A Major Project on

Shikshyalaya: A Virtual Classroom

Submitted in Partial Fulfillment of the

Requirements for the Degree of **Bachelor's**

Degree of Engineering in Computer

Engineering under Pokhara University

Submitted by:

Barsha Pokharel, 15307

Bibek Awal, 15309

Sujata Gaihre, 15397

Under the supervision of:

Asso.Prof. Saroj Shakya

Date:

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Department of Computer Engineering

NEPAL COLLEGE OF

INFORMATION TECHNOLOGY

Balkumari, Lalitpur, Nepal

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Barsha Pokharel (15307)
Bibek Awal (15309)
Sujata Gaihre(15397)

Nepal College of Information Technology

Balkumari, Lalitpur.

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ABSTRACT

The development of alternative teaching or learning online platforms, which is an effective supplement to the conventional teaching, has been a challenge in Nepal. This project introduces a virtual classroom platform "Shikshyalaya" developed with aid of Python/Django. The framework has the ability of run and support simultaneous mode of interactions like discussion forums, individual chat, uploading videos, social response and expert verification. As a real-time application, the platform will provide the feature of running, modifying and terminating the real-time sessions (live chat). Hence, the application is considered to create an interactive environment contributing for the students' and instructors/experts' satisfaction in sharing the education.

Keywords: Virtual Classroom, Discussion Forum, Python, Django

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ABBREVIATIONS

API	Application Program Interface
CSS	Cascading Style Sheet
GUI	Graphical User Interface
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
IDE	Integrated Development Environment
OS	Operating System
SDLC	Software Development Life Cycle
UI	User Interface
URL	Uniform Resource Locator
VCE	Version control systems
Wi-Fi	Wireless Fidelity

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1. INTRODUCTION

The teaching and learning method of classroom education has been upgrading with the advancement in technologies. For an instance, unlike the past methodologies of classroom education, there has been development of online-classes and open universities. There lies a major drawback in practice of online-education, which is 'challenges in interaction'. Online classes has been more on one-way education where users can repeat the teaching videos infinite times but cannot put forward the instant queries. In this regard, we came up with this idea of making the virtual classroom, which is more interactive and effective.

Our virtual classroom will provide the opportunity to the users to download notes, chat and discuss about the different queries (make comments, mark relevant and mark irrelevant to the answers) learn the syllabus through videos. It notifies the user if their questions are answered or if their answer is marked satisfied or unsatisfied and if the admin accepted their requested topics and many more. Likewise, the registered users can verify the most relevant answers, which can be very helpful for them.

The project has a separate login panel for the users, experts as well as for the administrator. It helps to maintain the communication between the users and will help the administrator to manage all the activity. Every user can edit their profile. Admin uploads the files in the form of text files, images, and videos. Any users can download the files and experts will verify those notes, which can be accessed by the registered users. In addition, there will be a discussion platform for the users, which will have different categories like science and technology, arts, commerce, entertainment and others. This will help the users stay updated and clear their doubts. Similarly, the notifications features will also be available which will be feasible for the users to stay updated. The main intention is to make the learning experience more flexible, stimulating and available around the clock and at any place with internet facilities.

1.1. PROJECT OVERVIEW

Popularity of the internet has contributed towards explosive growth in different fields. Students usually search the answer in google or ask the teacher if they have problems in their assignment. Therefore, we came to a concept on online classroom where user can ask questions and find the answer instantly.

The major goal of our project is to make the learning system more effective and easy. Our web app contains many features such as discussion platform for asking or answering questions,

private chat, downloading notes, chat with the experts/admin, request for a topic he/she wants to discuss, watch video tutorial online and others.

1.2. PROBLEM STATEMENT

With its increasing scope and availability, internet is now one of the most used resources by the users. One feature of internet that almost every users use to discuss any questionnaires is discussion forum. Users frequently use web applications like quora, stack exchange, etc. In addition, there are many established questions and answer sites. One of the problems users frequently encounter while using these sites is that they are mostly research oriented, and the questions related to syllabus are not discussed here. Our site differ from its predecessors in three main ways: it puts a heavy emphasis on the quality of questions in addition, in particular, answers, it allows users to vote on answers and encourages accountability amongst users, and it allows users to follow topics that interest them. Once you are registered, you will be guided in many ways creating your own profile, finding friends related to the interest of your topic, discussing about those topics, interacting with them and others. There are options to select as many or as few as required.

The significant advantage of this platform is two-way interaction. Unlike many other web platforms, our application has the features of verifying the answers that are posted in discussion panel by the experts.

1.3. PROJECT OBJECTIVES

The main objective of our project is to introduce a web application that provides virtual platform for users to have two-way interaction with the experts. Some other core objectives of our application are as follows:

- To help users to get the instant solutions to their queries/confusions
- To encourage users for online sharing and discussion about different topics
- To identify critical knowledge and skills gaps among individuals involved in different fields
- To develop the concept of asynchronous learning
- To provide opportunity for users to receive suggestions from the experts

- To encourage fruitful discussion among the students from different backgrounds and communicate, share, help, ask and answer the various problems that arise in the field.

1.4. SIGNIFICANCE OF STUDY

The study aims to find solution to the various queries that the users encounter during their studies and research. This study is not only a research based discussion platform but also syllabus and course related platform. The development of virtual classroom will provide users an efficient way to discuss and eventually help users in efficient learning.

1.5. SCOPE AND LIMITATION

The main scope of virtual classroom is to allow users for teaching and learning environment where users can discuss interact, communicate all in an online setting. The application is explicitly targeted to the users who have queries about the different topics. Moreover, the application is developed for the web platform, which results in more interactive learning. The following are the limitations of our application:

- There might be question in the efficiency of education taking in account of the user's attention/focus.
- Internet connection/availability is prior.
- There might be questions regarding the validity of the posted answers.

2. LITERATURE REVIEW

This section consists the literature study. It aims to provide readers a theoretical base for the project and develop an understanding of the nature of the project. The virtual classroom is an important aspect in online-based education portal used for remote learning. Virtual classrooms have taken over traditional learning process and therefore helped users get the ease and convenience generally; this education system is for interactive educational purpose only. It is popular in foreign countries but in context of Nepal, it is still in exploring verse.

2.1. PYTHON/DJANGO

Django is a Python-based free and open-source web framework, which follows the model-template-view architectural pattern. The Django Software Foundation is an independent organization established as a 501 non-profit. Django's primary goal is to ease the creation of complex, database-driven websites. Django offers a big collection of modules, which you can use in our own project. Primarily, frameworks exist to save developers a lot of wasted time and headaches and Django is no different. [1]

2.2. DBSQLITE3

Django in its 'out-of-the-box' state is set up to communicate with SQLite, a lightweight relational database included with the Python distribution. Therefore, by default, Django automatically creates a SQLite database for the project. In addition to SQLite, Django officially supports (i.e. included in Django itself) three other popular relational databases that include PostgreSQL, MySQL and Oracle. The Django configuration to connect to a database is done inside the settting.py file of a Django project in the DATABASES variable. [2]

2.3. ORM

Object-relational mapping (ORM) is a programming technique in which a metadata descriptor is used to connect object code to a relational database. Object code is written in object-oriented programming (OOP) languages such as Java or C#. ORM converts data between type systems that are unable to coexist within relational databases and OOP languages. [3]

By default, the configuration uses SQLite. SQLite is included in Python, so it is not necessary to install anything else to support the database.

2.4. EXISTING SYSTEM

In this part of the report, we will briefly describe the existing systems and undermine the features of the system.

Uniglobe Virtual Classroom

Uniglobe College, affiliated to Pokhara University of Nepal has already been using this virtual classroom as a web application. [4] Here, students and faculty can log in and experience the ultimate virtual experience and get access to all the features available.

Pros:

- All the detail information about the notice and exam are notified to the students.
- There will be no duplication of the user.

Cons:

- Limited to one institution only.
- Students admitted to the college are only allowed to view all the contents of the site.
- The site is limited to the Management courses only.

KUSOM

Kathmandu University School of Management has also been using virtual classroom as one of the feature in their website. Each student can log in and be updated with the latest news related to their concern subject and into group discussion if they come across any confusion. [5]

Pros:

- There is provision of group discussion and site announcement.
- The students are allowed to submit their assignments online.

Cons:

- Limited to one institution only.
- Courses are limited to management faculty only.

The Virtual Classroom application

This teaching and learning application enables teachers and students to conduct and attend online classes anytime, anywhere. The Virtual Classroom App to access a wide range of easy-to-use and innovative teaching, learning tools that help you collaborate in Virtual Learning process. [6]

Pros:

- It is accessible in wide range.

Cons:

- It is not user-friendly and very difficult to use.

Quora

Quora is an American question-and-answer website where questions are asked, answered, and edited by Internet users in the form of opinions. Its owner, Quora Inc., is based in Mountain View, California. [7]

Pros:

- It is globally accepted virtual classroom.
- There is good scope of getting response to answer.

Cons:

- There is no provision of video-lectures.

3. TEAM MEMBERS AND DIVIDED ROLES

Table 1: Divided Task

Name	Roles	Responsibilities
Barsha Pokharel	Backend developer Documentation Database Management UI Designer	• Development of the backend and testing • Project Planning • Development of documentation. • Timely review of database data(Django)
Bibek Awal	UI Designer Documentation Backend developer	• User friendly interface for Web Development • Development of documentation. • Project Planning • Layout Developer
Sujata Gaihre	Backend developer Documentation Database Management UI Designer	• Development of the backend and testing. • Development of documentation. • Manage Django Admin • Data Selection

4. METHODOLOGY

This section describes the different stages involved during the development phase of this application.

4.1. SOFTWARE DEVELOPMENT LIFE CYCLE

We have used incremental model for software development life cycle. In this model the product designed at first and tested incrementally (a little more is added each time) until the product is finished. It involves both development and maintenance. The product is defined as finished when it satisfies all its requirements. The advantages of incremental model are:

1. After each iteration, regression testing is conducted. During this testing, faulty elements of the software can be quickly identified because few changes are made within any single iteration.
2. It is generally easier to test and debug than other methods of software development because relatively smaller changes are made during each iteration. This allows for more targeted and rigorous testing of each element within the overall product.

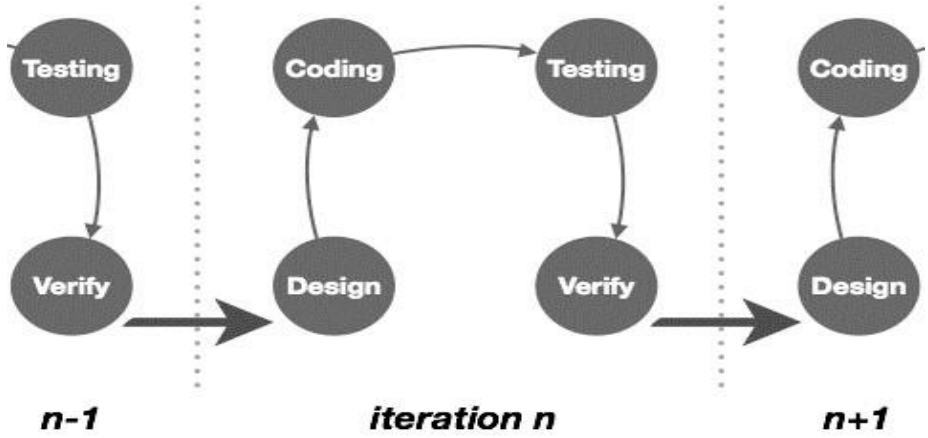

Figure 1: Iterative Model of Software Development Life Cycle

4.1.1 REQUIREMENT ANALAYIS

In requirement analysis phase, the different requirements that the final product was supposed to fulfill were determined, gathered and analyzed. The various requirements for Shikshyalaya were account registration, discussion platform, notifications, text messaging, notes, video tutorials etc. With successive iteration, this phase also involved the identification of requirements that

were not fulfilled in the previous builds of the software, but are still needed for the development of final product.

4.1.2. DESIGN

After finalizing the features of our project, we started our research that helped us to get clearer vision on our objectives and develop the project.

It contains the following elements:

1. Administrator Login: The administrator is the ultimate controller of the application with the highest authority.

The login has following features:

a) Student/Faculty/Expert:

It creates user, experts and faculty profile and can modify the desired profile.

b)View details:

Admin can view the list of user and details.

2. User Login: It enables a person to login as a user once logged in a user has the following features: -

a) Study Materials and Tutorials:

It displays the list of pdfs (or similar extension), and tutorial posted by the respective faculty.

b) Discussion Forums:

The users are allowed to discuss on any relevant topics.

4.1.3. IMPLEMENTATION

In implementation phase, the software was coded as per the design pattern mentioned earlier. This phase involved both the creation of new features, the upgrade and enhancement of previously coded feature as per the final requirements.

4.1.4. TESTING AND REVIEW

In this phase, the source code was built and tested in localhost and errors were figured out (both logical and syntactical) that existed in the application. The developer team tested the app by logging in from arbitrary accounts and sending requests and messages to each other.

Iterative is chosen due to the following reasons:

- Requirements can be changed if required by going back to the previous phases without affecting the ongoing process.
- This project is based on Django rest API due to which iterative testing and implementation is required.

4.2. FEASIBILITY STUDY

After doing the project Shikshyalaya, study and analyzing all the existing or required functionalities of the system, the next task was to conduct the feasibility of the project.

4.2.1. TECHNICAL FEASIBILITY

The proposed system is developed using Python and Django. As application is very user friendly and has GUI OS, it is very easy to use. All the required hardware and software are readily available in the market. Hence, the system is technically feasible.

4.2.2. OPERATIONAL FEASIBILITY

The proposed system is operationally feasible because of the following reasons.

- The users are benefited more as this app aims and serves for the various functionalities and features required to them.
- The cost of the proposed system is almost negligible when compared to the benefits gained.

4.2.3. ECONOMIC FEASIBILITY

As the necessary hardware and software are available in the market at a low cost, the initial investment is the only cost incurred and does not need any further enhancements. Hence, it is economically feasible.

4.3. TOOLS AND TECHNOLOGIES USED

Table 2: Tools and its Purpose

S.N	Tools/Language/Software	Purpose
1.	PyCharm	Code Editor IDE
2.	Django	Web Backend Framework
3.	Python	Programming language
4.	Microsoft windows 10/8	OS for Development and testing
5.	MS word/MS PowerPoint	Documentation and slide preparation

PyCharm

PyCharm is used as programming platform for developing our web application. It is the official IDE for web application development for Python/Django. It provides code analysis, a graphical debugger, an integrated unit tester, integration with version control systems (VCSes), and supports web development with Django. PyCharm is developed by the Czech company JetBrains. [8]

PyCharm makes it easier for programmers to write various web applications in Python supporting widely used web technologies like HTML, CSS, JavaScript, Typescript and Coffee Script. PyCharm further allows developers to avail a JavaScript debugger as well as Coffee Script and Typescript editors.

4.4. PERFORMANCE ANALYSIS

At the completion of project, the evaluation was done based on performance and feasibility of the deliverable obtained. As a sample test, two users were logged in to the application, and some questioning/answering, chat features test was done. The users tried to edit their respective profile. To test the notification feature while answered was marked satisfied/unsatisfied or the questions was answered, two different browsers were used. In addition, to check whether someone is online or not two different laptops were used.

The time taken for a message to reach from sender to the receiver were taken into account. After the analysis of performance, the web application was found to fulfill all the proposed requirements and features.

4.5. TIME SCHEDULE

ID	Iterotion	Task Name	Start	Finish	Duration
1	Iteration 1	Requirement analysis and specification	7/28/2019	8/7/2019	10d
2		Design Specification	8/7/2019	8/15/2019	8d
3		Develop System	8/15/2019	8/26/2019	10d
4		Testing and debugging	8/26/2019	8/30/2019	5d
5	Iteration 2	Requirement analysis and specification	8/30/2019	9/10/2019	10d
6		Design Specification	9/10/2019	9/16/2019	6d
7		Develop System	9/16/2019	9/25/2019	9d
8		Testing and debugging	9/25/2019	10/1/2019	6d
9	Iteration 3	Requirement analysis and specification	10/1/2019	10/11/2019	10d
10		Design Specification	10/11/2019	10/18/2019	7d
11		Develop System	10/18/2019	10/24/2019	6d
12		Testing and debugging	10/25/2019	10/31/2019	6d
13		Overall System test	10/31/2019	11/17/2019	15d
14		Documentation	8/15/2019	11/25/2019	88d

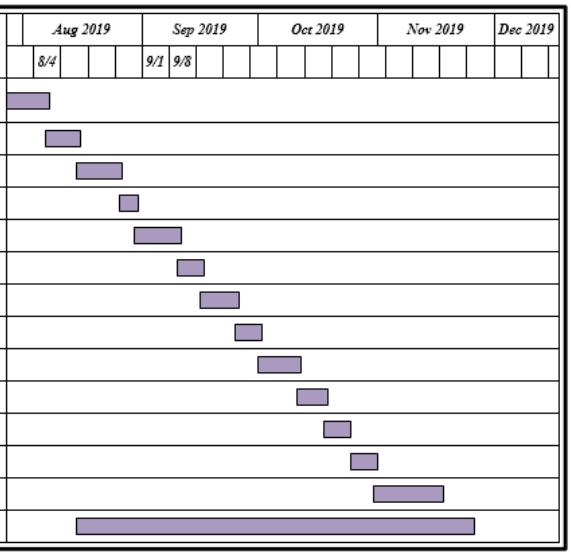

Figure 2: Time Schedule for Project

The project was divided into five phases which were carried out as shown in the Gantt above. The major phases were preliminary investigation, requirement analysis and feasibility study, system design and modeling, coding and documentation. Three iterations were carried out as per the iterative software development life cycle.

5. REQUIREMENT ANALYSIS

The core requirements that are inevitable for the achievement of the objectives were identified so that valuable time will not be spent on unnecessary requirement specification. Requirement engineering specifies the software's operational characteristics and establishes constraints that the software must meet.

At the initial phase of the requirement analysis, requirements are first listed and then modelled by using various UML modelling diagrams.

5.1. FUNCTIONAL REQUIREMENTS

1. The user can login to pre-existing account or create a new user account.
2. The user can prompt to sign in via email registration.
3. The user can discuss about any relevant topics and request for the topic to the admin if not available.
4. The user get points according to the performance they do.
5. The number of views of question is updated according to the views.
6. The trending question is displayed according to the highest number of views.
7. The user will see his/her recent chats, the list of the registered user.
8. The user will be notified if the questions are answered, marked satisfied or marked irrelevant.
9. There is search feature available in Shikshyalaya.
10. The user can upload/download notes available.

5.2. NON FUNCTIONAL REQUIREMENTS

The non-functional requirements of Shikshyalaya include the following:

5.2.1 USABILITY

The web app will provide the web-interface to the end users with the optimum user-friendliness so that user can be accustomed to the website while using it.

5.2.2 REUSABILITY

The web app developed will be able to meet the user expectations as well as it would to reliable to match up with the existing products. As per the implemented research, this system would meet the objectives as specified and would be easy to maintain and carry out for further extensions.

5.2.3 PERFORMANCE

The system will be able to ask questions using the tags, chat in real time, and watch video tutorials, download notes and many more. The processing depends upon the size of the input.

5.2.4 SECURITY

Users are to sign up and then only get access to the information regarding the notes, questions, answers and tutorials that are related to their course. Therefore, each user has been given their own account with username and password to login. Password information are kept safe from intruders as well as those who are authorized to manage database only.

5.2.5 EXTENDIBILTY

The system could easily extended using the different features later.

5.3. USE CASE

The main purpose of the use cases is to demonstrate the different ways that a user might interact with the system. The few diagrams that follow illustrate different ways of interaction of user and system in the application.

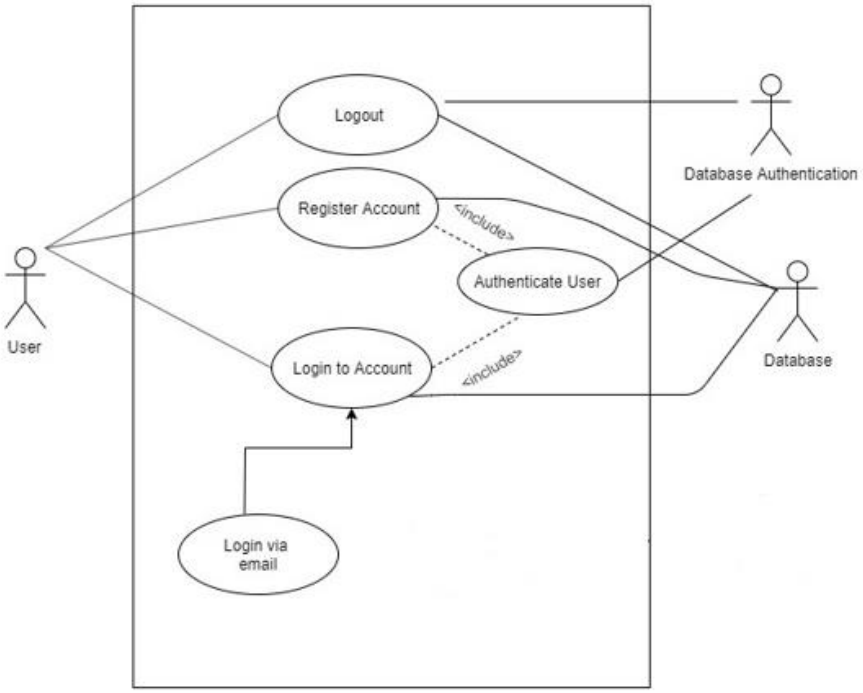

Figure 3: UseCase Diagram for user-authentication

Use Case: Authenticate User	
Actors	User, Database Authentication
Description	When the user first opens the website, Database Authentication checks whether the user is logged in or not. If the user is not logged in, he/she is taken to the Login / Register form. The user can choose to login/register via email. In case the user selects to authenticate via email, he/she provides email and password and then tap the login button. Once the user is logged in, he/she can log out any time he/she likes.
Pre-Conditions	The user should have either a valid email account.
Post Condition	The user will be able to use all the features available in the website.

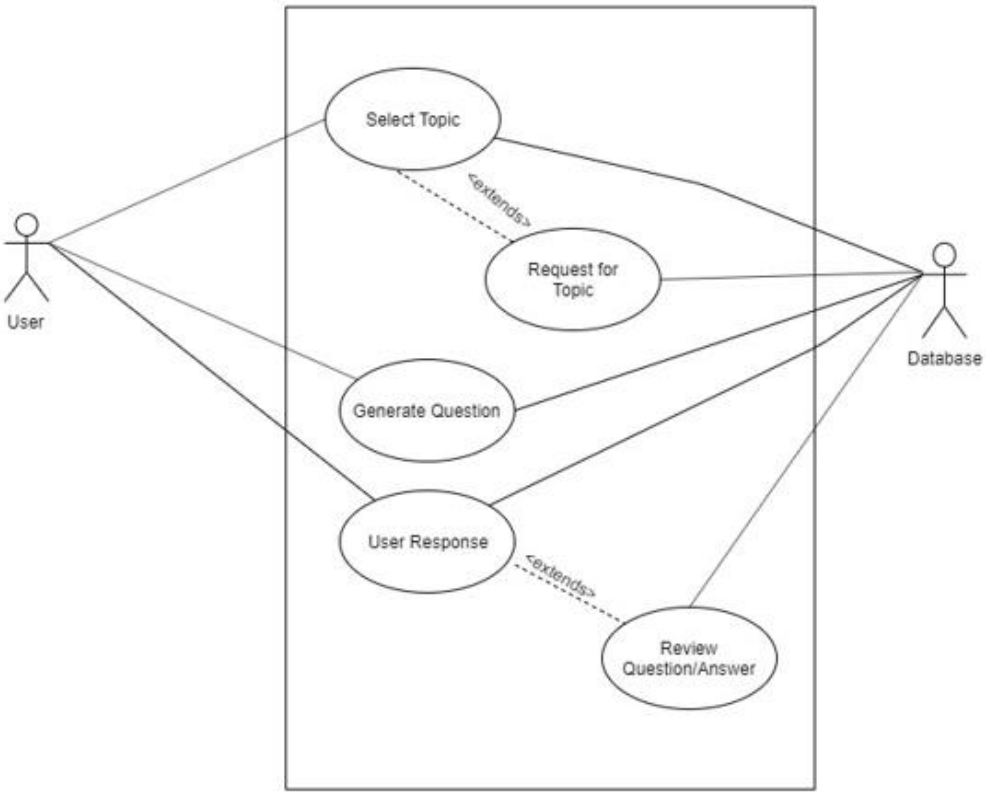

Figure 4: UseCase Diagram for asking and answering queries

Use Case: Question/Answer Discussion Platform	
Actors	User, Database Authentication
Description	When the user is on the main page, there is platform for asking and answering the questions. If the user wants to ask he/she selects the category, if the category is unlisted, he/he request the topics he/she wants to ask. The category is then added; hence, he/she ask the questions of the requested category. Here, user can review the answer by marking it satisfied or unsatisfied.
Pre-Conditions	The user should have either a valid email account, a Google account.
Post Condition	The user will be able to use all the features available in the website.

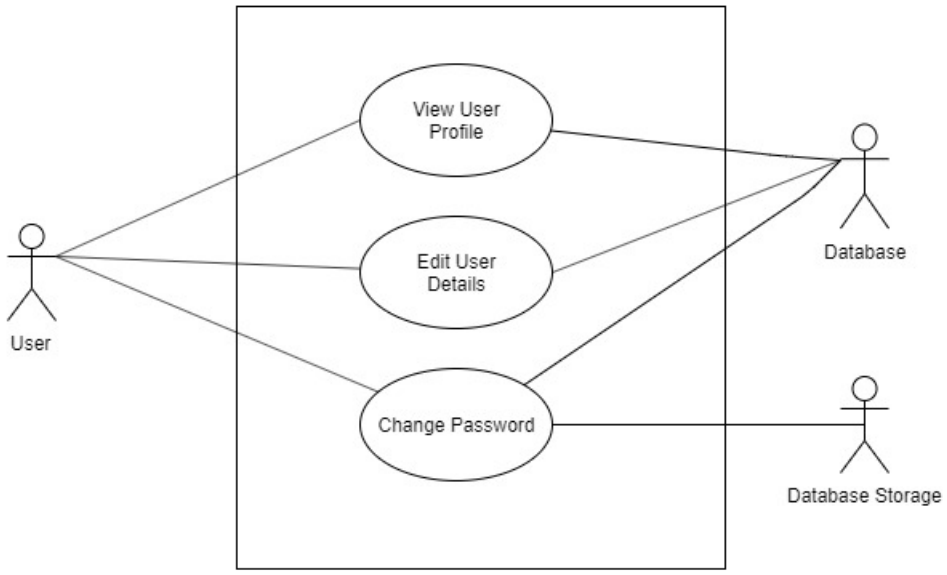

Figure 5: UseCase Diagram for managing User Profile

Use Case: Managing User Profile	
Actors	User, Database Authentication
Description	Whenever the user creates an account in the application for the first time, he/she creates a profile, which contains the profile personal details like name, address, etc. A user can view any other user's profile in the application. She may also choose to send a message to that user. A user can also edit her profile anytime in the future, but the username should be unique and not taken by any other users in the application. If the user changes her profile details and password which is updated to the database.
Pre-Conditions	The user should have logged in into the account.
Post Condition	The user will be able to edit their profile.

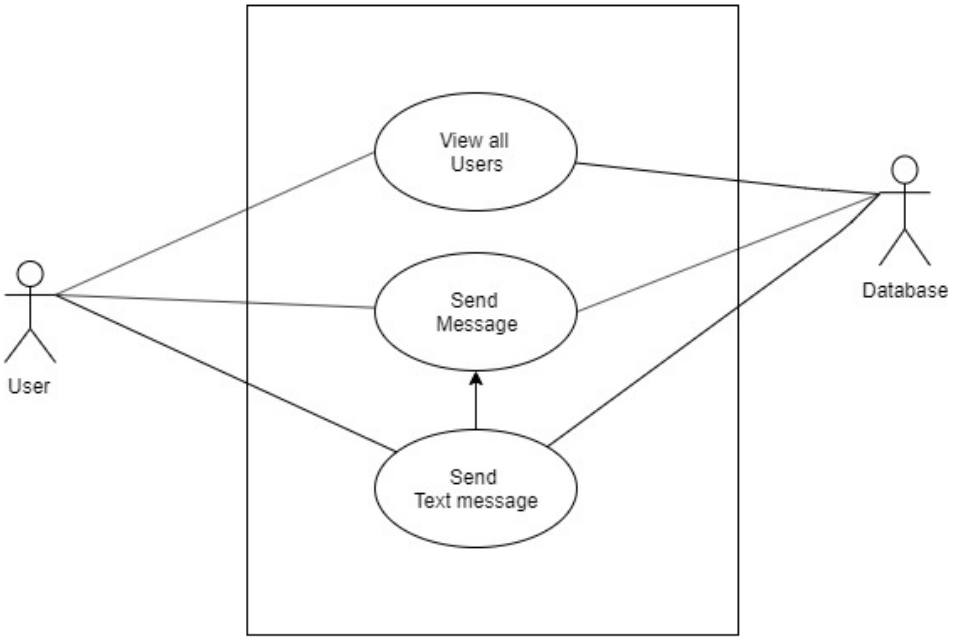

Figure 6: UseCase Diagram for one to one messaging

Use Case: One to One Messaging	
Actors	User, Database Authentication
Description	Once the user is logged in, he/she should be able to see the list of all the users she has connected to. The user can also view all other users. Since the user can send message request to anyone who is registered to the application and even to the admin. One can view the conversation that he/she has with that specific user. Inside the chat UI, the user can send either normal text messages.
Pre-Conditions	The user should have either a valid email account.
Post Condition	A message is sent from the sender account to receiver account.

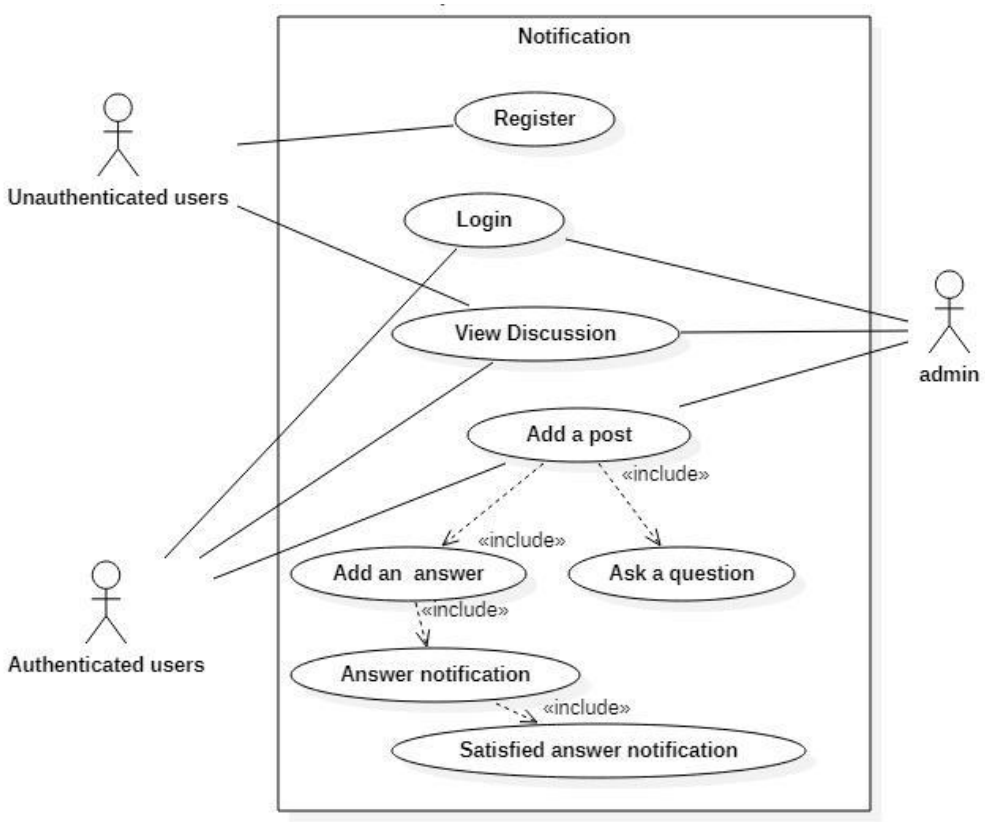

Figure 7: UseCase Diagram for Notifications

Use Case: Notifications	
Actors	Unauthenticated Users, Authenticated Users, Admin
Description	Once the user is logged in, he/she should be able to add a post i.e. Ask the question in the discussion forum, the notifications arise when their question is asked or answer is marked satisfied.
Pre-Conditions	The user should have logged in.
Post Condition	A notification is received.

6. DESIGN

The section documents the various steps taken during the development of Shikshyalaya.

6.1 DATA STRUCTURE DESIGN

The data type, size and constraints for each data Entity is documented. The data types are identified as following:

- Character varying(n)
- Integer
- Date
- Boolean
- Text
- Double Precision

6.2. CONTEXT DIAGRAM

The context diagram represents the overall explanation of the website 'Shikshyalaya'.

The system has been shown in diagrammatic process below:

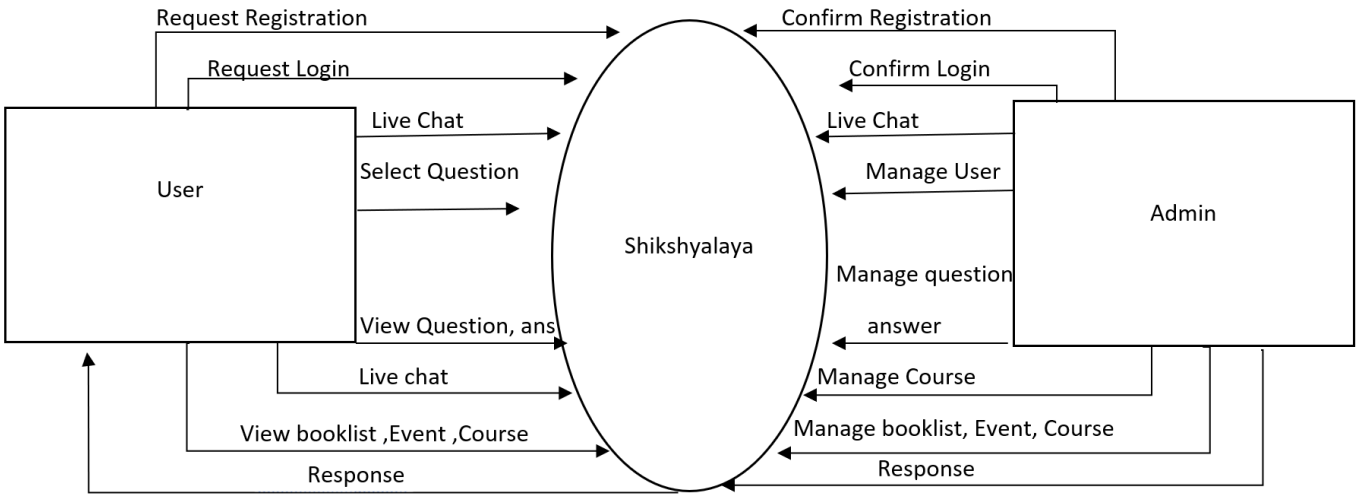

Figure 8: Context Diagram of Shikshyalaya

6.3. DATAFLOW DIAGRAM

A Data Flow Diagram (DFD) is a graphical representation of the "flow" of data through a system. The following Data Flow Diagram represents the flow of data in our system:

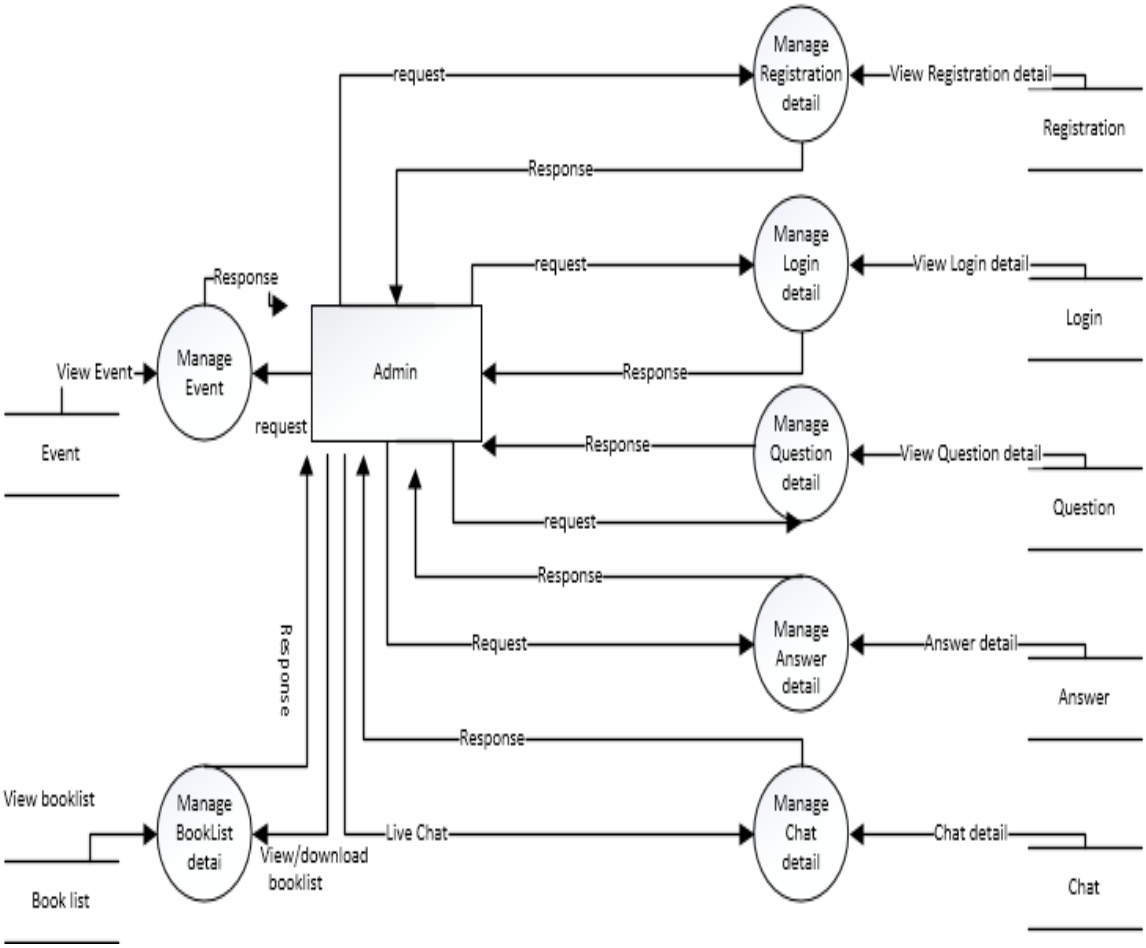

Figure 9: DataFlow of Admin

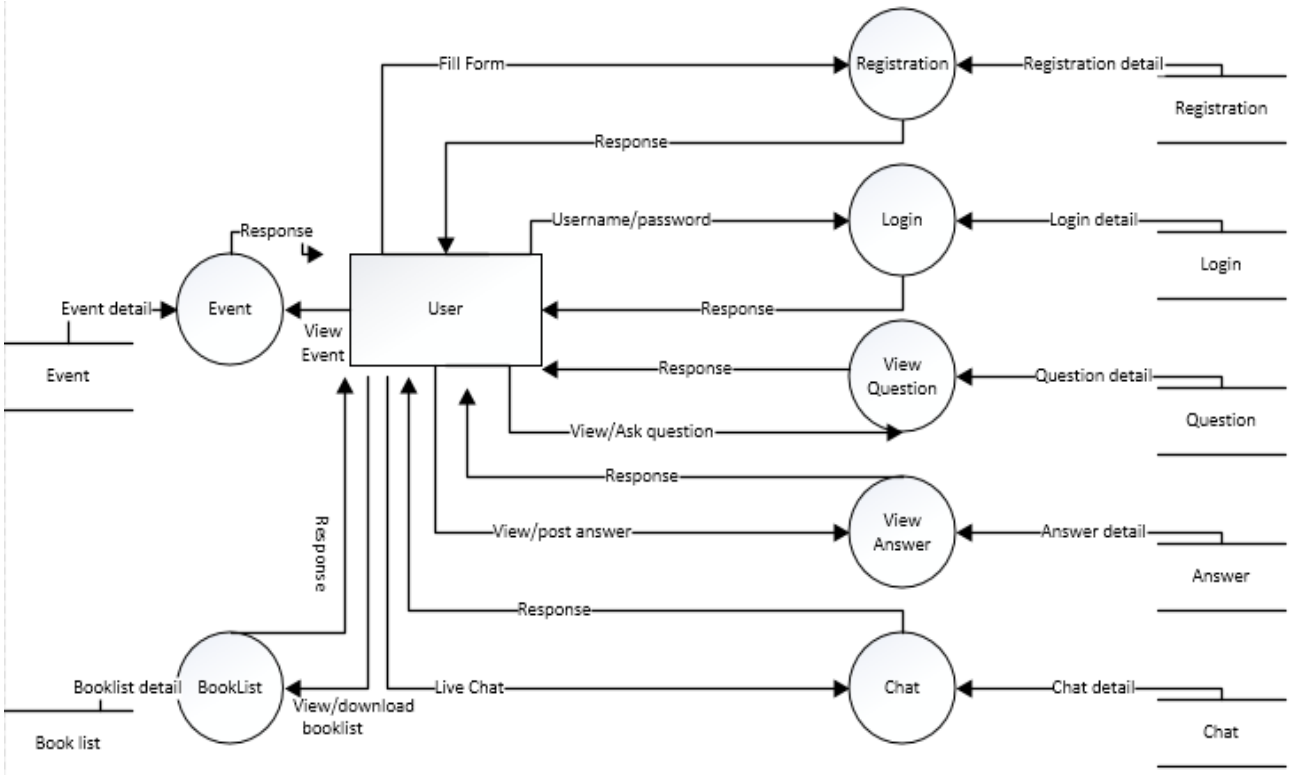

Figure 10: Dataflow of User

6.4. ER DIAGRAM

The main purpose of E-R diagram is to illustrate an information system's entities and the relationships between those entities graphically. The following ER diagram shows the various entities and the relationships among them in the application.

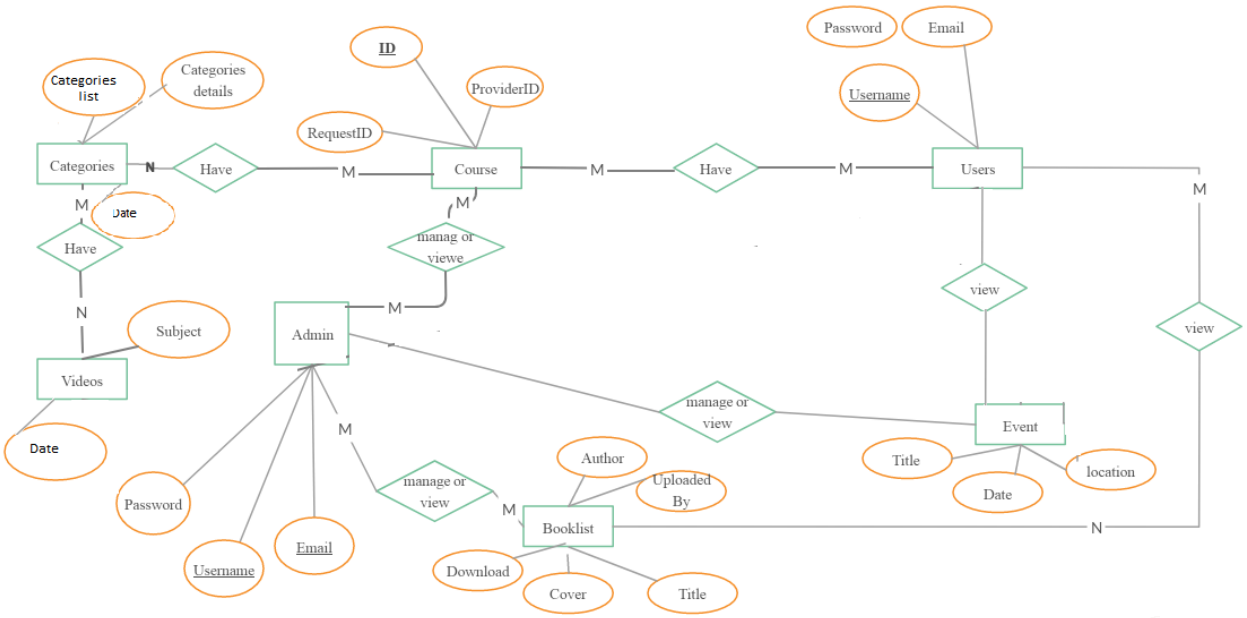

Figure 11: ER diagram of Course/Book List/Event

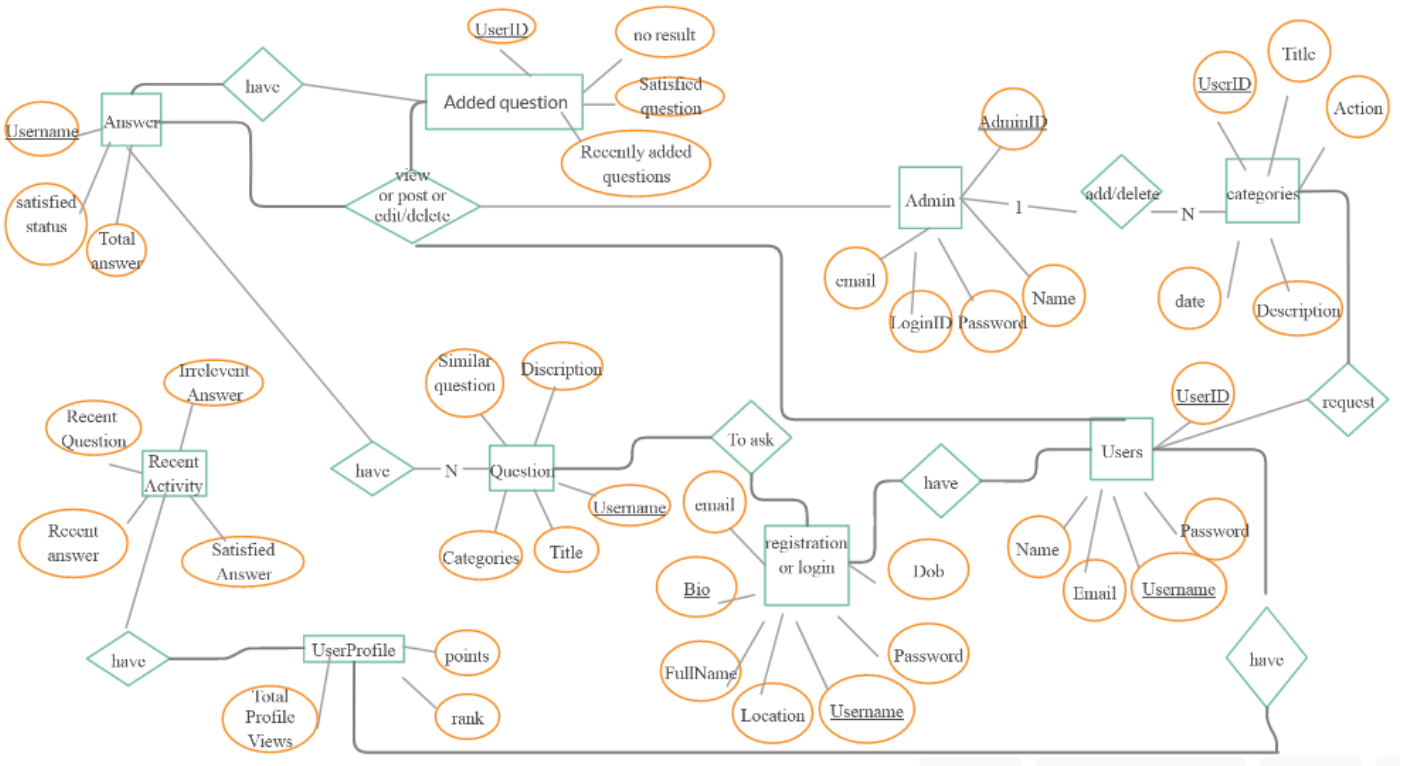

Figure 12: ER diagram of question/answer

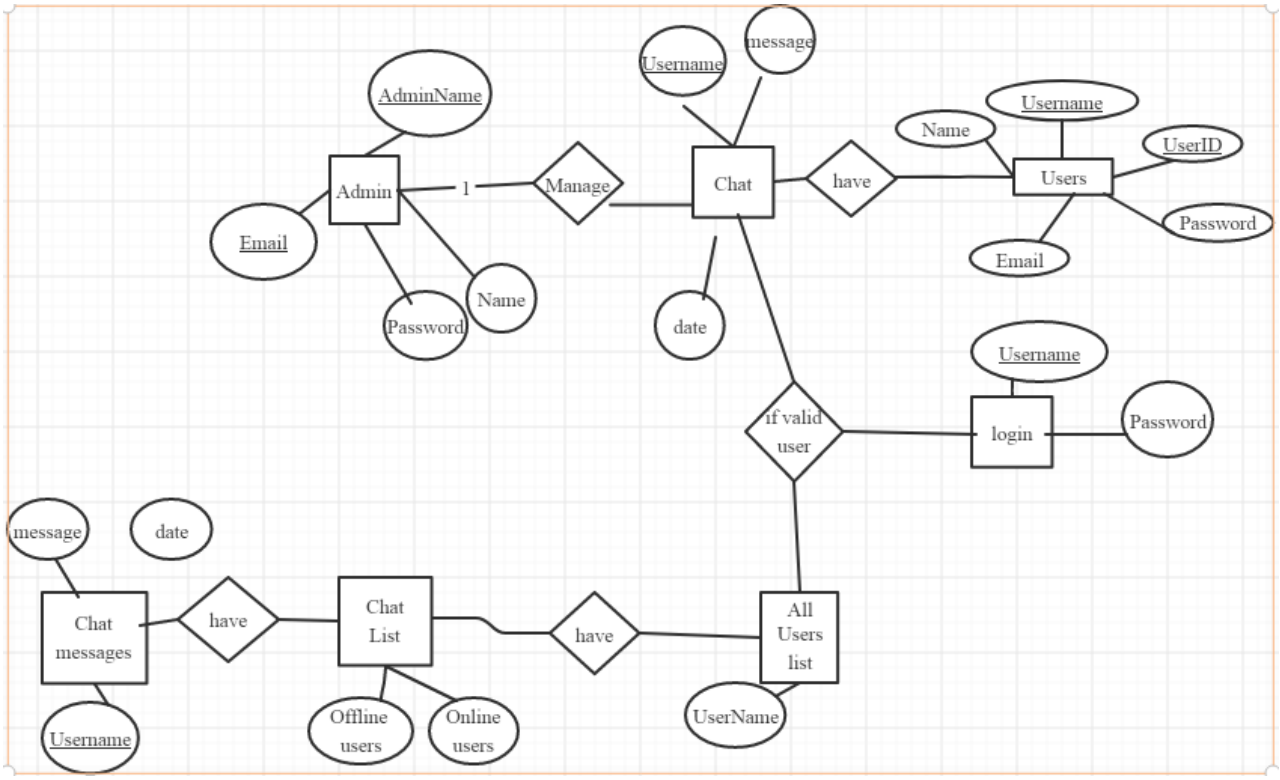

Figure 13: ER diagram of chat

6.5. CLASS DIAGRAM

The main purpose of class diagram is to describe the structure of a system by showing the system's classes, their attributes, operations and the relationships among objects. The following class diagram shows the overall schema of the objects used in the application.

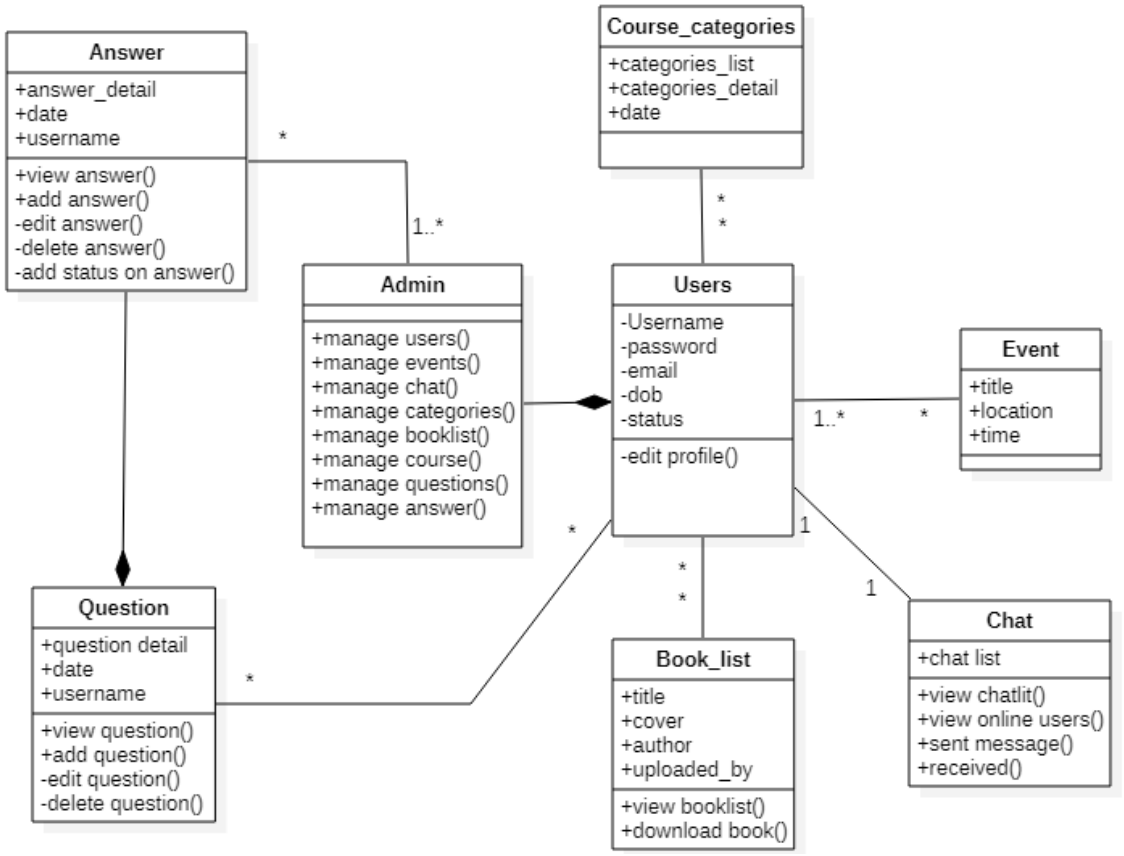

Figure 14: Class diagram of Shikshyalaya

6.6. SEQUENCE DIAGRAM

A sequence diagram shows the dynamic view of the interaction between the various objects during runtime. The following sequence diagrams show how the client and the different objects of the application interact with each other in different use case scenarios.

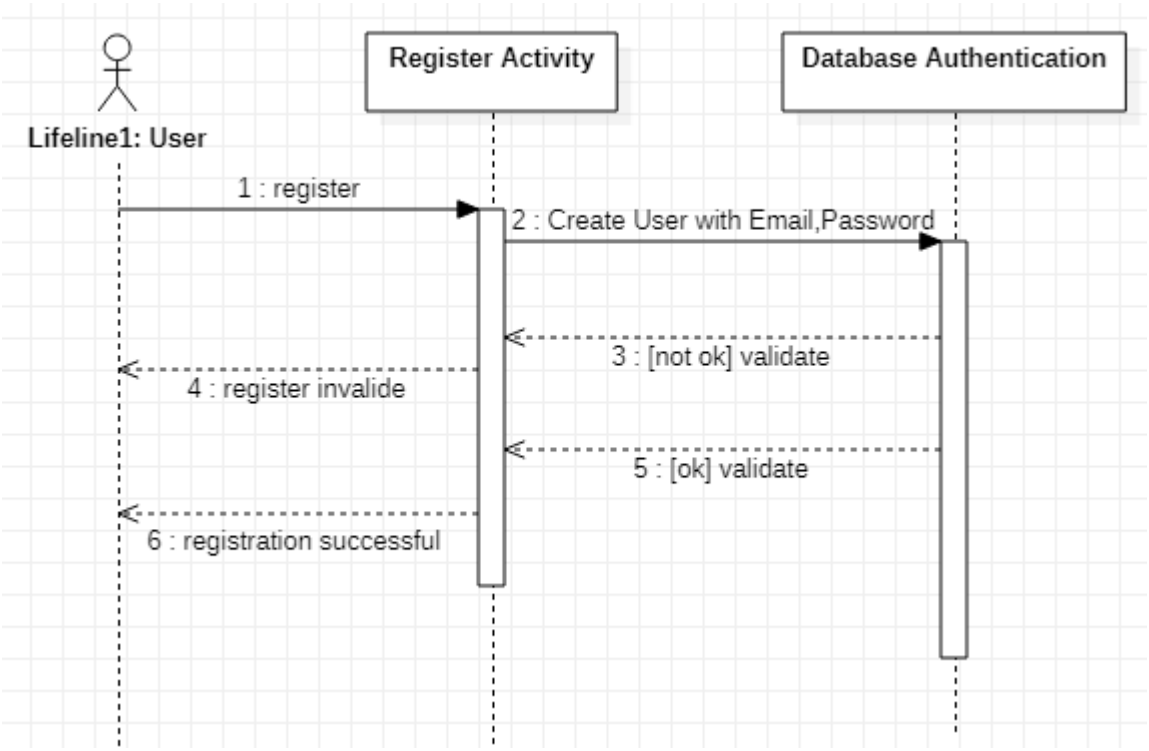

Figure 15: Sequence Diagram for User Registration

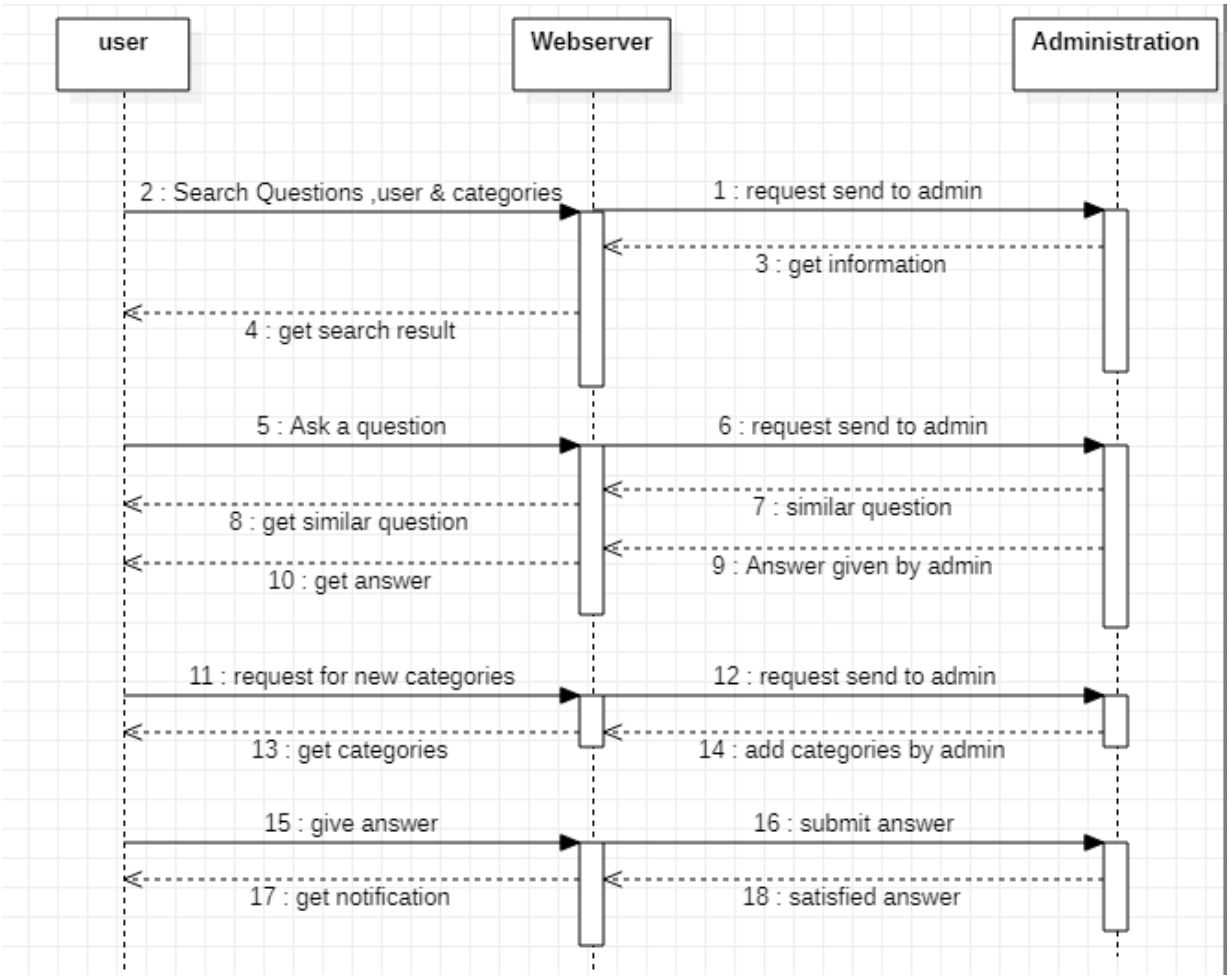

Figure 16: Sequence Diagram for question/answer

6.7. ACTIVITY DIAGRAM

Activity diagram is defined as a UML diagram that focuses on the execution and flow of the behavior of a system instead of implementation.

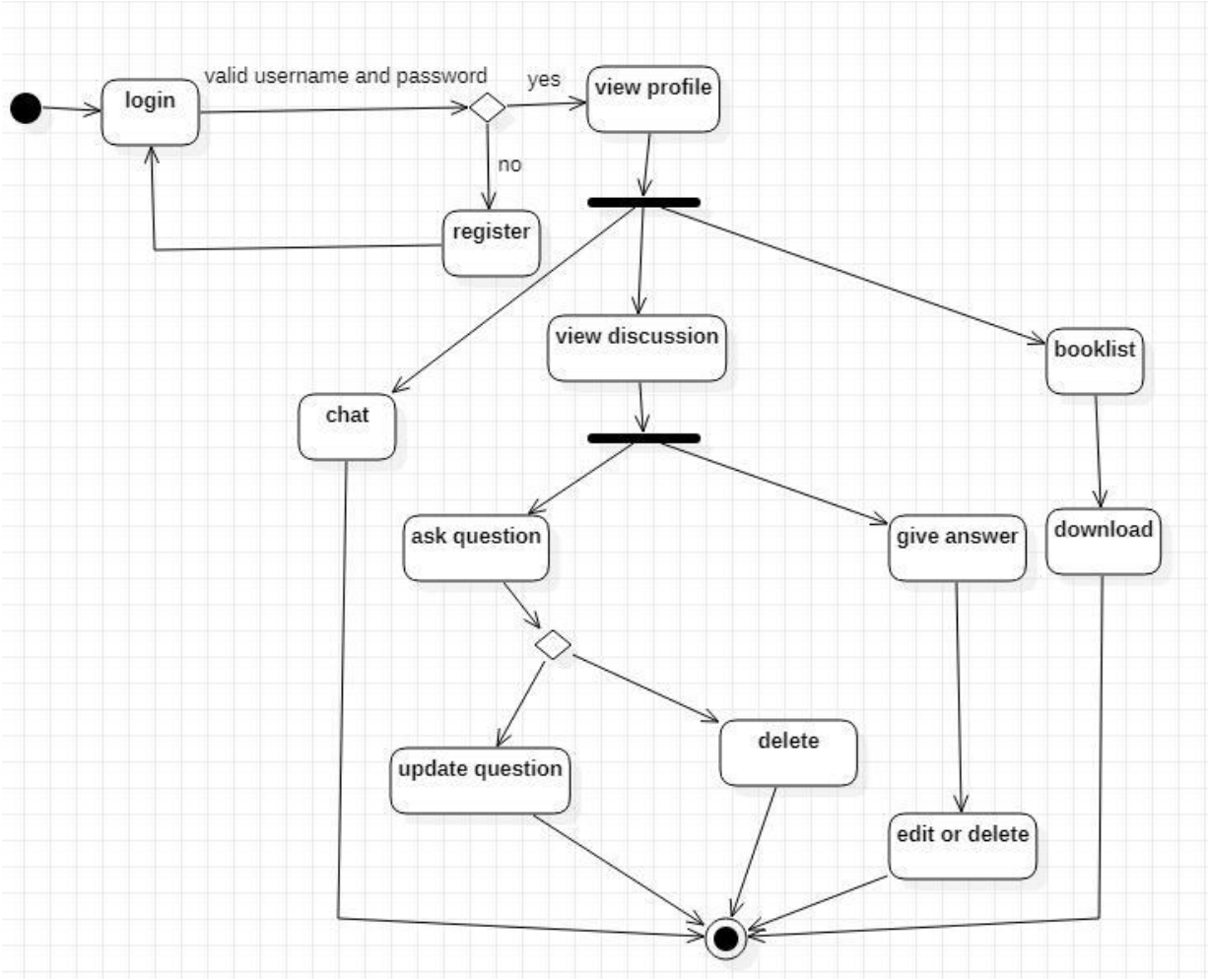

Figure 17: Activity diagram for Asking/Answering

7. CODING AND IMPLEMENTATION

After the logical solution of the enlisted requirements, the app was set up and coded. The following sections describe the various steps that were required during the implementation phase of Shikshyalaya.

7.1. PROJECT SETUP

First, a new project was set up in the PyCharm IDE with following specifications:

Project name: Shikshyalaya, JetBrains PyCharm 2017.1.3

Django Version: 1.11

7.2. DJANGO INTERGRATION

Django is a high-level Python Web framework that encourages rapid development and clean pragmatic design. A Web framework is a set of components that provide a standard way to develop websites fast and easily. Django's primary goal is to ease the creation of complex database-driven websites. Some well-known sites that use Django include PBS, Instagram, Disqus, Washington Times, Bit bucket and Mozilla. [9]

Testing Django applications

Testing a Web application is a complex task, because a Web application is made of several layers of logic – from HTTP-level request handling, to form validation and processing, to template rendering. With Django's test-execution framework and assorted utilities, we can simulate requests, insert test data, inspect the application's output and generally verify our code. The best part is, it is easy. The preferred way to write tests in Django is using the unit test module built in to the Python standard library.

7.3. UI DESIGN

This phase involves the design of various layouts to be displayed in the front-end when user browses to several activities and fragments. These layouts are designed in PyCharm IDE and are written in html/bootstrap/CSS.

The various layouts created during the coding phases and their purposes are enlisted in the table that follows. The screenshots of the layouts are provided in Appendix-I.

Templates used in the application:

Directory: Main

The list of templates and its use is listed below:

- base.html: This is the primary template of the web application. It holds navigation bar and footer.
- index.html: This is the html file where you see the main home page of the website.
- ask_question.html: Once logged in, one can ask the desired question.
- answer.html: Anyone can answer the question asked in the webpage if the user is logged in.
- detail.html: all the question description and answer to post, marking the answer as satisfied or irrelevant is contained here.
- add_category.html: if the user is admin, he/she can add the category (biology, physics and many more) as per required.
- book_list.html: One can download the book he/she is looking for.
- courses.html: All the videos lectures can be viewed here.

Directory: Account

The list of templates and its use is listed below:

- register.html: The user can register through this view.
- login.html: After successful registration, one can login to the account.
- update_account.html: The user can change name and email address.
- change_password.html: the user can change the password through this view.

Directory: django_private_chat

The list of templates and it use is listed below:

- dialogs.html: One can view the chat of users to chat and chat one to one with desired.

Directory: Meetings

The list of templates and it use is listed below:

- detail.html: The list of events happening is viewed here.

7.4. REGISTRATION

After the design, the registration and login features were implemented. The simplest way to implement a user sign up is by using the UserCreationForm. We used the same strategy using the default Django user, using username to authenticate and is interested only in setting the username and password upon sign up.

A new user with an email and password can easily be created by invoking a call to method. What we did here is handling the UserCreationForm processing. After the code reach form.Save, the user is created. However, here we need to take a step further: manually authenticate the user.

In order to perform the authentication, we need to grab the raw password from the input that came from POST. The user.password stores the hash, and we cannot use it directly to authenticate. After the coding part, we made the Django templates and rendered the template(html file) from the views.py.

7.5. USER PROFILE

A user profile is created the first time when a user logs on to a computer. The profile is stored on the admin site. The users can update his profile as per his requirement. The simple way to implement a user update is by using UpdateProfileForm. After the users has successfully logged in to the site he can view the activities he has done. One can view the recent activities by rendering the html file through views.py.

7.6. DISCUSSION FORUM (QUESTION/ANSWER DISCUSSION)

The feature was added to allow users to ask question and answer on different topics. One can view the detail of the question asked and answer to the question by simply clicking to the question. The question is followed by the category the user selected while asking question which is done by using Category.objects.all().order_by("category") along with the time of the

question posted on which is done by using Question.objects.all().order_by("-date") and the user who posted it.

One can view for the how many times the question has been viewed and how many answers has been made so far by counting the answers which is done by using Question.objects.annotate(num_answers=Count('answer')).orderby("-date"). Points will be rewarded based on questions answered i.e if the answer is mark satisfied by the question author or the admin each will get 10 points.

7.7. CHAT ROOM (SENDING TEXT MESSAGES)

Users after logging in can chat with any registered users or admin. There is separate chat room where user can chat and view the list of the users available. The users can view the online users and chat with them in real time along with the feature of viewing the next end user typing.

7.8. DOWNLOAD NOTES

There are notes made available by the admin/teachers, which the users can download by viewing the book list. If request. Method = = 'POST' then the book will be uploaded in the book_list html page when it is posted by admin.

7.9. WATCH VIDEO TUTORIALS

The users can watch the video provided by the admin/teachers on the course site where different category of videos will be provided.

8. TESTING AND REVIEW

This section describes the process involved in various tests conducted in the application. The specification of the devices in which the app was tested on is listed on the table that follows.

Table 3: Devices used for testing the application

SN	Device Name	Specifications
1.	Dell	Manufacturer: Dell Processor: Intel Core™ i7-7500U CPU @2.70GHz 2.90GHz Installed memory(RAM):8.00 GB
2.	Dell	Manufacturer: Dell Processor: Intel Core™ i5-6300HQ CPU @2.30GHz 2.30GHz Installed memory(RAM):8.00 GB
3.	Compaq	Manufacturer: Compaq Processor: AMD E-300 APU with Radeon™ HD Graphics 1.30 GHz Installed memory(RAM):4.00 GB
2.	PyCharm	Version: 2017.1.1 Django Versiom:1.11

8.1. HARDWARE AND SOFTWARE SEPECIFICATION

The following are the different specifications both in hardware and software levels that a target device must fulfill to run Shikshyalaya successfully.

Processing Speed: 800 MHz or Higher

Memory: 28 MB or Higher

Input: Standard Keyboard, Mouse

Storage: Hard Disk

Output: Monitor, Printer

Operating System: Windows 98 or higher

Drivers: Required Drivers of the Hardware parts

8.2 TEST CASES

The following test cases were used while unit testing the application.

Table 4: Test case used for unit testing

Test Case #	**Category**	**Test Scenario**	**Expected Result**	**Actual Result**
1.	General UI	Launch web application from the localhost	App launch successful	App launch successful
2.		Login to the account for the first time	UI shows the home page.	UI shows the home page.
3.		Navigate to 'Find Users, Categories and Questions'	Show the desired search	Shows the desired search
4.		Click in the Chat button	UI shows the registered users of the application	UI shows the registered users of the application
5.		Click for Requesting topics	Request topic form appears	Request topic form appears
6.		Click the Courses	UI shows the list of lectures added in the web app	UI shows the list of lectures added in the web app
7.	Login/Registration	Enter unregistered id and tap login button	Show invalid id message	Shows invalid id
8.		Enter the registered email but incorrect password	Show incorrect password message	Shows incorrect password message.
9.		Create a New User(Enter existing Username or leave other fields/s empty)	Correct error/s to create user message	Correct error/s to create user message

10.		Create a New User(Enter a unique username and fill all fields)	New User created successfully	New User created successfully
11.	Managing Profile	Update User Details	UI shows the form where email, name and location is to be updated	UI shows the form where email, name and location is to be updated
12.		Update New Password(Enter matching password pair and fill new password)	Password changed successfully message	Password changed successfully message
13.		Update User Details(Leaving some field blank)	Prompt that the fields cannot be empty	Prompt that the fields cannot be empty
14.	Discussion Forum	Click on the 'Ask Question'	UI shows the form with category, title and description to be entered	UI shows the form with category, title and description to be entered
15.		Click on the Question asked by the other users	Next page appears where answer is to be entered	Next page appears where answer is to be entered
16.		Click on the Trending question	The question with maximum views appears	The question with maximum views appears
17.		Click on similar question	Question with same category appears	Question with same category appears

18.	Chat UI	Type nothing and click the send button	Nothing happens	Nothing happens
19.		Type a text message and then click send button	The text message is sent to the other user	The text message is sent to the other user
20.		Type some text message	The other user sees the typing	The other user sees the typing
21.	Download Notes	Click on the notes to be downloaded	Successfully gets downloaded	Successfully gets downloaded
22.	Watch Video Tutorials	Click on the video to be watched	The videos plays successfully	The videos plays successfully

9. CONCLUSION

The major problem encountered during the development of Shikshyalaya was the difficulty that exists today while asking the questions related to the course subjects. In the existing system, the students need to wait for teachers for asking questions. However, if the teacher is unable to provide time to the students then they are obliged to rely on internet to find the answers. In such cases, the students browse various sites to search the answers and may involuntarily share their personal information to unsafe websites. Furthermore, the validity of the contents in the discussion forums might be questionable. Hence, in future the platforms with involvement of the experts can be developed.

10. RECOMMENDATIONS

Due to time limits and weightage of the project, the application has some distinct aspects that can be improved further. This section provides some recommendations that can further enhanced:

1. Single Sign In features can be added.
2. The authentication methods can be extended to other alternatives like Phone authentication, Twitter, etc.
3. The chat features can be further made advance like adding the medias i.e. sending image message, video message, etc.
4. The discussion forum can be further made advance like adding the medias i.e. attaching image messages while asking question.
5. After the optimizations, the website will be published to its own domain.

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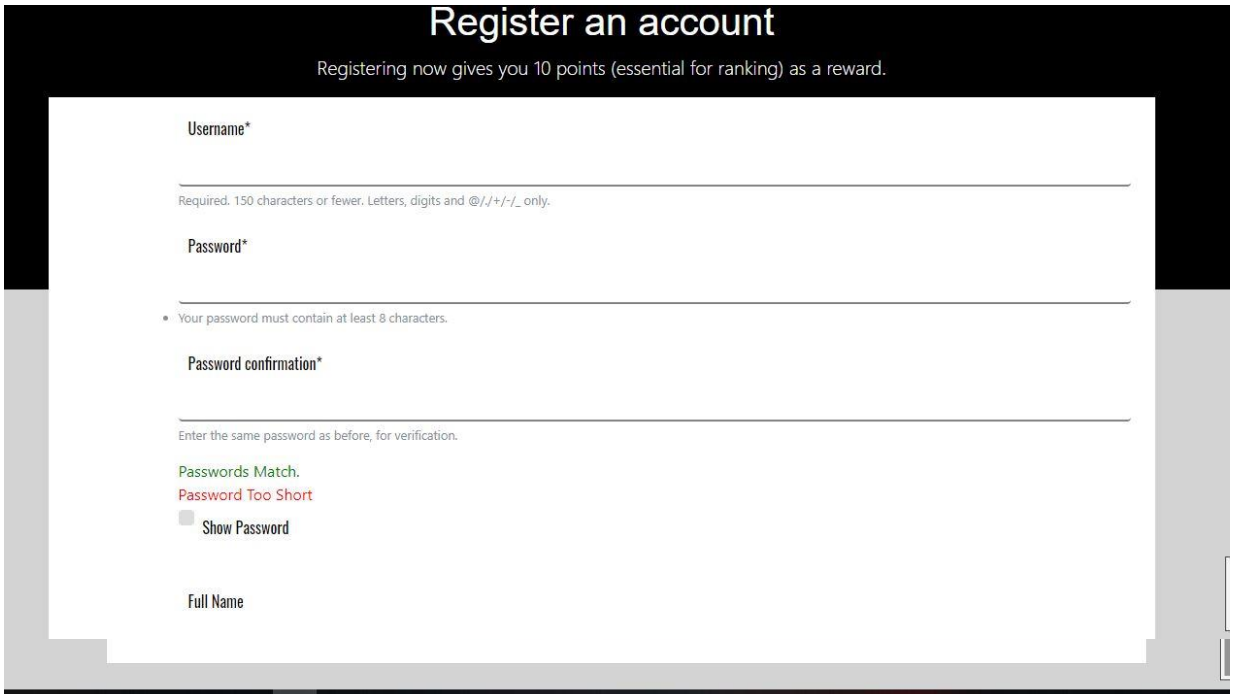
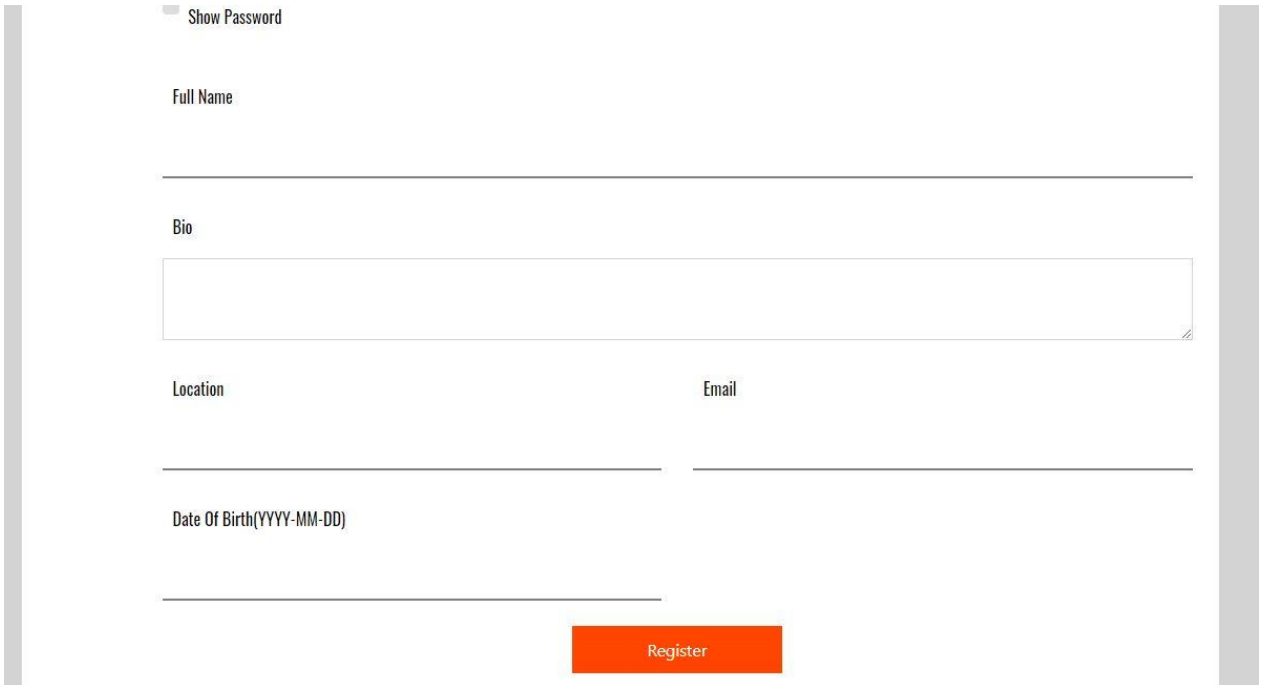
[8]Findwords.info. (2019). *What does pycharm mean*. [online] Available at: https://findwords.info/term/pycharm [Accessed 23 Nov. 2019].

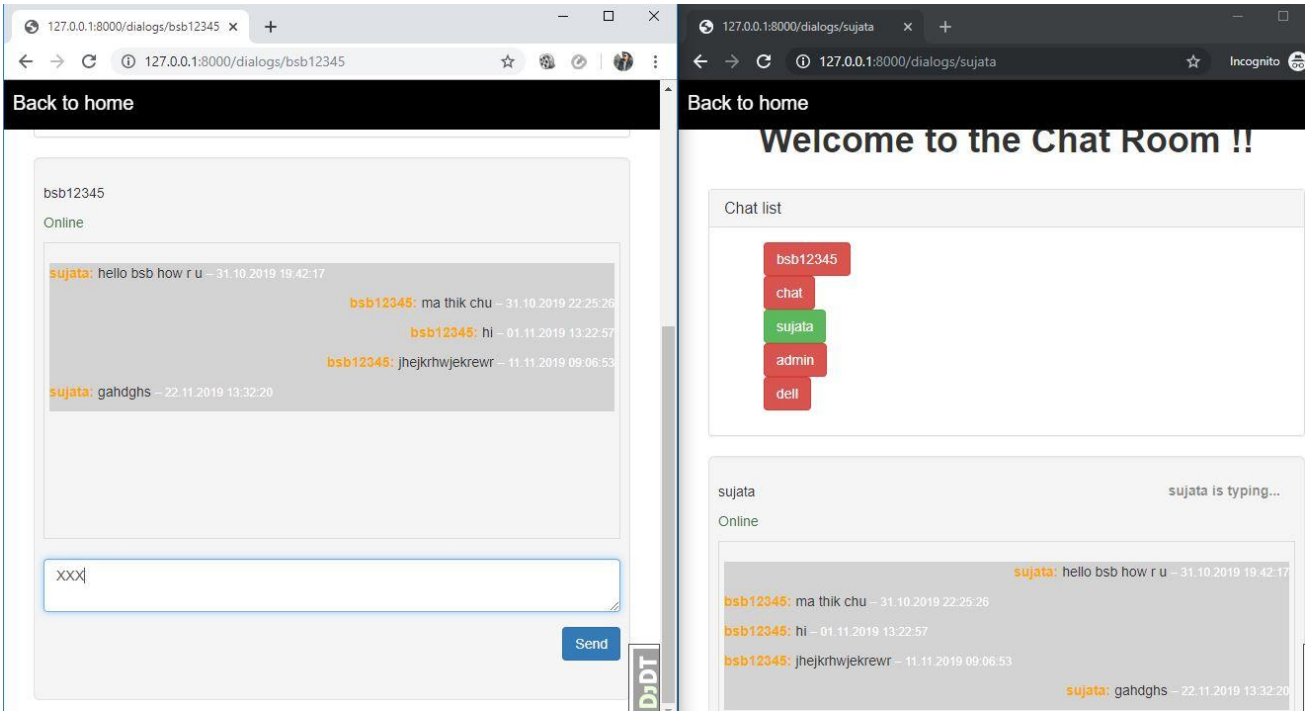
[9] Python, R. (2019). *Django Tutorials – Real Python*. [online] Realpython.com. Available at: https://realpython.com/tutorials/django/ [Accessed 23 Nov. 2019].

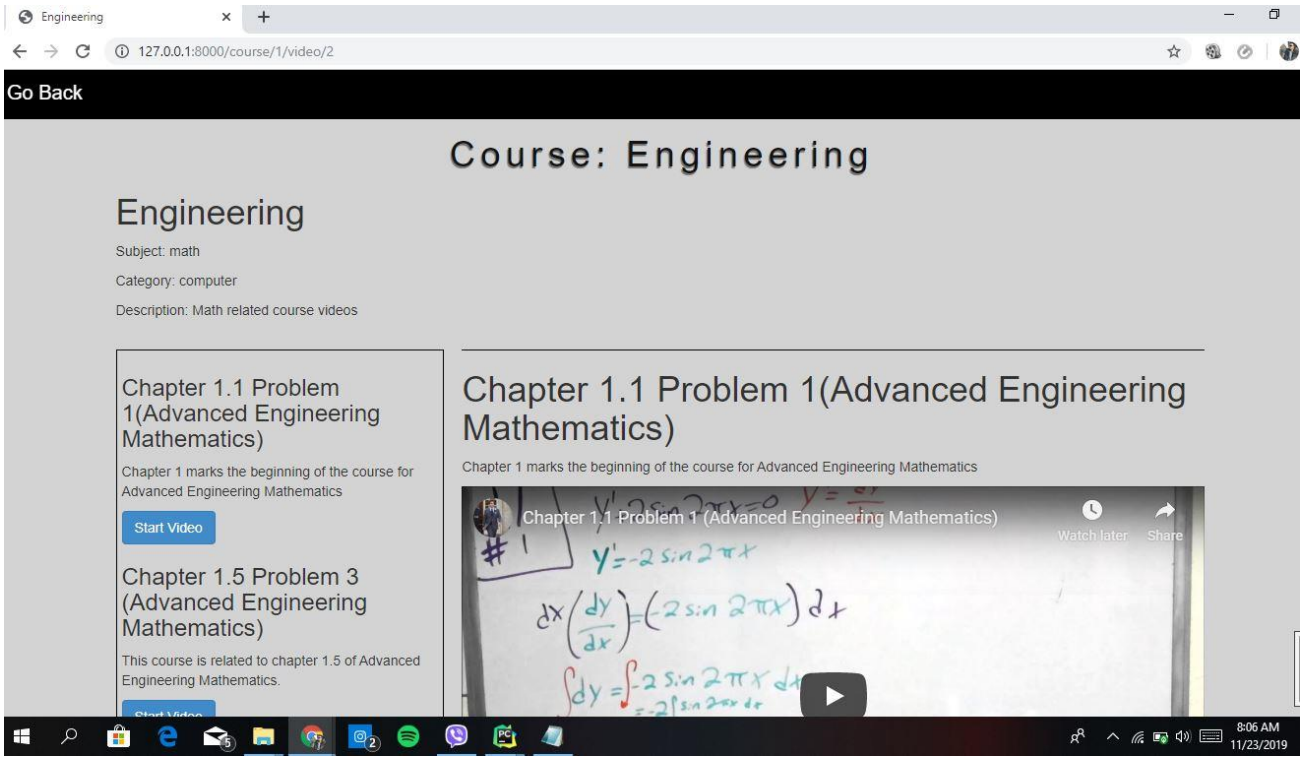
APPENDIX – I

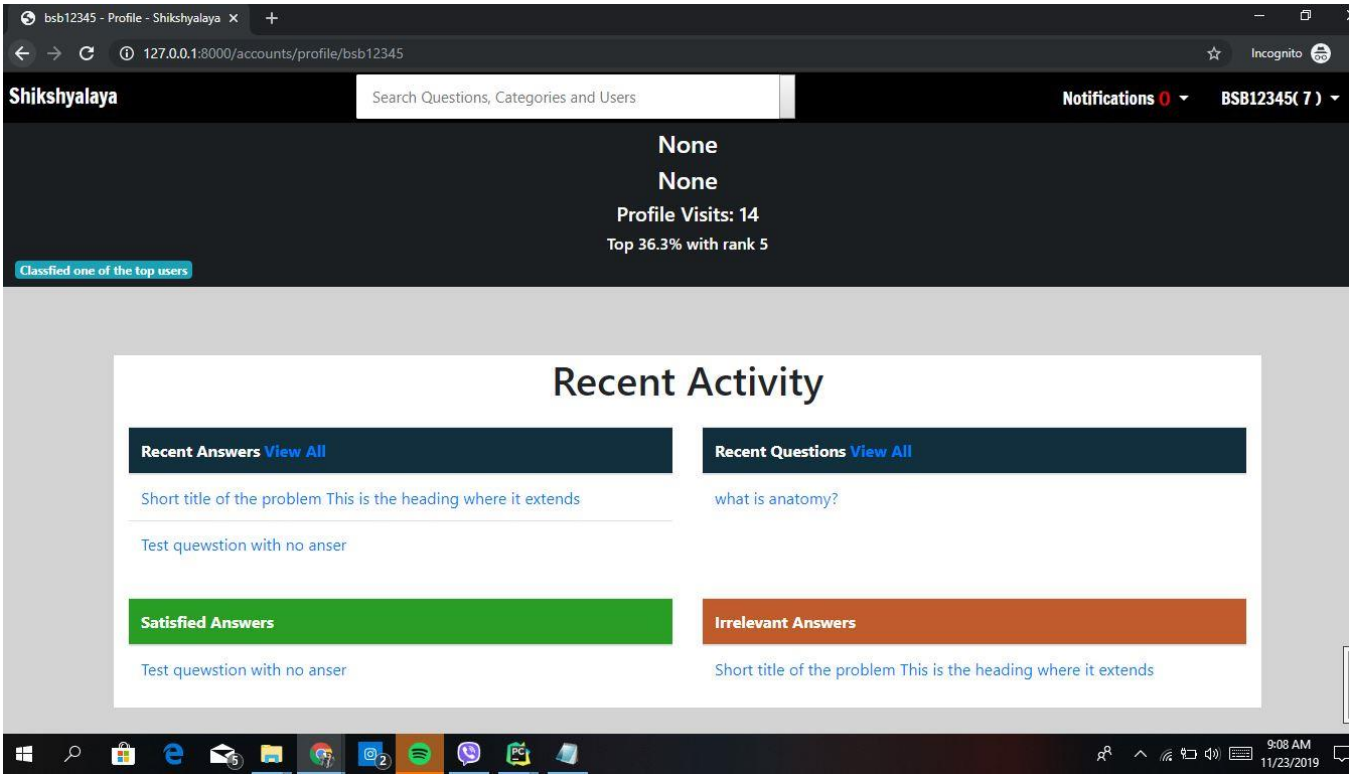
This appendix lists the screenshots of various screenshots of UI. Please note that the UI could be quite different on different user devices because the layouts depend on screen size, pixel quantity, etc. of the target device.

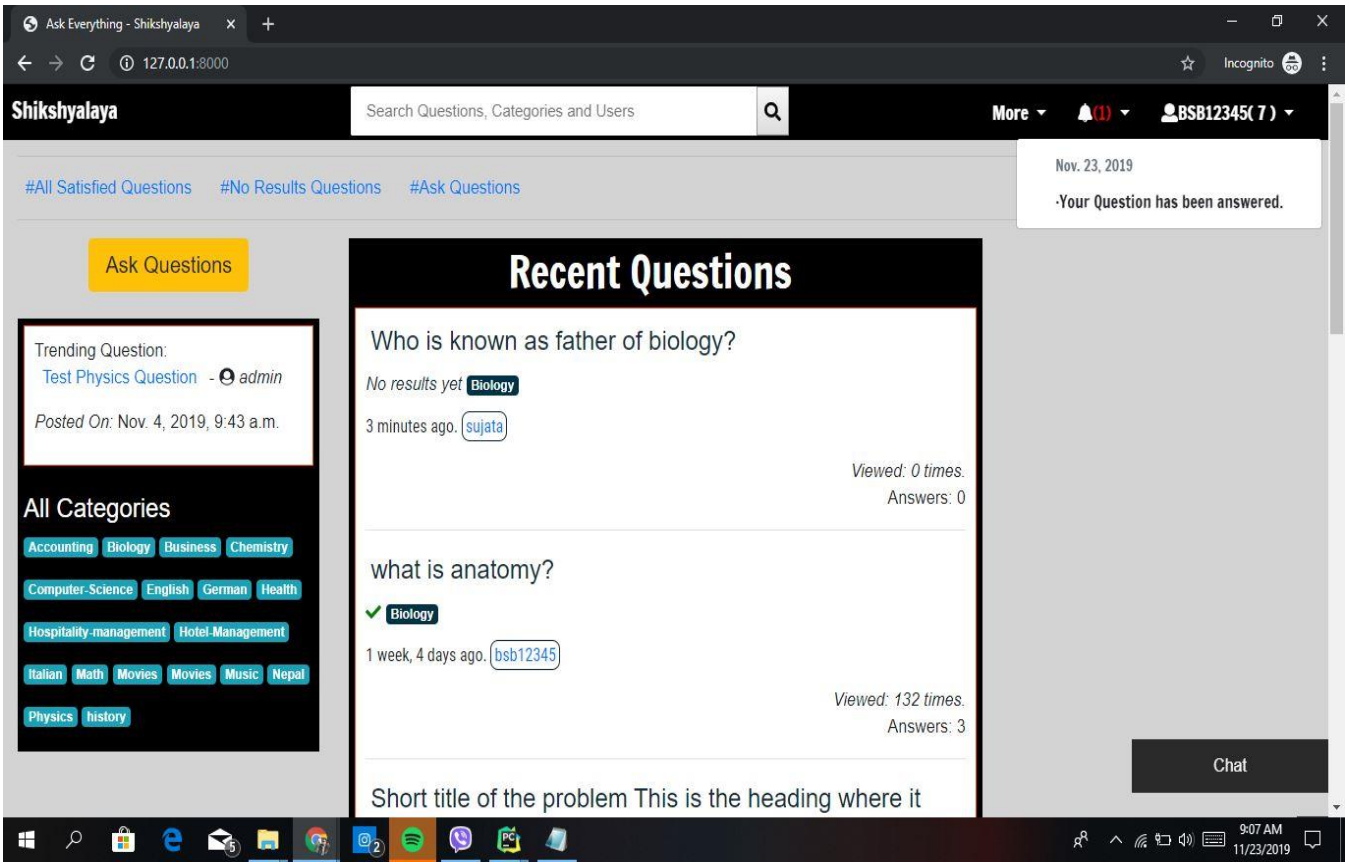


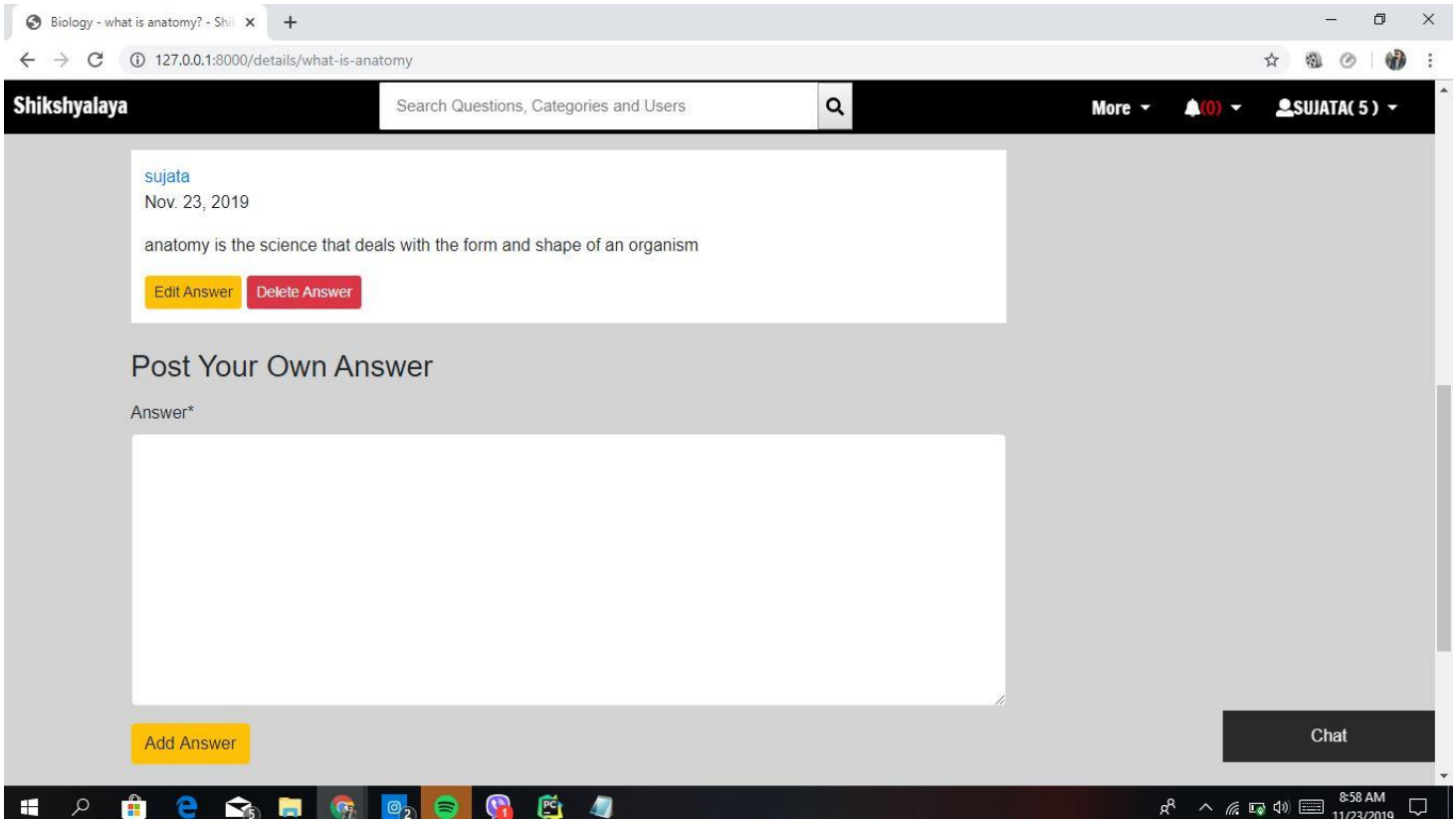


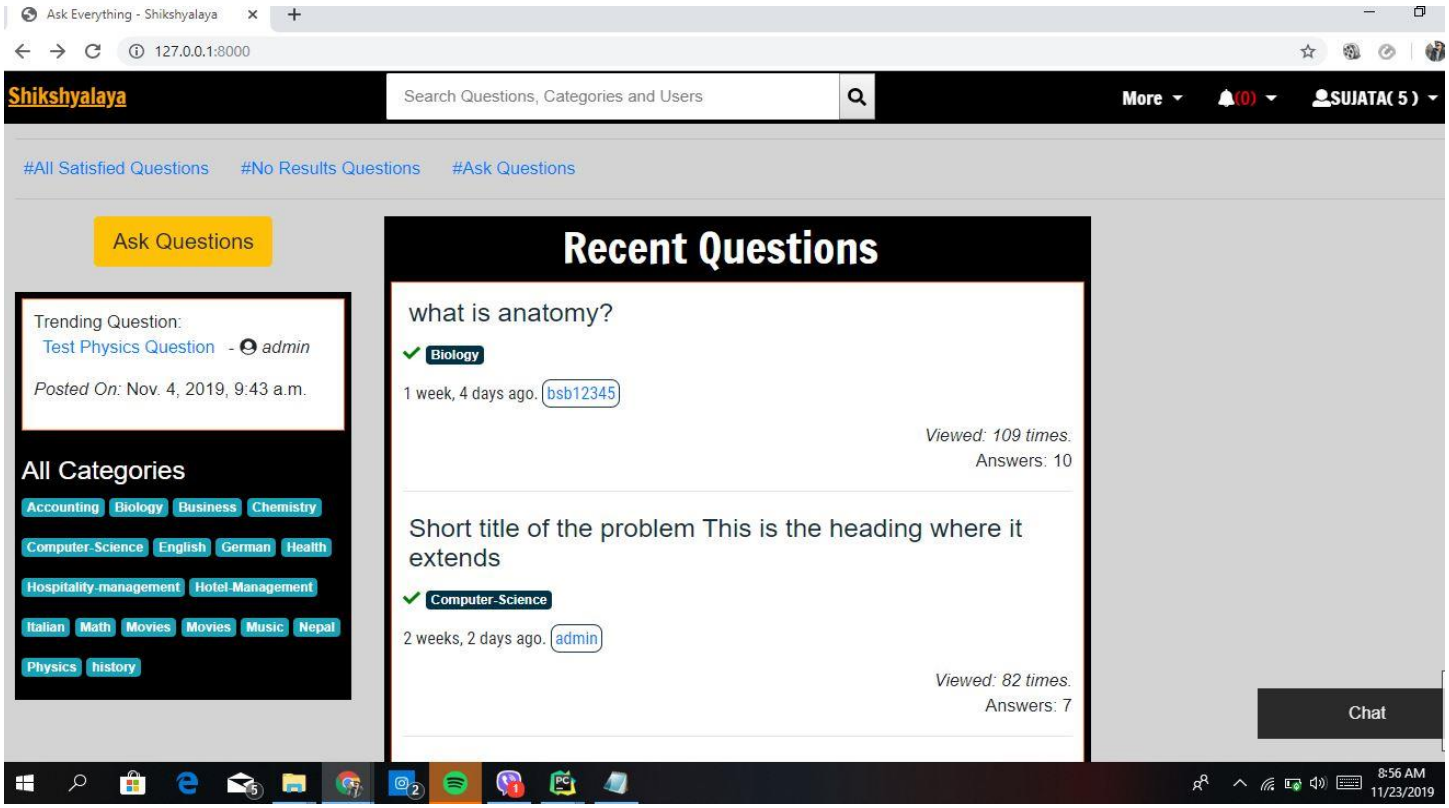

127.0.0.1:8000/dialogs/bsb12345
127.0.0.1:8000/dialogs/bsb12345
Back to home
bsb12345
Online
sujata: hello bsb how r u – 31.10.2019 19:42:17
bsb12345: ma thik chu – 31.10.2019 22:25:26
bsb12345: hi – 01.11.2019 13:22:57
bsb12345: jhejkrhwjekrewr – 11.11.2019 09:06:53
sujata: gahdghs – 22.11.2019 13:32:20
xxx
Send
127.0.0.1:8000/dialogs/sujata
Incognito
Back to home
Welcome to the Chat Room !!
Chat list
bsb12345
chat
sujata
admin
dell
sujata
sujata is typing...
Online
sujata: hello bsb how r u – 31.10.2019 19:42:17
bsb12345: ma thik chu – 31.10.2019 22:25:26
bsb12345: hi – 01.11.2019 13:22:57
bsb12345: jhejkrhwjekrewr – 11.11.2019 09:06:53
sujata: gahdghs – 22.11.2019 13:32:20

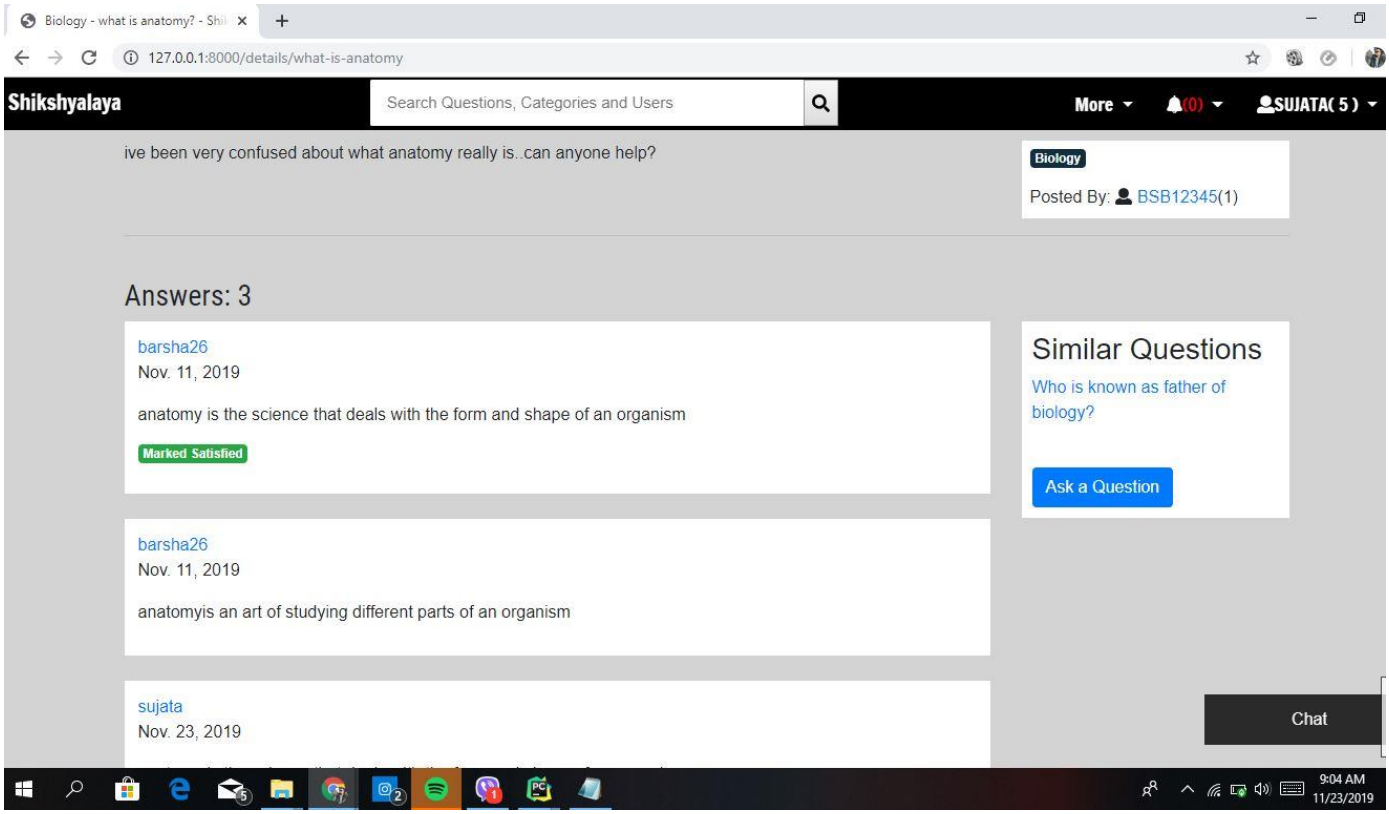

Engineering
127.0.0.1:8000/course/1/video/2
Go Back
Course: Engineering
Engineering
Subject: math
Category: computer
Description: Math related course videos
Chapter 1.1 Problem 1(Advanced Engineering Mathematics)
Chapter 1 marks the beginning of the course for Advanced Engineering Mathematics
Start Video
Chapter 1.5 Problem 3 (Advanced Engineering Mathematics)
This course is related to chapter 1.5 of Advanced Engineering Mathematics.
Chapter 1.1 Problem 1(Advanced Engineering Mathematics)
Chapter 1 marks the beginning of the course for Advanced Engineering Mathematics
Chapter 1.1 Problem 1 (Advanced Engineering Mathematics)
Watch later
Share
8:06 AM
11/23/2019


bsb12345 - Profile - Shikshyalaya
127.0.0.1:8000/accounts/profile/bsb12345
Incognito
Shikshyalaya
Search Questions, Categories and Users
Notifications 0
BSB12345(7)
None
None
Profile Visits: 14
Top 36.3% with rank 5
Classfied one of the top users
Recent Activity
Recent Answers View All
Short title of the problem This is the heading where it extends
Test quewstion with no anser
Recent Questions View All
what is anatomy?
Satisfied Answers
Test quewstion with no anser
Irrelevant Answers
Short title of the problem This is the heading where it extends
9:08 AM
11/23/2019


Ask Everything - Shikshyalaya
127.0.0.1:8000
Incognito
Shikshyalaya
Search Questions, Categories and Users
More
(1)
BSB12345(7)
Nov. 23, 2019
·Your Question has been answered.
#All Satisfied Questions
#No Results Questions
#Ask Questions
Ask Questions
Trending Question:
Test Physics Question - admin
Posted On: Nov. 4, 2019, 9:43 a.m.
All Categories
Accounting
Biology
Business
Chemistry
Computer-Science
English
German
Health
Hospitality-management
Hotel-Management
Italian
Math
Movies
Movies
Music
Nepal
Physics
history
Recent Questions
Who is known as father of biology?
No results yet
Biology
3 minutes ago.
sujata
Viewed: 0 times.
Answers: 0
what is anatomy?
Biology
1 week, 4 days ago.
bsb12345
Viewed: 132 times.
Answers: 3
Short title of the problem This is the heading where it
Chat
9:07 AM
11/23/2019

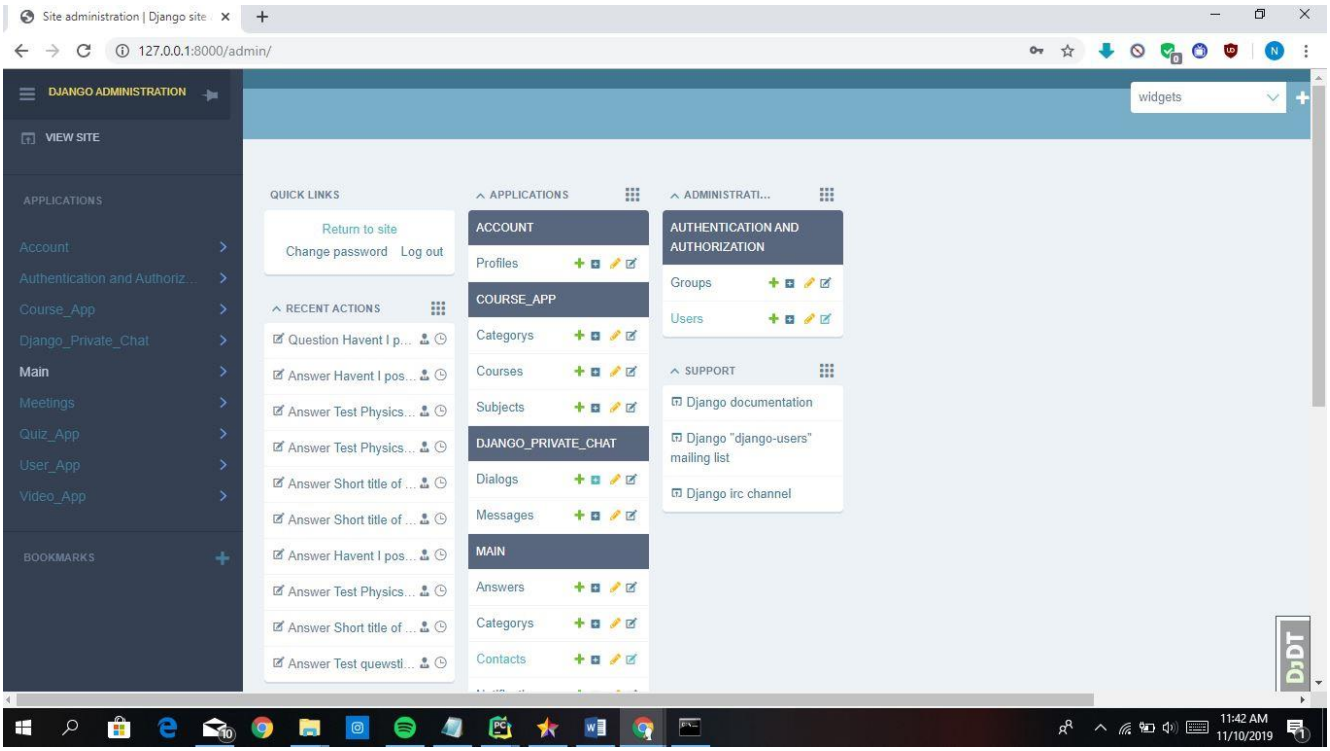

Biology - what is anatomy? - Shi
127.0.0.1:8000/details/what-is-anatomy
Shikshyalaya
Search Questions, Categories and Users
More
(0)
SUJATA(5)
sujata
Nov. 23, 2019
anatomy is the science that deals with the form and shape of an organism
Edit Answer
Delete Answer
Post Your Own Answer
Answer*
Add Answer
Chat
8:58 AM
11/23/2019


Ask Everything - Shikshyalaya
127.0.0.1:8000
Shikshyalaya
Search Questions, Categories and Users
More
(0)
SUJATA(5)
#All Satisfied Questions
#No Results Questions
#Ask Questions
Ask Questions
Trending Question:
Test Physics Question - admin
Posted On: Nov. 4, 2019, 9:43 a.m.
All Categories
Accounting
Biology
Business
Chemistry
Computer-Science
English
German
Health
Hospitality-management
Hotel-Management
Italian
Math
Movies
Movies
Music
Nepal
Physics
history
Recent Questions
what is anatomy?
Biology
1 week, 4 days ago. bsb12345
Viewed: 109 times.
Answers: 10
Short title of the problem This is the heading where it extends
Computer-Science
2 weeks, 2 days ago. admin
Viewed: 82 times.
Answers: 7
Chat
8:56 AM
11/23/2019


Biology - what is anatomy? - Shi
127.0.0.1:8000/details/what-is-anatomy
Shikshyalaya
Search Questions, Categories and Users
More
(0)
SUJATA(5)
ive been very confused about what anatomy really is..can anyone help?
Biology
Posted By: BSB12345(1)
Answers: 3
barsha26
Nov. 11, 2019
anatomy is the science that deals with the form and shape of an organism
Marked Satisfied
barsha26
Nov. 11, 2019
anatomyis an art of studying different parts of an organism
sujata
Nov. 23, 2019
Similar Questions
Who is known as father of biology?
Ask a Question
Chat
9:04 AM
11/23/2019

APPENDIX -II

The following is the Django administration.



APPENDIX III

This section documents the code snippets that were used for some specific purposes in the project.

Saves a new chat message to database:

```
def new_messages_handler(stream):

    while True:
        packet = yield from stream.get()
        session_id = packet.get('session_key')
        msg = packet.get('message')
        username_opponent = packet.get('username')
        if session_id and msg and username_opponent:
            user_owner = get_user_from_session(session_id)
            if user_owner:
                user_opponent =
get_user_model().objects.get(username=username_opponent)
                dialog = get_dialogs_with_user(user_owner, user_opponent)
                if len(dialog) > 0:
                    # Save the message
                    msg = models.Message.objects.create(
                        dialog=dialog[0],
                        sender=user_owner,
                        text=packet['message'],
                        read=False
                    )
                    packet['created'] = msg.get_formatted_create_datetime()
                    packet['sender_name'] = msg.sender.username
                    packet['message_id'] = msg.id

                    # Send the message
                    connections = []
                    # Find socket of the user which sent the message
                    if (user_owner.username, user_opponent.username) in
ws_connections:
                        connections.append(ws_connections[(user_owner.username,
user_opponent.username)])
                    # Find socket of the opponent
                    if (user_opponent.username, user_owner.username) in
ws_connections:
                        connections.append(ws_connections[(user_opponent.username,
user_owner.username)])
                    else:
                        # Find sockets of people who the opponent is talking with
                        opponent_connections = list(filter(lambda x: x[0] ==
user_opponent.username, ws_connections))
                        opponent_connections_sockets = [ws_connections[i] for i in
opponent_connections]
                        connections.extend(opponent_connections_sockets)

                    yield from fanout_message(connections, packet)
                else:
                    pass
            else:
                pass
        else:
            pass
```

Details for question:

```
def question(request):
    if request.user.is_authenticated:
        # points
        points = Profile.objects.get(user=request.user)
        score = points.points
        lists = Category.objects.all().order_by("category")
        if request.method == 'POST':
            title = request.POST.get('title')
            if not title:
                raise ValueError('Please add a suitable title.')
            description = request.POST.get('description')
            user = request.user
            date = timezone.now()
            vl = request.POST.get('values')
            category_item = Category.objects.get(category=vl)
            questionobj = Question(user=user, title=title, description=description,
date=date,
                                   category=category_item)
            questionobj.save()
            return redirect('main:home')
        else:
            form = QuestionForm()
        return render(request, 'main/ask-question.html',
                      {'form': form, 'lists': lists, 'points': points, 'score':
score})
    else:
        return redirect('accounts:login')

# details for the question
def details(request, slug):
    # setting notifications for the page
    if request.user.is_authenticated():
        notifications = Notification.objects.filter(user=request.user, read=False)
        notif_counts = notifications.count()

        # points
        points = Profile.objects.get(user=request.user)
        score = points.points
    else:
        notifications = 'None'
        notif_counts = 0

        points = 'None'
        score = 0
    # getting the details of the question
    question = Question.objects.get(slug=slug)
    answers = Answer.objects.filter(question_id=question.id)
    cot = answers.count()
    # similar questions
    similar = Question.objects.filter(category=question.category)
    final = similar.exclude(title=question.title).order_by('-date')[:5]
```