Contents

1 Acknowledgement

The success and final outcome of this project required a lot of guidance and assistance from many people and we are extremely privileged to have got this all along the completion of our project. All that we have done is only due to such supervision and assistance and we would not forget to thank them.

We respect and thank Dr. Biju R. Mohan and Dr. Raksha R. Nadgir, for providing us an opportunity to do the project work and giving us all support and guidance which made us complete the project duly. We are extremely thankful to her for providing such a nice support and guidance, although she had busy schedule managing the academic affairs.

We are thankful to and fortunate enough to get constant encouragement, support and guidance from all Teaching staffs of Information Technology department which helped us in successfully completing our project work. Also, We would like to extend our sincere esteems to all staff in laboratory for their timely support.

2 Project Introduction

Recent advances in the Web have rapidly changed our life in various ways. These advances provide new ways for people to communicate on a global scale and assess vast amounts of information. The Web provides educators with opportunities to implement a range of new teaching and learning practices,which redefine classroom learning experiences. This enables a WBI (Web-Based Instruction) system as a teaching aid. It integrates a hypertext information network with communication and collaborative tools, presents two important innovative features: i) it provides specific tools to manipulate the multimedia information contents of the Web pages; ii) authorized users can modify the information network in the system.

The computer technology and network technology are developing rapidly and their applications in education are more and more widely. After class, students can learn the course through network by themselves and exchange learning information. It can help students to improve their learning interest and learning effectiveness. There are various courses as a required course in the major of computer science and technology, and has a great important role in improving students' abilities in analyzing problems, describing problems, and solving problems.

A teaching website can provide the relative course learning materials for students, e.g. PPT, source codes, and supplementary materials. It can also provide the functions of homework release for teachers and the functions of homework submission for the registered students. The teaching BBS is built to support the conversation between admin and students. It will be convenient for mentor to answer the student's questions. It also promotes the communication between the students. This system can promote the teaching efficiency and improve the teaching method.

Educational websites can include websites that have games, videos or topic related resources that act as tools to enhance learning and supplement classroom teaching. These websites help make the process of learning entertaining and attractive to the student, especially in today's age. A learning experience where the learner must contribute to an activity is called active engagement, while a learning experience where the learner is mainly a recipient of information is called passive engagement. When a form of engagement is engrossed by a learning activity, the learner is focused and attentive, and becomes captured and committed to the task at hand. So, an educational website should be filled with many learning activities and communication system for better understanding of concept.

The goal of this project is to develop a educational website which will be interactive and knowledge-filled. The content will help the should learn faster and easier way and motivate towards learning more. Our model also adopts the principles of constructivism so that both collaborative learning and self-learning are emphasized.

3 Software Requirement Specification - Introduction

3.1 Purpose

The purpose of this document is to present a detailed description of the E-Learning Tutorial Web System. It will explain the purpose and features of the system, the interfaces of the system, what the system will do, the constraints under which it must operate and how the system will react to external stimuli. This document is intended for both the stakeholders and the developers of the system and will be proposed to the IT Dept., NITK Surathkal for its approval.

3.2 Intended Audience and Reading Suggestions

The document is intended for developers, project managers, users, testers, guiding staff and documentation writers. All the readers can find required specification of the system in document. The developers can find information of their interest in the requirements. The users, testers and staff can see features section for related information.

3.3 Project Scope

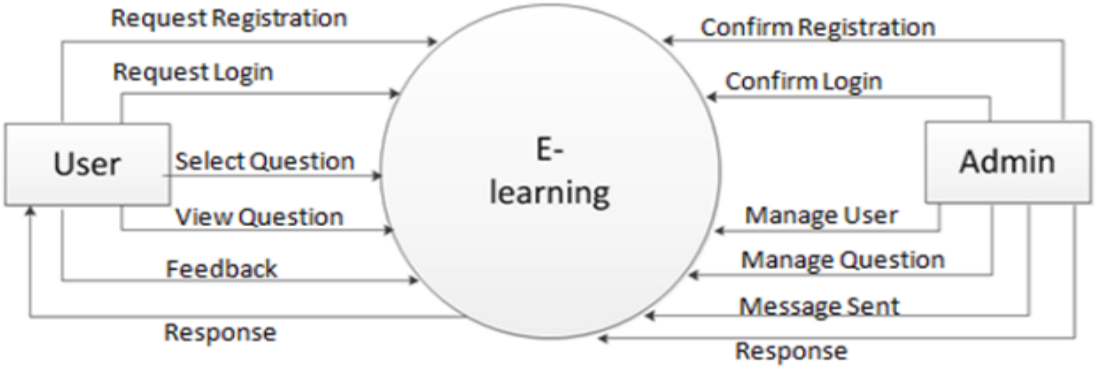
This software system will be a E-Learning Tutorial Web System for all the interested users of society. This system will be designed to maximize the user's productivity by providing different methods to learn a concept of respective subject, which would otherwise have to be performed looked for all over the Internet. By maximizing the user's learning efficiency and production the system will meet the user's needs while remaining easy to understand and use.

More specifically, this system is designed to allow an user to manage and communicate with an admin or other user for any related post and admin to publish articles on some given topic to website. The software will facilitate communication between admins, reviewers, and the users via comment or requesting messages. The user will also be provided with a platform to implement a concept which he/she learned. User can post any article through admin. The system also contains a relational database containing a list of admins, users and articles.

4 Overall Description

4.1 Product Perspective

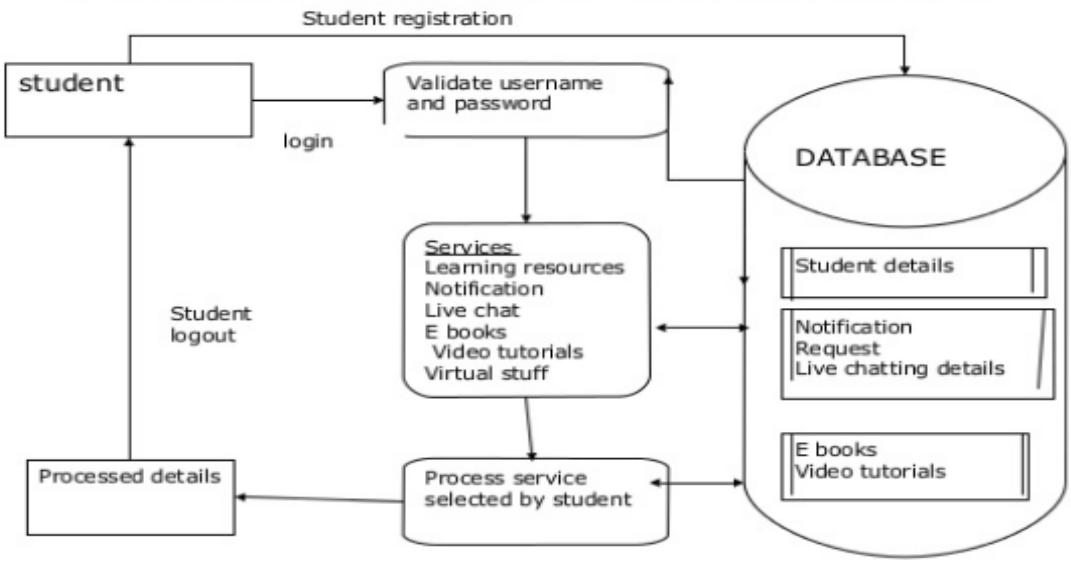
This documentation is of E-Learning tutorial website. The system is a self-contained product. This product is made while keeping in mind about the usefulness and complexity to work on the product. It is made very simple and easy so that every user can work on it without facing any difficulty. The user can manage the posts of the system by coordinating with the admin. A user can also view posts of other users and look up for what concept is needed.



4.2 Product Functions

The product has various major functions, some of them are as specified:

1. Articles are provided on concepts of various subjects, which are editable.
2. User can request for certain specific article.
3. User can add their own article on the website.
4. Admin can manage user and their profile.
5. Concepts can be implemented on a provided platform.



4.3 User Classes and Characteristics

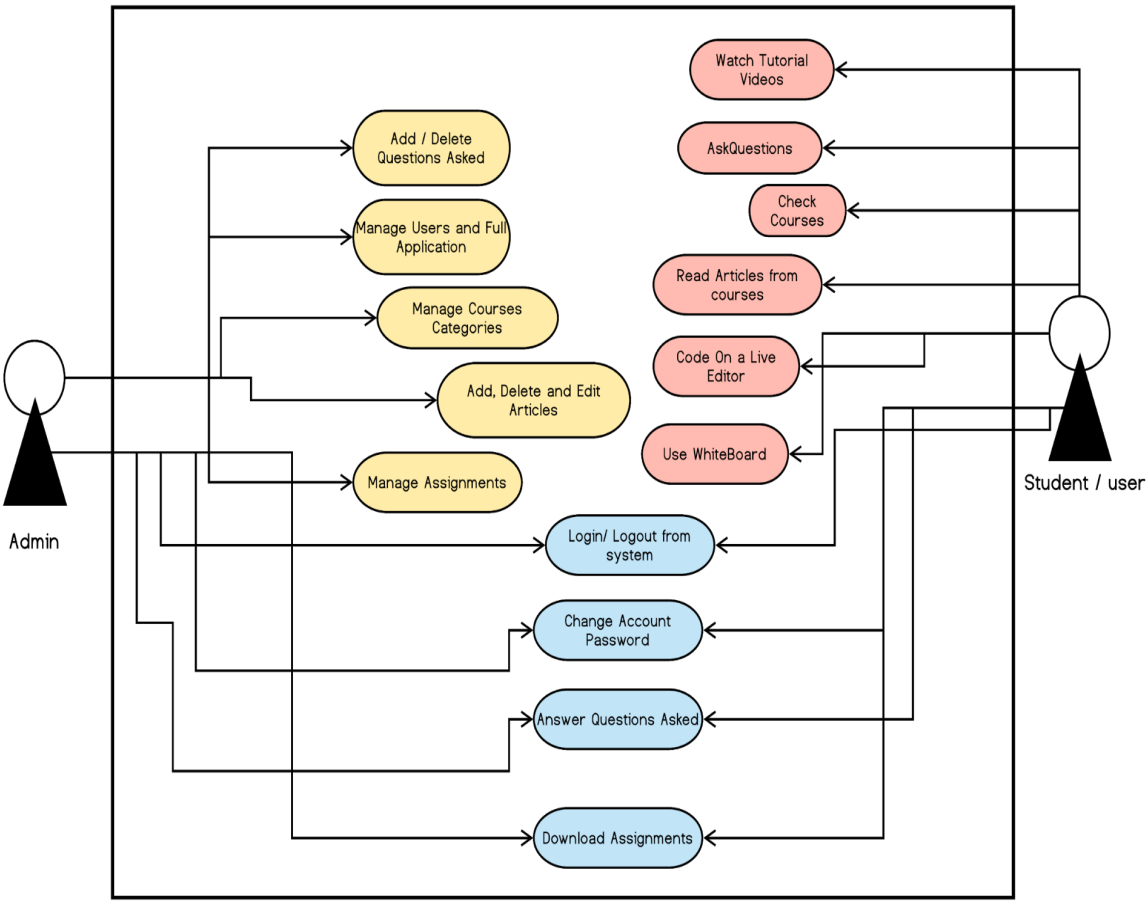
The user and developer is expected to be Internet literate and be able to use a search engine and other Internet facilities. The frequency of use is not a matter of concern. Anyone interested in learning some concepts effectively can use this product. The product is basic web interface with good user interface, so technical expertise does not matter for using it.

The user is also expected to be Computer literate and to be able to use button, pull-down menus, and similar tools. User can be any high school or above student or a developer.

There are two actors here, User and Admin. User have control of most of the activities where as Admin have access to all the activities.

- The first use case diagram shows two primary actors - student/user and admin.
- Use Case Diagram - summarizes the details of our system's users (actors) and their interaction with the system
- The user/student signs up if they are new to the app or signs in if they already have a valid account.
- The authentication system helps in authenticating the details of the guest trying to sign in / sign up.
- The admin checks the validity of the users by seeing their details.
- Once the guest has successfully signed in, they now become a user. The user can now interact with the application.

- User can read articles , code on a live editor , ask questions , download assignments , answer questions.
- Admin can do all of the stuff user can do and he has the first hand permission to edit/delete any details in app.



Use Case Diagram for BrainIgniter (E - Learning Web App)

4.4 Operating Environment

The product can be used in any operating system of computer on a web browser. It is also usable on browsers of mobile set or tablet. The versions need not be necessarily latest, but recommended.

4.5 Design and Implementation Constraints

The designed system is a simple to use product. The developers can use and modify full product with ease. There are some requirements which are stated below.

The product is designed on Code Igniter platform. PHP, JavaScript, HTML and CSS are scripting languages used. Bootstrap is necessary external API. The web system is also dependent on other web system, so there rules and policies may affect the working of product. YouTube is the software used for video lecture streaming. SQLite is the database used.

4.6 Assumptions and Dependencies

The system has some dependencies on other web systems. The video is streamed via YouTube and coding platform is taken from Tutorials Point. This are stated on the assumption that the dependent web systems are working properly.

5 External Interface Requirements

5.1 User Interfaces

The product works on a web browser. For the user interface to work properly, browser should be commendable with Bootstrap and web scripting, designing and styling languages such as PHP,JS,CSS,HTML etc. Rest all the functionality depends on the browser and computer being used.

The User Interface section defines the way the various stakeholders interact with the System. All screens will be developed to work on a PC/Laptop. Error messages will appear at the bottom and shall be self descriptive - The maximum size of error messages will be 80 Characters. Buttons will be used to make the navigation simpler. In order to increase Usability of screens, Patient Registration and Consultation Requests screens will have bigger font size to aid Elderly people.

User	User Interface Name	UI Description
All	Login	Each User/Admin needs a Valid Login credentials to proceed further
User	Signup	If user is new he/she needs to login through this button on UI
User	Ask	This button redirects user to the BBS module of the system where he/she can check Questions and add answers to them or can ask new questions
User	Code Practice	Using this button user will be redirected to a coding platform where they can write their own HTML scripts and can view them in realtime
User	BBS	This button redirects user to the BBS module of the system where he/she can check Questions and add answers to them or can ask new questions
User	Online Test	Using this button user can go to an online test platform such as Indiabix etc
User	Whiteboard	Using this button user can go to a whiteboard where he can draw his/her ideas inorder to explain it to others.

User	User Interface Name	UI Description
All	Content	Takes the user to list of all the topics availaible on the website
All	View	Takes the user to list of all the topics availaible on the website for a particular category
User	Assignment	This button redirects user to the page having list of assignments for each given topics
User	Download	This button is used to download the corresponding assignment
User	Search	This box takes a string input and searches the whole website for matching data and displays it to user

User	User Interface Name	UI Description
Admin	Add Post	Using this admin can add articles of certain topics for all the categories
Admin	Add Category	Using this admin can add categories
Admin	Add Topic	Using this admin can add topics of certain categories
Admin	Add User	Using this admin can add new users for the system
Admin	Add Admin	Using this admin can create a new admin credentials
Admin	Upload	Using this admin can upload a new pdf formatted assignment to certain topics of each category
Admin	Add Answer	Admin can add answers to the questions asked by the users of the system
Admin	Manage Posts	Admin can edit/delete posts using this button which will redirect him to a new module for manipulating posts
All	Logout	Using this button user/admin can end his/her session for the system

5.2 Hardware Interfaces

The System shall be deployed on any browser. All the stakeholders are supposed to log-in into the E-Learning tutorial website where there will be options to operate the system. Hardware Requirements for stakeholders:

- Pentium 4 processor or higher
- Approximately 100 MB of free hard drive space
- Minimum 128 MB RAM
- Minimum 1GB database space
- Minimum 2GB RAM

5.3 Software Interfaces

The System is self contained and no data is supposed to be given as input to any third party. User and admin are supposed to log-into the system to access the website, so are the testers. Software Requirements for Hosting:

- CodeIgniter
- Xampp
- Browser (Google Chrome, Mozilla Firefox, Safari etc.)
- Operating System supporting the above browsers.

5.4 Communications Interfaces

The System will be available on local engine as a URL and will be operational using standard web-browsers (Safari, Google Chrome and firefox). Users, admins and others will connect through a secured encrypted connection over internet (https://). Since the data communicated over internet is confidential it is imperative that encrypted protocols are used to prevent data leakages. There is functionality provided in the system for communicating with admin through messages.

6 System Features

6.1 Personnel authorised accounts

- All the user have their own personal account which are verified by admin.
- User actions:
  - Log In
  - Sign Up
- The user has to sign up to create a new account. Later, they can log in in their account to use the system.
- The system can not be used by any unauthorised person.

6.2 Managing accounts

- The admin can manage the account of other admins and all the users.
- actions:
  - adding new account
  - deleting a account
  - updating data
- Since, the web system should have no problem of security breach, only admin is allowed to do stated operations on any account.

6.3 Article posting

- Only the admin is allowed to post any article on the system.
- actions
  - publishing an article
  - removal of articles
  - updating/modifying the article

- The user can request any article to admin through BBS and after reviewing, the article is posted.
- The admin can also update or delete any article based on its validity on latest date.
- The articles can also contain video lectures with them.

6.4 Conversation between admin and users

- The user can communicate with admin through given medium of messages.
- actions
  - sending a message
  - receiving
  - replying
  - providing articles
- The user can answer a question posted on the system for the benefit of other users.

6.5 Code implementation

- A platform is provided to perform coding and checking whether the implementation is correct or not.
- user actions
  - implement any program/concept
  - run the program
  - check for errors
- The coding platform has various options for supportable languages. Such as HTML, CSS and JavaScript.

6.6 System feature Priority Matrix

The following section describes the System features and their Priorities based on a few criteria and talking to specific members of our team:

- Feasibility: How technically possible is the feature given the resources and tools we currently have? Talking to our technical team members—back-end engineers, UI designers, and front-end developers—to understand what can be done (vs. what's impossible or highly improbable).

- Desirability: Use every available tool to understand whether this is something your users desire. That means talking to researchers, UX designers, marketers, and support, as well as going through any users tests and validation you may have already completed.

- Viability: How does this feature relate to or support our overall strategy and the requirements of the market? Talking to relevant executives and other product managers to understand how this feature works in a bigger ecosystem—both our own (other features, strategies, and goals) and the industry as a whole (regulations, legal issues, financials).

Sl	Feature Names	Priority
1	Add Post	HIGH
2	Add Category	HIGH
3	Add Topic	HIGH
4	Add User	MEDIUM
5	Add Admin	MEDIUM
6	Upload Assignments	HIGH
7	Add Answers to questions	MEDIUM
8	Manage Posts	LOW
9	Logout	HIGH
10	Ask questions	HIGH
11	View the article	HIGH
12	Content Library	Low
13	WhiteBoard feasibility	Low
14	Online Coding Practice	Medium

7 Other Nonfunctional Requirements

7.1 Performance Requirements

At the peak, system should be able to scale to 10,000+ users (Learners) concurrently. Further, since the system needs to be designed for 24/7 operations, hence the availability should be high - 99.999 percent.

The system data shall be backed up every night (full back-up) with a cycle of 30 days. This essentially means that there will be a provision to rollback by a month. Post back-up everyday the back-up shall be restored on a dummy production system to ensure completeness and correctness of back-up. Post that the dummy production database shall be purged.

7.2 Safety Requirements

As the user's data is highly confidential and private care would be taken to ensure that the confidentiality is maintained. Only authorized members i.e. admins will have the access to user profiles and their requests. Since there are no published external interfaces, there is no risk envisaged at the moment in terms of unwarranted data cascade.

7.3 Security Requirements

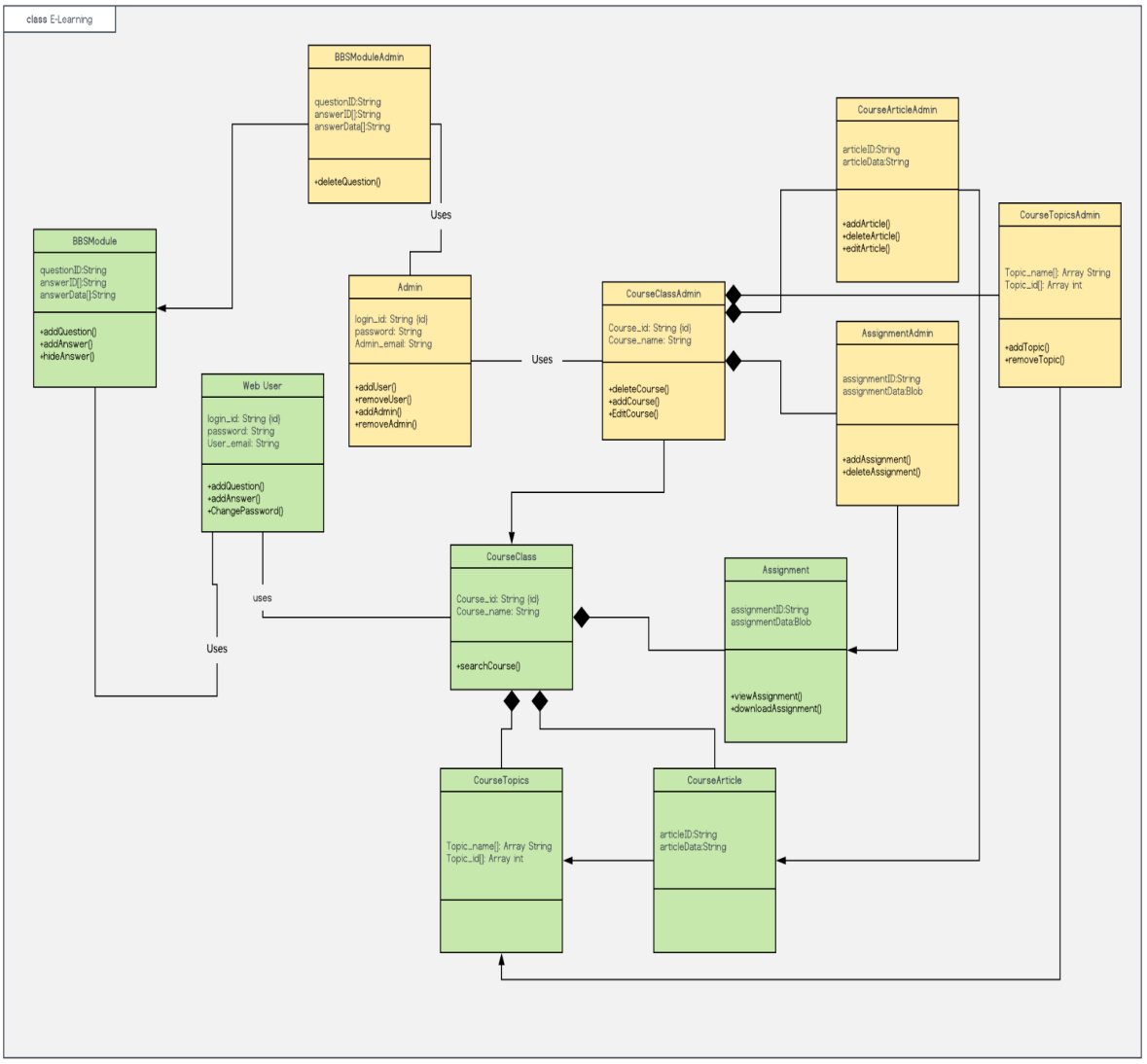
As the user's data is highly confidential and private care would be taken to ensure that the confidentiality is maintained. Only authorized members i.e. admins will have the access to user profiles and their requests. Since there are no published external interfaces, there is no risk envisaged at the moment in terms of unwarranted data cascade.

7.4 Software Quality Attributes

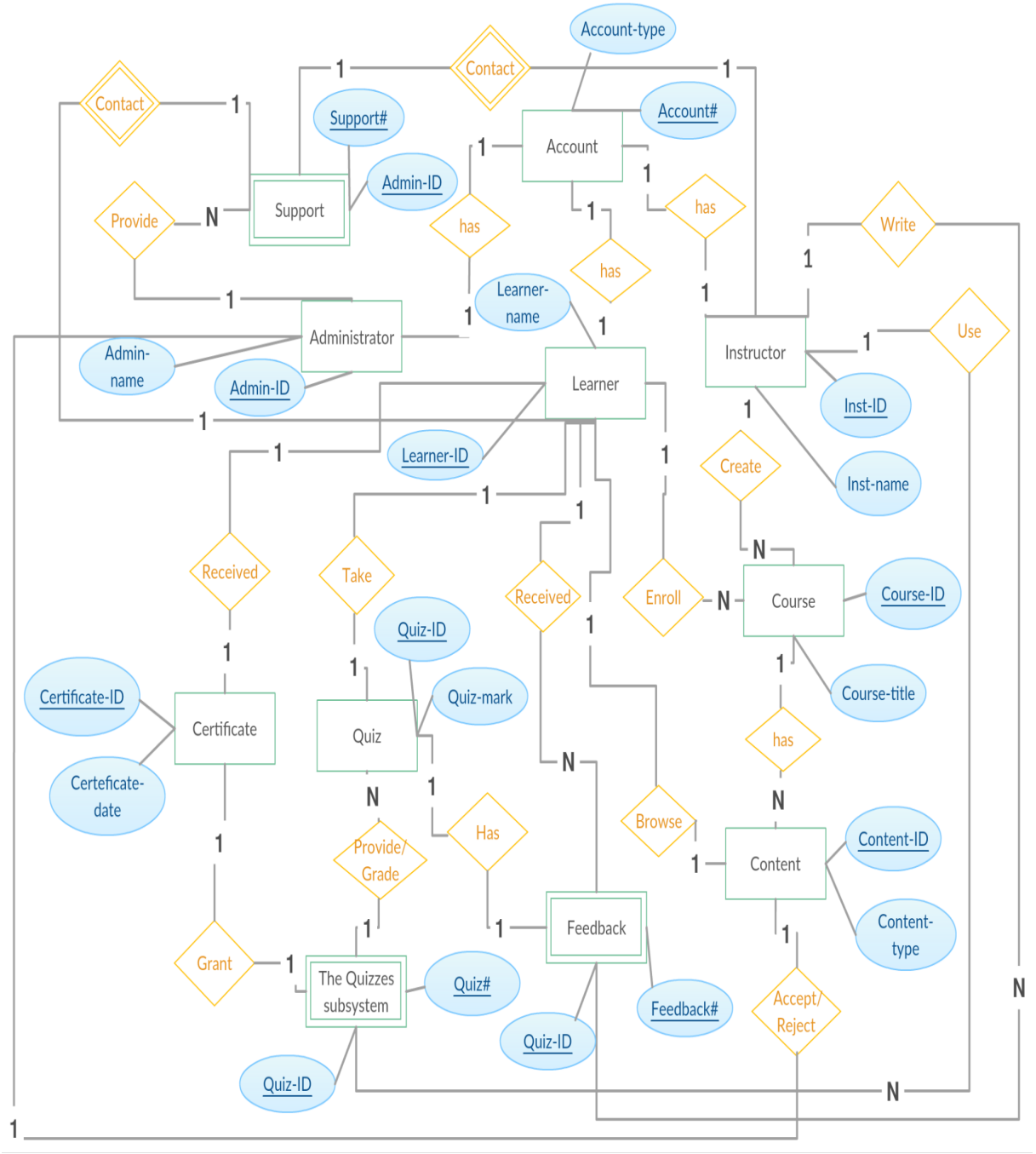
The Key Software Quality Attributes are Availability, Reliability and Usability. As the system is expected to be 24/7 - High availability is very important. Also, since the major transaction i.e. concept learning and posting has classified data/ information of the user, the system needs to be highly reliable. Lastly, the system is likely to be used by all age users, hence the screens have to be designed for Usability.

8 Analysis Models

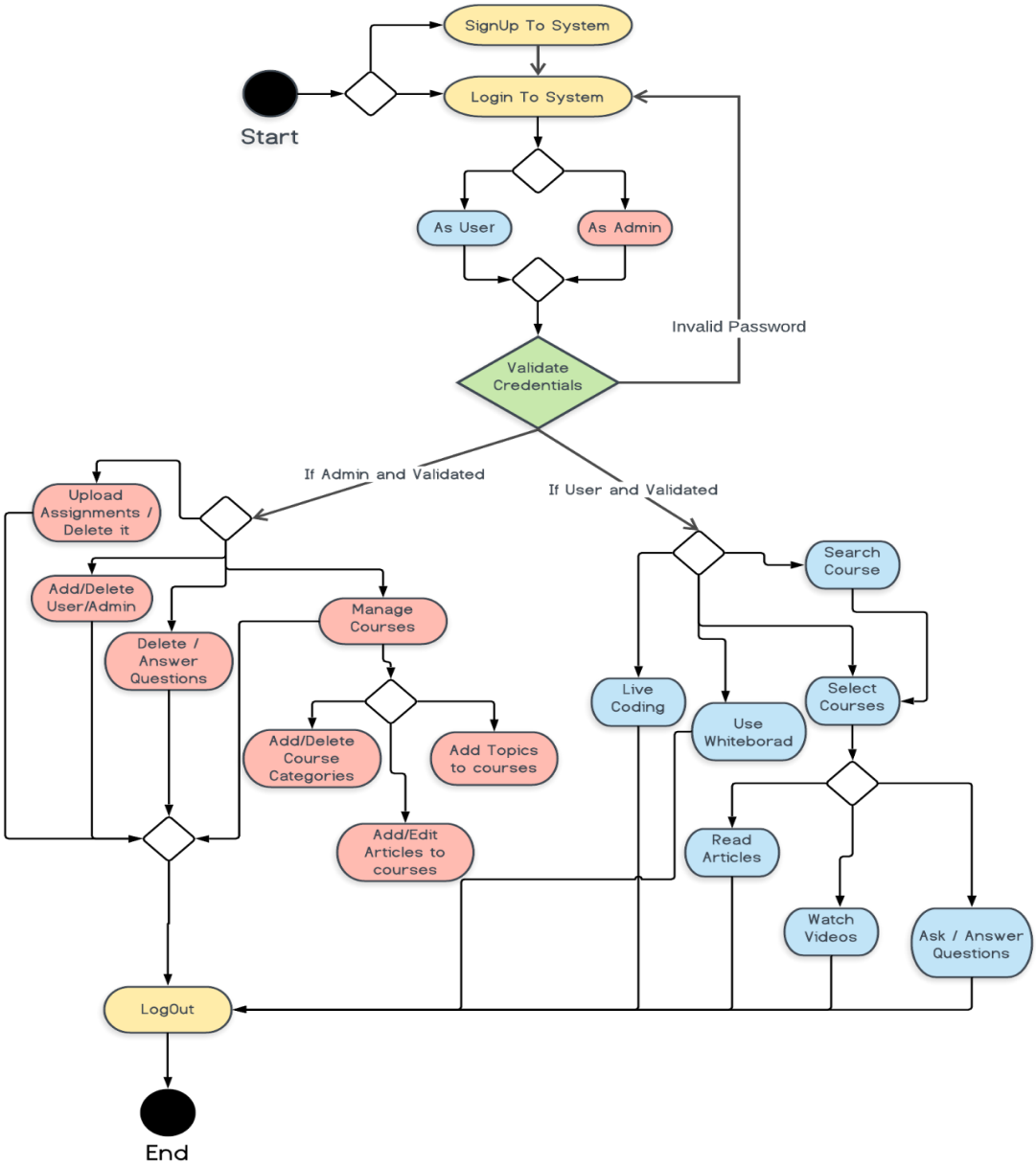
Class Diagram:



Entity-Relationship Diagram:

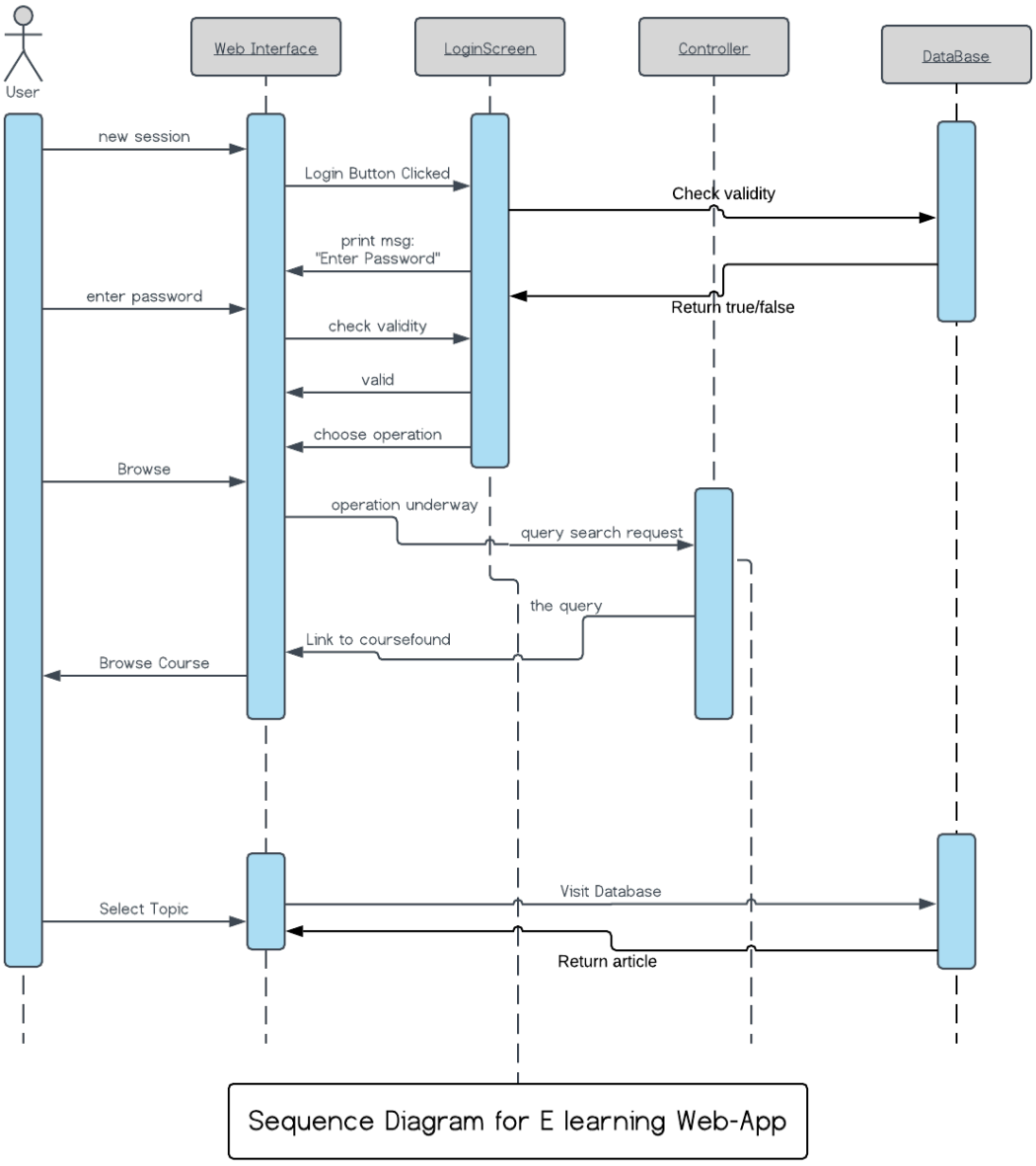


Activity Diagram:



Activity Diagram for E-learning Web-App

Sequence Diagram:



9 Tools Used

9.1 CodeIgniter

CodeIgniter is an open-source software rapid development web framework, for use in building dynamic web sites with PHP. CodeIgniter contains libraries, simple interface and logical structure to access these libraries, plug-ins, helpers and some other resources which solve the complex functions of PHP more easily maintaining a high performance. It simplifies the PHP code and brings out a fully interactive, dynamic website at a much shorter time. It supports PHP version of 5.2.6 or newer and MySQL version 4.1 or newer. It makes your web more robust and your code easier to read and maintain. It is a free toolkit, light weight and easier to install.

CodeIgniter is loosely based on the popular model–view–controller (MVC) development pattern. While controller classes are a necessary part of development under CodeIgniter, models and views are optional. Codeigniter can be also modified to use Hierarchical Model View Controller (HMVC) which allows developers to maintain modular grouping of Controller, Models and View arranged in a sub-directory format.

9.2 Xampp

XAMPP stands for Cross-Platform (X), Apache (A), MariaDB (M), PHP (P) and Perl (P). It is a simple, lightweight Apache distribution that makes it extremely easy for developers to create a local web server for testing and deployment purposes.

XAMPP's designers intended it for use only as a development tool, to allow website designers and programmers to test their work on their own computers without any access to the Internet. To make this as easy as possible, many important security features are disabled by default. XAMPP has the ability to serve web pages on the World Wide Web. A special tool is provided to password-protect the most important parts of the package. XAMPP also provides support for creating and manipulating databases in MariaDB and SQLite among others. Once XAMPP is installed, it is possible to treat a localhost like a remote host by connecting using an FTP client.

9.3 Selenium

Selenium is a portable framework for testing web applications. Selenium provides a playback (formerly also recording) tool for authoring functional tests without the need to learn a test scripting language (Selenium IDE). It also provides a test domain-specific

language (Selenese) to write tests in a number of popular programming languages, including Groovy, Java, Perl, PHP, Python, Ruby and Scala. The tests can then run against most modern web browsers. Selenium deploys on Windows, Linux, and macOS platforms. It is open-source software, released under the Apache 2.0 license: web developers can download and use it without charge.

Selenium has the support of some of the largest browser vendors who have taken (or are taking) steps to make Selenium a native part of their browser. It is also the core technology in countless other browser automation tools, APIs and frameworks.

9.4 Pagespeed Insight

Google Pagespeed Insights is a tool that empowers you to make decisions that increase the performance of your website. Recommendations from Google Pagespeed are based upon current industry best practices for desktop and mobile web performance.

Through the addition of advanced data visualization, tagging, filtering, and snapshot technology, Google Pagespeed Insights for WordPress provides a comprehensive solution for any webmaster looking to increase their site performance, their search engine ranking, and their visitors browsing experience.

10 Test Case Design

10.1 Test Design Specification

- Interface Testing: BrainIgniter has many modules and components. Information from these components must be passed between each other and to other components throughout the application. Interface testing will be used to evaluate whether these components and modules pass data and control correctly to one another.

- Regression Testing: BrainIgniter is being developed in Waterfall processmodel. After each code/build change, our development environment is setup to run all test cases against the current code base with each push to main repository.

- Coverage Testing:As per the SRS, we will be writing our own unit tests on each new code push. Because of this requirement, in addition to other testing methods, we aim to have near 100% code coverage. This means that 100% (or extremely close to 100%) of the source code written passes through a test at some point in the testing suite.

- Automated Test Deployment:BrainIgniter is being developed and improved as per the suggestions from everyone and as and when some bug is found by the developers while using it, as a result is becomes very important for the team to have automated tests after every code push and automatically deploy it to the server where the application is hosted in order to reduce a lot of manual work and get the new application code running in few minutes itself.

- Unit Testing:BrainIgniter is utilizing unit and integration testing. All of the unit and integration test cases are constructed with detailed knowledge of the code base, and have been automated to run with each code base change.

- System Testing:BrainIgniter is a web application and hence will be needed to setup for different hospital management systems and in a different way and according to their needs. Hence we will be testing the application on different environments and verify the successful working of it.

10.2 Environmental Needs

This section contains the properties that are needed to test BrainIgniter. An environment matching the following criteria can be used to test.

- The environment should have network connection.
- The web browser should have JavaScript enabled.
- The environment will be able to run the web browser specified by the given test.
- The environment should have a virtual environment setup and the dependencies mentioned in the requirements.txt file in the virtual environment.
- The environment should have MYSQL database installed.
- The environment has access to the source code of the BrainIgniter application.

10.3 Testing Specification

This section contains tables for each of the features to be tested. Each subsection specifies the USE CASES to be tested, the procedures necessary to run the test cases, and the items being tested. Each Use Case includes automated tests.

- Automated Test 1 (LoginUnitTest)

```
Starting ChromeDriver 73.0.3683.68 (47787ec04b6e38e22703e856e101e840b65afe72) on port 43364
Only local connections are allowed.
Please protect ports used by ChromeDriver and related test frameworks to prevent access by malicious code.
Apr 09, 2019 5:29:20 AM org.openqa.selenium.remote.ProtocolHandshake createSession
INFO: Detected dialect: OSS
LOGIN unit Test Successful with Name Welcome Arjun
```

- Automated Test 2 (BBSUnitTest)

```
Starting ChromeDriver 73.0.3683.68 (47787ec04b6e38e22703e856e101e840b65afe72) on port 40651
Only local connections are allowed.
Please protect ports used by ChromeDriver and related test frameworks to prevent access by malicious code.
Apr 09, 2019 5:33:45 AM org.openqa.selenium.remote.ProtocolHandshake createSession
INFO: Detected dialect: OSS
LOGIN with Name Welcome Arjun
BBS unit Test Successful
```

- Automated Test 3 (BBSAskQuestionUnitTest)

```
Starting ChromeDriver 73.0.3683.68 (47787ec04b6e38e22703e856e101e840b65afe72) on port 10576
Only local connections are allowed.
Please protect ports used by ChromeDriver and related test frameworks to prevent access by malicious code.
Apr 09, 2019 5:37:16 AM org.openqa.selenium.remote.ProtocolHandshake createSession
INFO: Detected dialect: OSS
LOGIN with Name Welcome Arjun
BBS opened
BBS ask unit Test Successful
```

- Automated Test 4 (LogoutUnitTest)

```
Starting ChromeDriver 73.0.3683.68 (47787ec04b6e38e22703e856e101e840b65afe72) on port 39441
Only local connections are allowed.
Please protect ports used by ChromeDriver and related test frameworks to prevent access by malicious code.
Apr 09, 2019 5:40:18 AM org.openqa.selenium.remote.ProtocolHandshake createSession
INFO: Detected dialect: OSS
LOGIN with Name Welcome Arjun
LOGOUT Successfull
```

- Automated Test 5 (AssignmentUnit)

```
Starting ChromeDriver 73.0.3683.68 (47787ec04b6e38e22703e856e101e840b65afe72) on port 8232
Only local connections are allowed.
Please protect ports used by ChromeDriver and related test frameworks to prevent access by malicious code.
Apr 09, 2019 5:42:25 AM org.openqa.selenium.remote.ProtocolHandshake createSession
INFO: Detected dialect: OSS
LOGIN with Name Welcome Arjun
Assignment opened successfully
```

- Automated Test 6 (AssignmentDUnit)

```
Starting ChromeDriver 73.0.3683.68 (47787ec04b6e38e22703e856e101e840b65afe72) on port 40919
Only local connections are allowed.
Please protect ports used by ChromeDriver and related test frameworks to prevent access by malicious code.
Apr 09, 2019 5:43:56 AM org.openqa.selenium.remote.ProtocolHandshake createSession
INFO: Detected dialect: OSS
LOGIN with Name Welcome Arjun
Assignment Downloaded Successfully
```

Test Case ID	Test Case Objective	Pre requisite	Steps	Input Data	Expected Output	Actual Output	Status
TC_01	Log-In Check	Userid & Password	1. Enter userid 2. Enter password 3. Submit	Userid: user@gmail.com Password: ****	Welcome User	Welcome User	Pass
TC_02	BBS Page Check	User should be logged in	1. Go to navigation bar 2. Find BBS section and enter	-	Page Title	Page Title	Pass
TC_03	Ask question	User should be logged in	1. Click on 'Ask Something' 2. Select category 3. Post question	Question in text format	Success notification	Success notification	Pass
TC_04	Check posted question	User should be logged in	1. Go to BBS page 2. Search for uploaded question	Uploaded question	Question found	Question found	Pass
TC_05	Answering Question	User should be logged in	1. Click '+' on selected question 2. Submit answer for the question	Answer in text format	Answer submitted	Answer submitted	Pass

11 Performance Testing

https://brainigniter.000webhostapp.com/index.php/user_login_controller

The speed score is based on the lab data analyzed by Lighthouse.

Analysis time: 4/9/2019, 12:37:54 AM

Scale: 90-100 (fast) 50-89 (average) 0-49 (slow)

Lab Data

Lighthouse analysis of the current page on an emulated mobile network. Values are estimated and may vary.

First Contentful Paint	1.7 s	First Meaningful Paint	1.8 s
Speed Index	2.2 s	First CPU Idle	2.7 s
Time to Interactive	3.0 s	Estimated Input Latency	10 ms

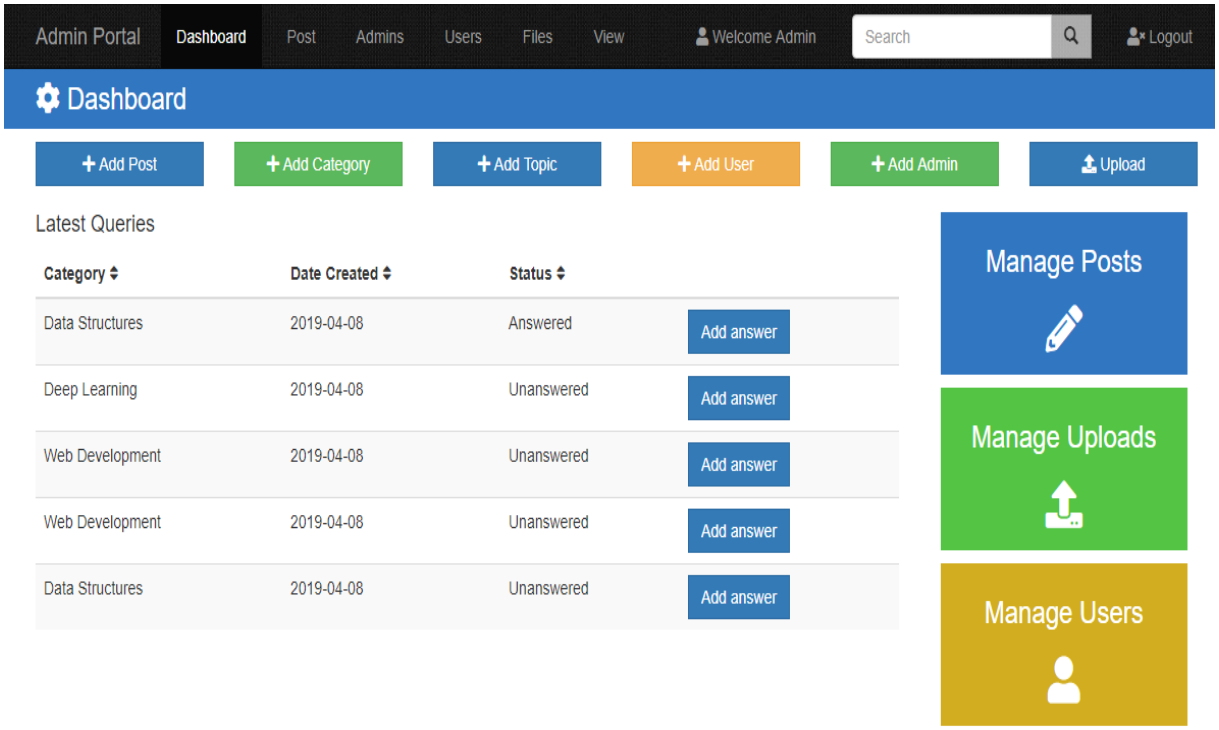
Passed audits

13 audits

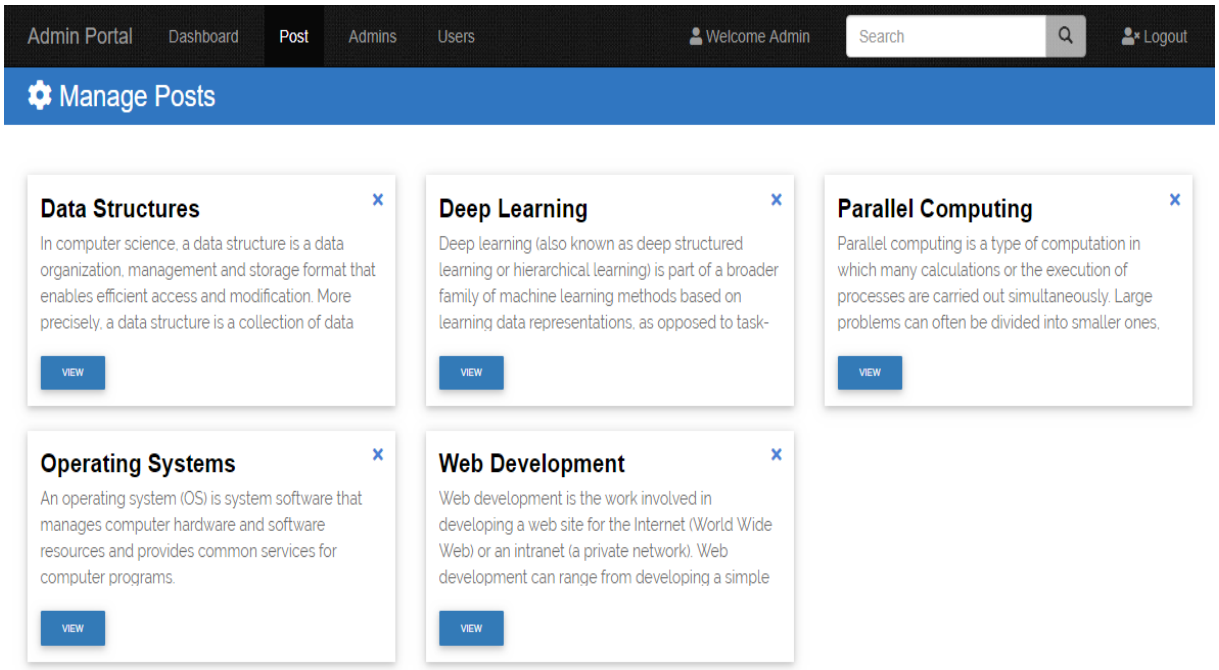
1	Minify CSS	
2	Minify JavaScript	
3	Efficiently encode images	Potential savings of 10 KB
4	Enable text compression	
5	Preconnect to required origins	
6	Avoid multiple page redirects	
7	Preload key requests	
8	Use video formats for animated content	
9	Avoids enormous network payloads	Total size was 393 KB
10	Avoids an excessive DOM size	303 nodes
11	User Timing marks and measures	
12	JavaScript execution time	0.2 s
13	Minimizes main-thread work	1.2 s

12 Screenshots

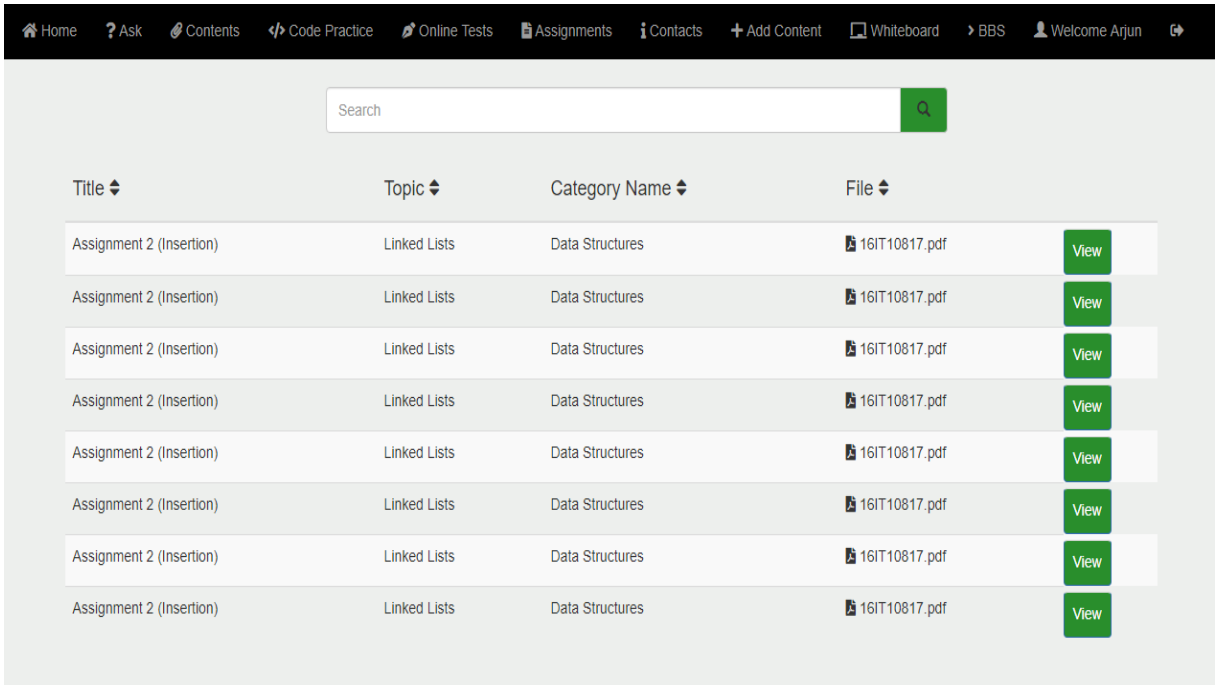
Admin Main



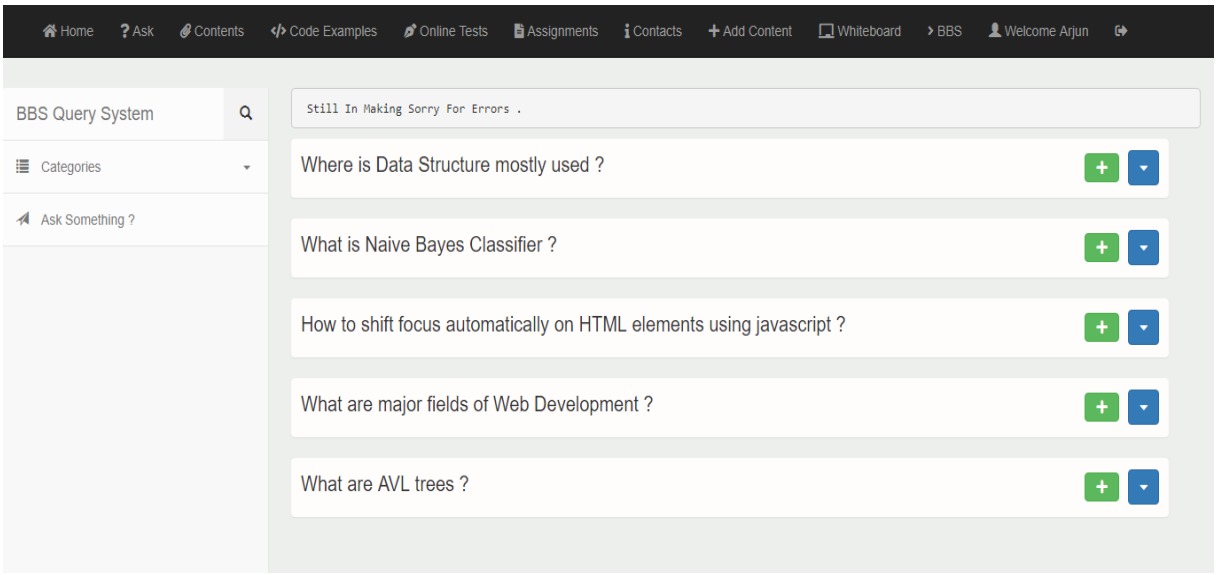
Admin Post



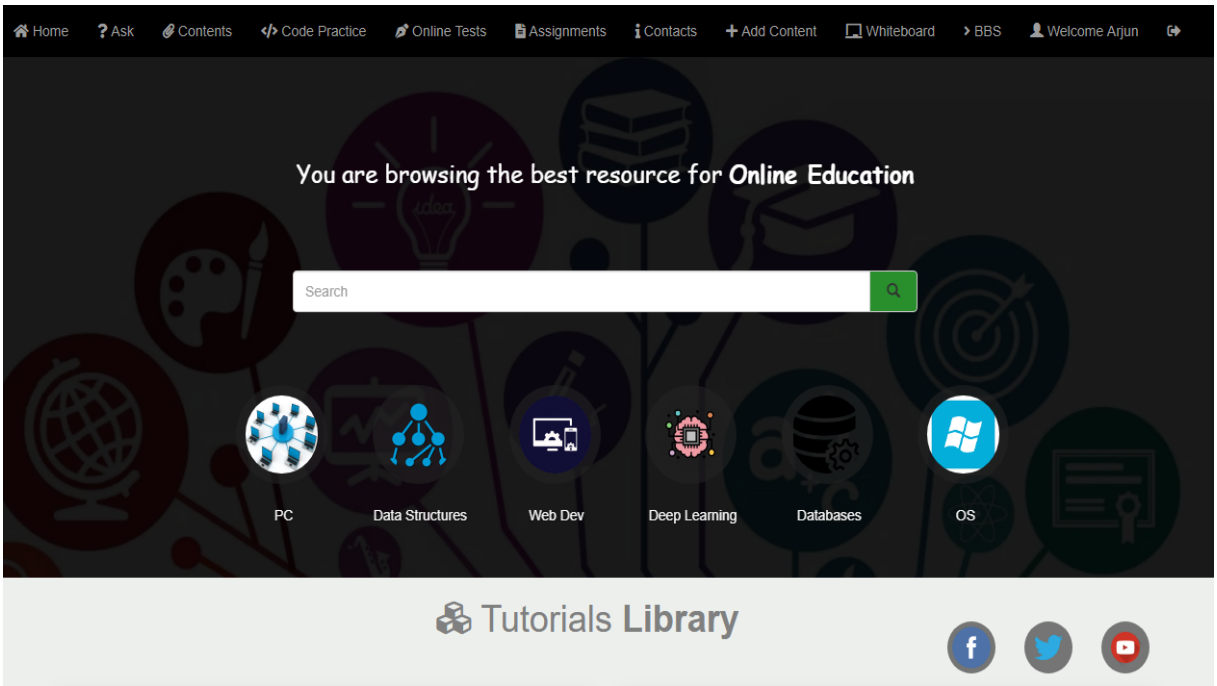
Assignment



BBS Module



Landing Page



13 Conclusion and Future Works

This website is designed and implemented through template, module and columns. CodeIgniter and MySQL database are used to construct the course website in this paper. It is very suitable for customizing the teaching website. It also promotes the diverse styles in teaching website. Admin can customize the labels and publish teaching resource in the server term. The course content representation and website design are separated. So admin can easily update and manage the website. This website can be configured and used for different courses. The website is designed in such a way that it will be possible for users to operate easily and interactive. This website is fully dynamic. It also contains user management, model management and website information management function, so the user can set it to for his/her best experience.

While doing this project we faced many challenges and we solved some of them and we would solve some of them in future.So The future of this project is to make it more responsive to make it available for all the devices of different sizes.Also we would implement dynamic demo module for other coding languages and show realtime reflection of what's happening inside the code to the user. We need to optimise the database and make it more compact to make it occupy less space on server. Also we might implement an android app for the same.