There will be only one Admin credential.
- It can add various department in system.
- Admin can deactivate/reactivate department.
- It can add courses in the department.
- It can also deactivate/reactivate courses.
- Admin will send registration link to instructors.

- Admin will do mapping of various courses to various instructors at the beginning of each semester.
- Admin can add/remove instructor.

3.2.2 Instructor's Role

- Instructor can view all the courses registered against his/her name in current semester as well as past semesters.
- Instructor will insert course grading policy of his/her registered course at the beginning of current semester.
- Instructor can not modify course grading policy, but he/she can update weight of various assignments.
- System will import marks of students from LMS like-Moodle or it can browse marks in the form of a CSV file from the local machine for specific locally conducted assignments.
- Instructor has choice to incorporate Blended MOOCs weightage for final composite mark sheet.
- Instructor can give priority to some assignment conducted on Blended MOOCs.
- Instructor has the flexibility to generate draft mark sheet.
- Instructor will be able to generate final mark sheet only once.
- Final mark sheet can be modified by authoritative person.

3.3 Typical use cases

3.3.1 Admin Role

The admin will be responsible for maintaining the system within the institute after installation. Figure 3.1 shows the responsibility of the admin. For example, admin will register the session and also assign semester course for teacher.

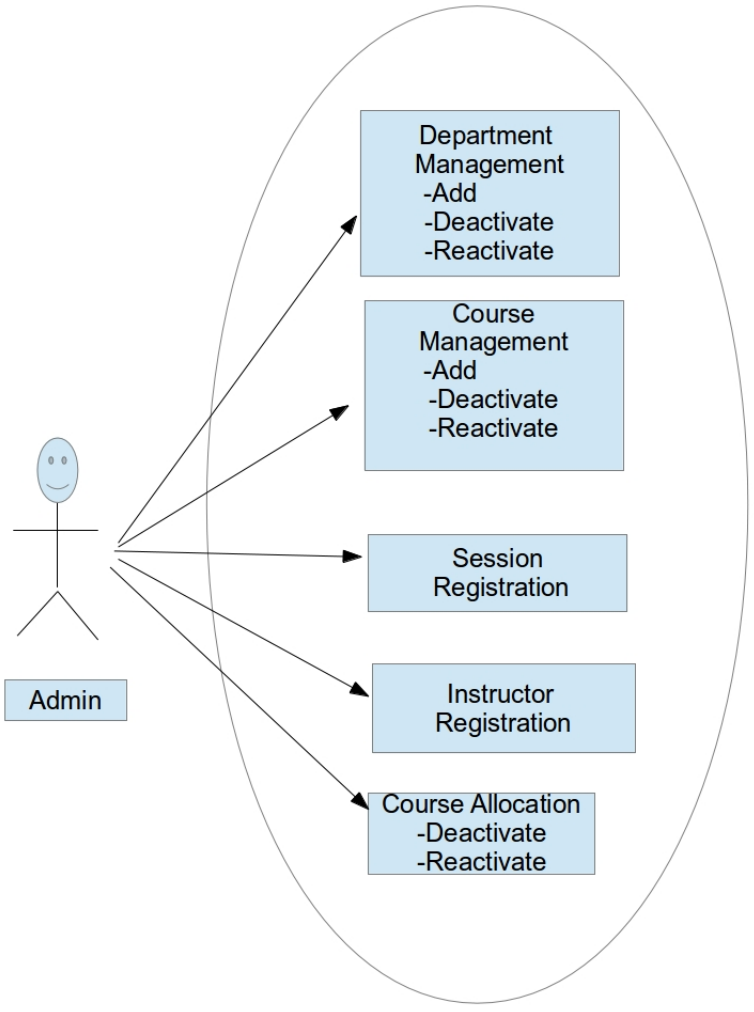

Figure 3.1: Admin Role

3.3.2 Teacher Role

The teacher will maintain local marks of students in the system and download MOOC marks in the form of CSV from IITBombayX and generate a composite mark sheet of local marks and MOOC marks.

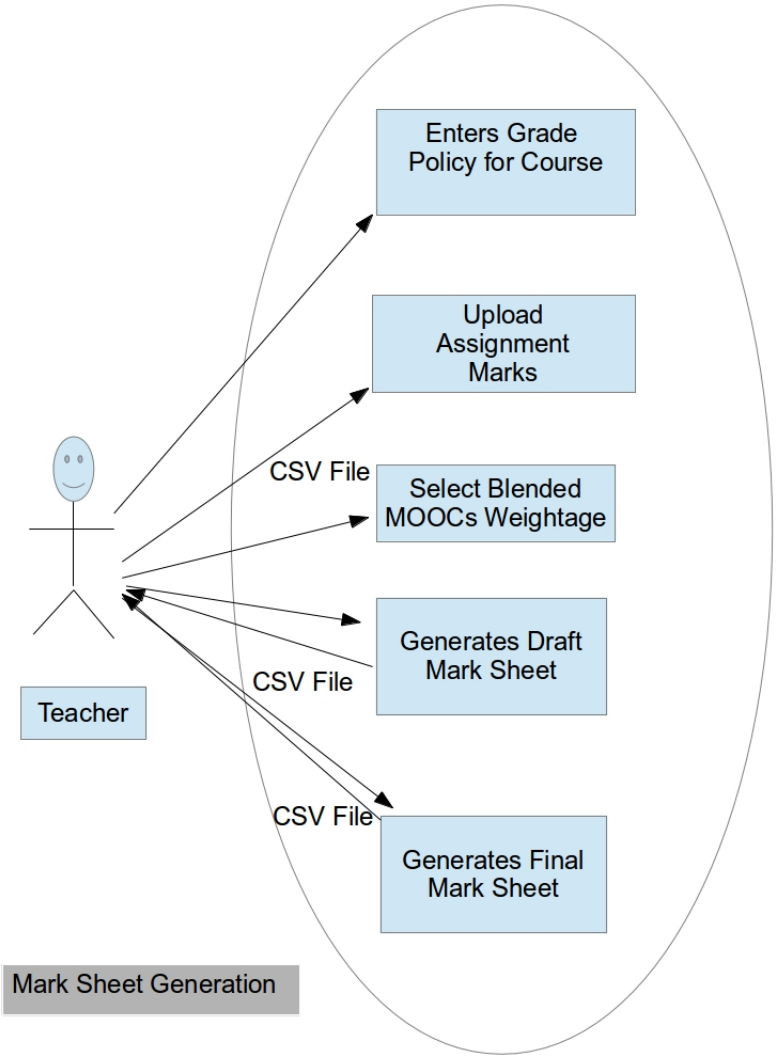

Figure 3.2: Teacher Role

Chapter 4

System Design

4.1 System view and Data Flow Diagram

4.1.1 System view

System will be installed locally with in the institute and teacher will use it for recording and generating marks of students as shown in figure 4.1.

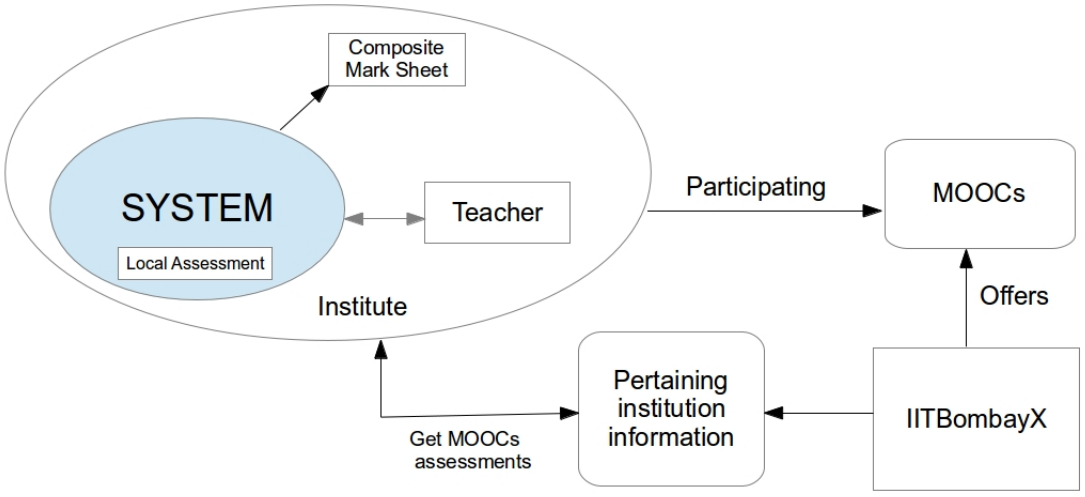

Figure 4.1: System View

4.1.2 Data Flow Diagram

Teacher has a facility to upload local assessment and generate compositr mark sheet comprises of local marks as well as online MOOC marks.

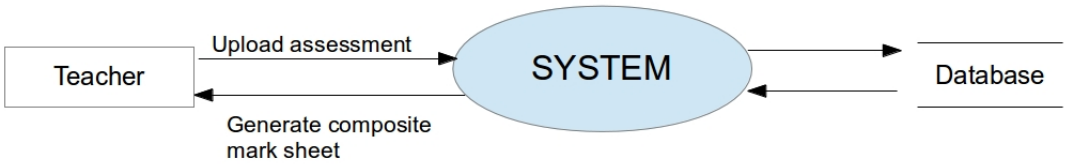

Figure 4.2: Data Flow Diagram

4.2 Modules and interfaces

4.2.1 Admin Interfaces

4.2.1.1 Department

- Add Department: Add department in the system.
- Deactivate Department: Deactivate department in the system, if necessary.
- Reactivate Department: Reactivate the deactivated departments in the system, if necessary.
- View Department: View current department in the system.

4.2.1.2 Course

- Add Courses: Add courses in department in the system.
- Deactivate Course: Deactivate course in the system, if necessary.
- Reactivate Course: Reactivate the deactivated course in the system, if necessary.
- View Course: View all the course or department wise in the system.

4.2.1.3 Register Session

- Register current session at beginning of each semester in the system.
- Can view all the registered session in the system.

4.2.1.4 Course Assignment in Current Session

- Do the mapping of course to Instructor at the beginning of each semester.

4.2.2 Teacher Interfaces

4.2.2.1 View

- Can view all the assigned courses in current semester.
- Can view all the assigned courses.

4.2.2.2 Grade policy

- Create: Create grade policy for each assigned course at beginning of each semester.
- View: Can view the created grade policy.

4.3 User Interfaces

4.3.1 Admin UI

After login the admin will see the dashboard where admin can mange deparment, manage course, etc,

4.3.2 Teacher UI

The teacher in his/her dashboard will be able to see assigned courses for the current semester and also all the previous courses, if any. As shown in the Figure 4.5, for mark sheet generation module, teacher will be able to see create and view grade policy, give weightage to blended MOOC, etc.

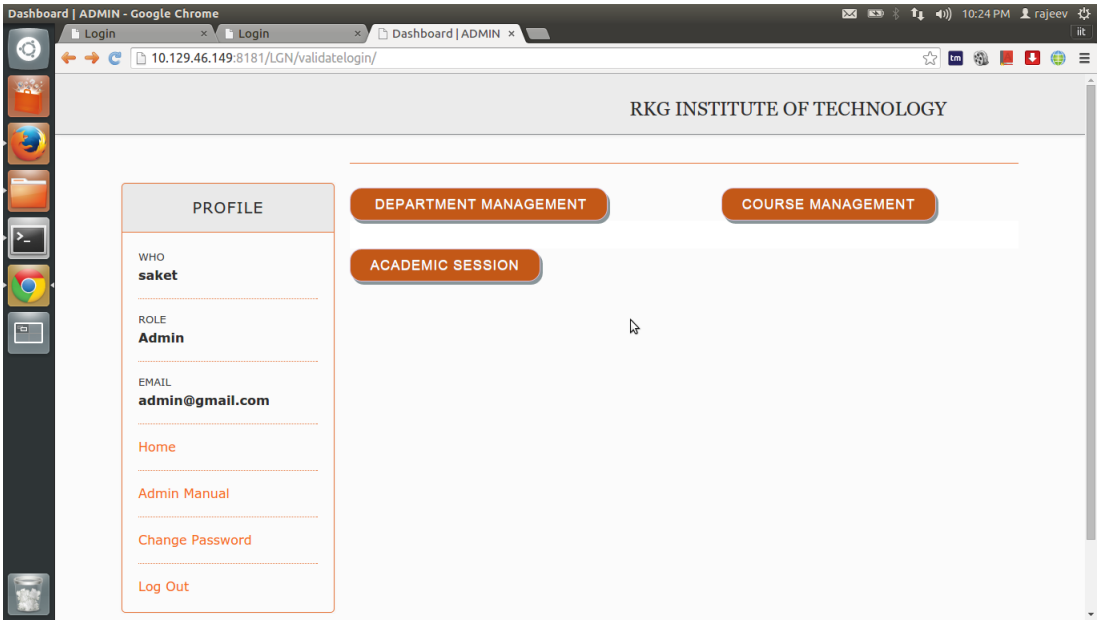

Figure 4.3: Admin Dashboard

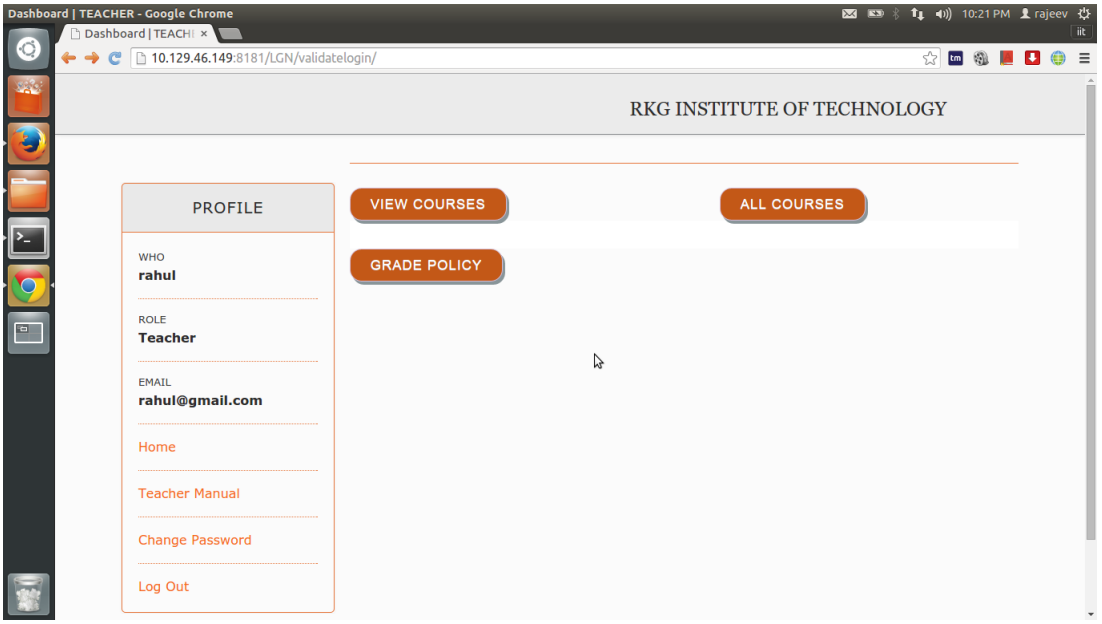

Figure 4.4: Teacher Dashboard

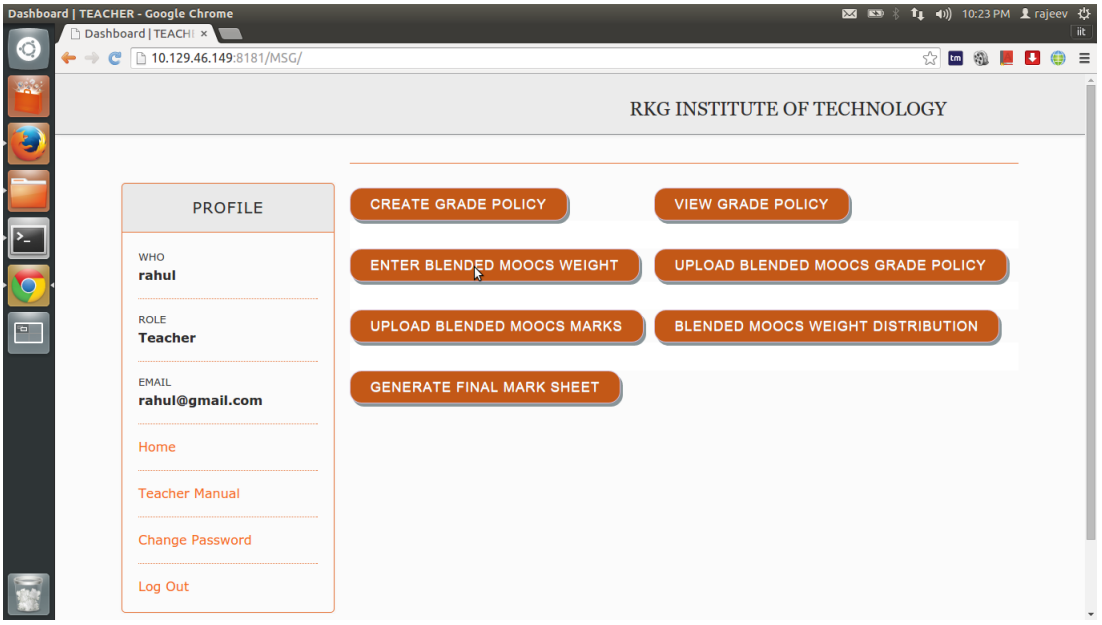

Figure 4.5: Teacher Mark Sheet Generation View

4.4 Prototype design and implementation

While developing prototypes for the system I have taken help from the Django documentation[11] with MySQL as back end database and develop front page using technology HTML, CSS, etc.

4.4.1 Database Design

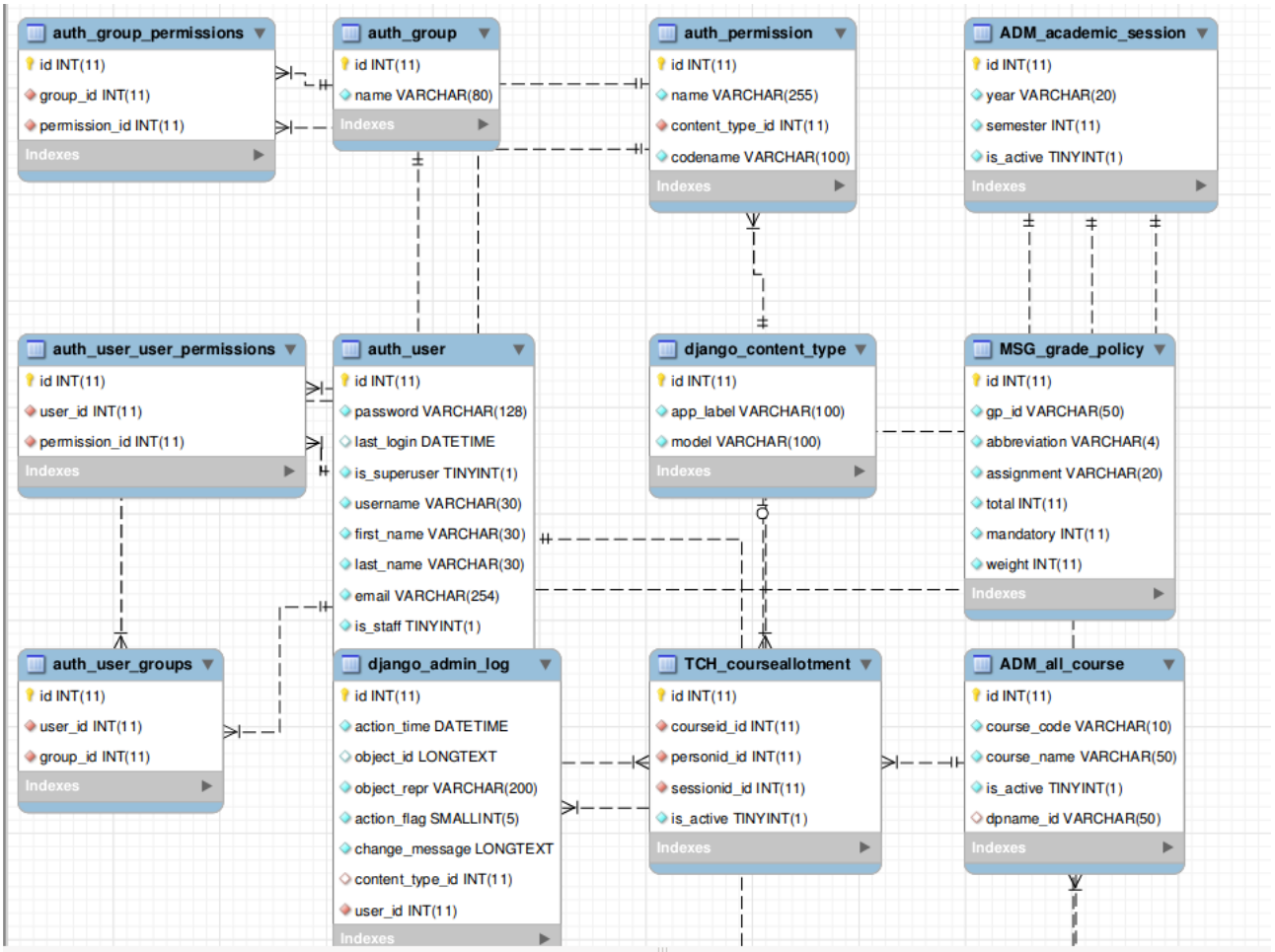

Figure 4.6: ER diagram part-1.1

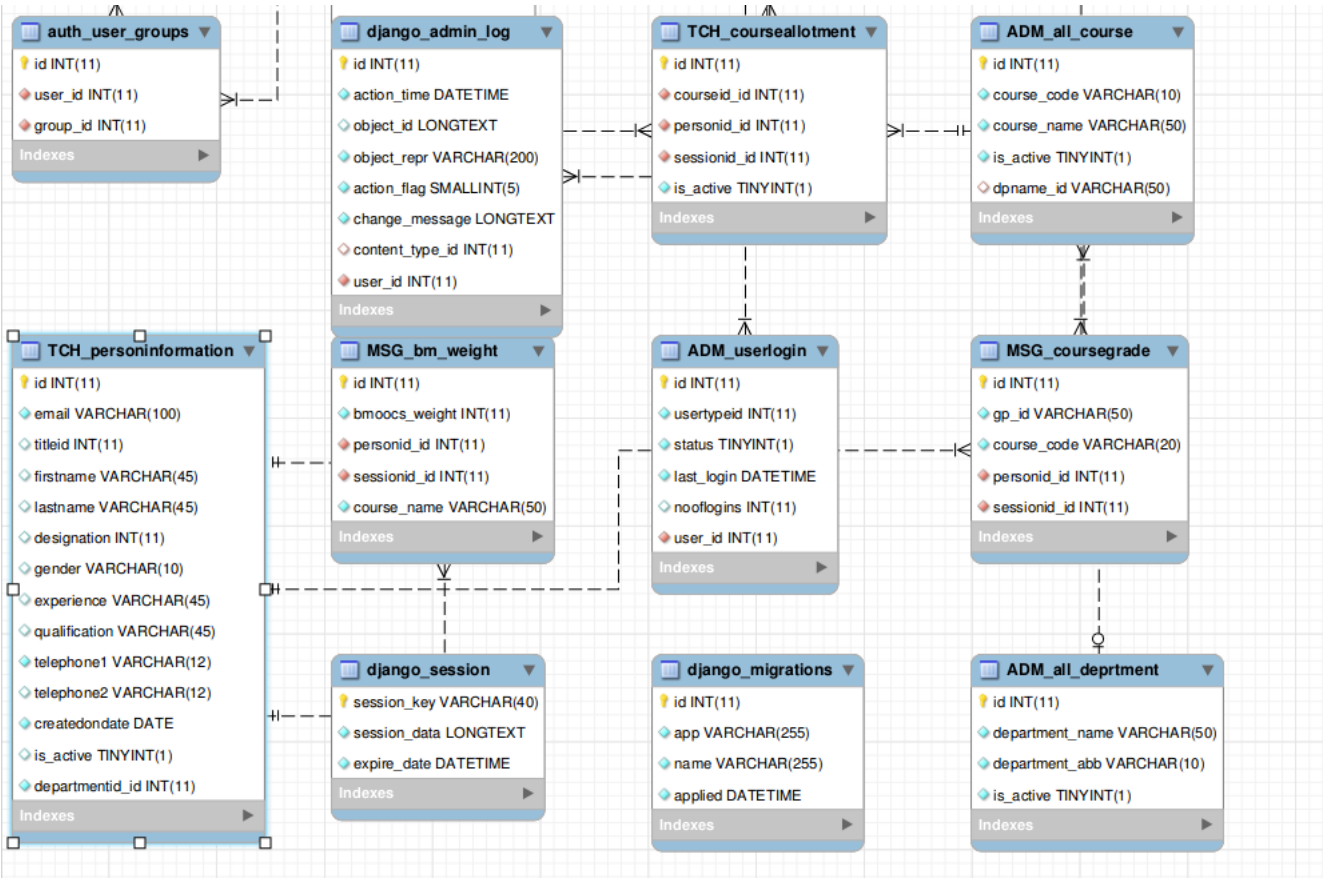

Figure 4.7: ER diagram part-1.2

4.4.2 Technology Used

- HTML: It is the main mark-up language for displaying web pages and other information that can be displayed in a web browser.
- CSS: Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language.
- JavaScript: It is a prototype-based scripting language that is dynamic, weakly typed and has first-class functions and is mainly used for client side validation etc.
- AJAX: AJAX is the art of exchanging data with a server, and updating parts of a web page - without reloading the whole page.
- MySQL: It is the world's most used open source relational database management that runs as a server providing multi-user access to a number of databases.

- Django/Python: Django is a free and open source web application framework, written in Python, which follows the model-view-controller (MVC) architectural pattern.
- Bootstrap: Bootstrap is the most popular HTML, CSS and JavaScript framework for developing responsive, mobile-first web sites.
- The Operating System used primarily in this project is Ubuntu 14.04.

4.4.3 MOOCs Assessment and Composite Mark sheet

4.4.3.1 MOOC grade policy

Figuere 4.8 shows the grading policy for a MOOC. It is a CSV file in which the first column is the number of evaluations of an assignment, and the second column is weightage of an assignment, and the third column is name of an exam, and the forth column contains the number of droppable evaluations of an assignment, and fifth column contains short label for a respective assignment.

```
7,0.6,Graded Quiz,1,GQ
1,0.4,Final Exam,0,FE
```

Figure 4.8: MOOC grading policy

4.4.3.2 All MOOC assessment

Figuere 4.9 shows the MOOC marks of all the students, who are registered for MOOC course with IITBombayX and regular university course. The first line in the Figure shows the maximum marks for the evaluation, second line contains the list of MOOC evaluations, and from third line onwards contain marks obtained by each student in corresponding evaluation.

4.4.3.3 Composite mark sheet

Figuere 4.10 shows the composite mark sheet of local marks and MOOC marks of all the students, who are registered for blended MOOC course with IITBombayX along with

```
max,10,10,15,15,15,20,25,40
Roll Number,GQ-1,GQ-2,GQ-3,GQ-4,GQ-5,GQ-6,GQ-7,FE
1105301,8,7,12,11,15,18,25,38
1105302,6,6,12,0,14,19,20,35
1105303,9,8,15,10,14,16,19,40
1105304,5,4,NA,10,11,16,13,20
1105305,4,5,NA,NA,9,10,14,19
1105306,8,7,10,11,9,18,24,40
1105307,5,6,13,13,11,16,22,31
1105308,7,6,11,4,10,14,20,28
1105309,6,8,12,0,NA,19,20,15
11053010,8,9,10,13,11,18,18,34
```

Figure 4.9: All MOOC assessment

their regular university course. Figure shows the blended MOOC weight in this case it is 25(shown in figure). It also shows weight distribution and maximum marks for each of the blended MOOC evaluation.

```
##########################################################################################
Teacher Name : rahul parashar
Course Name : Thermodynamics
##########################################################################################
=======================  Blended MOOCs Weight  ========================
Blended MOOCs weightage: 25
----------------------------------------All evaluations at blended MOOCs
GQ-1,GQ-2,GQ-3,GQ-4,GQ-5,GQ-6,GQ-7,FE
----------------------------------------Weight distribution for blended MOOCs
0, 0, 0, 0, 25, 0, 0, 0
----------------------------------------Maximum marks for blended MOOCs evaluations
10,10,15,15,15,20,25,40
************************ students Marks  ****************************************
==========================================================================================
==================================
Roll Number,Institute Total Marks,GQ-1,GQ-2,GQ-3,GQ-4,GQ-5,GQ-6,GQ-7,FE,MOOCs Total,Total
==========================================================================================
==================================
1105301,58.5,8,7,12,11,15,18,25,40,25.0,83.5
1105302,48.75,6,6,12,0,14,19,20,35,23.33,72.08
1105303,66.0,9,8,15,10,14,16,19,40,23.33,89.33
1105304,51.75,5,4,0,10,11,16,13,20,18.33,70.08
1105305,41.25,4,5,0,0,9,10,14,19,15.0,56.25
1105306,63.75,8,7,10,11,9,18,24,40,15.0,78.75
1105307,52.5,5,6,13,13,11,16,22,31,18.33,70.83
1105308,67.5,7,6,11,4,10,14,20,28,16.67,84.17
1105309,33.75,6,8,12,0,0,19,20,15,0.0,33.75
11053010,18.75,8,9,10,13,11,18,18,34,18.33,37.08
```

Figure 4.10: Composite Mark Sheet

Chapter 5

Future Work and Conclusion

5.1 Admin- Module and Interfaces

5.2 Login- Module

- **Instructor Replacement** Due to some reason, if the instructor has to change the current running course, the admin can update the instructor for the corresponding course.
- **Instructor Registration** Registration requests will be sent by admin through email to the instructor.

5.3 Teacher- Module and Interface

- **Upload Blended MOOCs Grade Policy** The instructor will download blended MOOCs grade policy in CSV format from the blended MOOCs website and will upload this grade policy for the corresponding course.
- **Upload Blended MOOCs Mark Sheet** The instructor will download blended MOOCs mark sheet in CSV format from the blended MOOCs website and will upload this grade policy for the corresponding course.
- **Re-use Grade Policy** if Instructor wants to continue with any one of previously generated grade policy, then the instructor can forward one of defined grade policy.

- **Update Grade Policy** The instructor can not add or remove assignments from defined grade policy only update the weight of assignments of current semester grade policy.
- **Upload Institute Mark Sheet** The Instructor can upload the maximum marks for assignment and marks obtained by students in the CSV file.
- **Update Institute Mark Sheet** In case of any discrepancy, instructor can update the marks of students.
- **Generate Draft Mark Sheet** The instructor has option to generate draft mark sheet, to verify any discrepancy in marks before generating final mark sheet.
- **Generate Final Mark Sheet** If the instructor chooses to include blended MOOCs marks, then the final mark sheet will be a composite of local institute marks and blended MOOCs marks otherwise final mark sheet will consist only of institute marks.
- **Grade Generation** Once the final mark sheet is generated, instructor will enter a range of marks for specific grades and will get a final grade sheet.

5.4 Login- Module

- Login module code needs to be modified, so the individual role in the system can see only assigned part.
- A module for forgot password will be integrated with a valid register email id.

5.5 Integration with Moodle

If any institute use open source LMS like Moodle this system will integrate with Moodle and will get the student marks from Moodle and generates grade sheet.

5.6 Conclusion

The blended MOOCs requires the composition of institute marks and MOOCs marks. So, to make this process easy and efficient for the blended MOOCs partner teachers. We

have built a system which stores marks of institute evaluations and takes MOOCs marks in the form of CSV file and generate a composite mark sheet. The teachers, who are not the part of blended MOOCs can also use this system to keep records of students marks. The system will install and runs locally in engineering colleges in India.

Blended MOOCs require the composite nature of in-classroom learning and online participation. To this effect, both evaluation i.e. classroom as well as online evaluation, are necessary for the complete assessment of students. Regular assessments in different forms (online quizes, in-classs exams) make the teacher aware of the current subject understanding of students in a class.

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