Learn Hub

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Session: 2019-2023

STATEMENT OF SUBMISSION

This is to certify that **Nimra Ikram** Roll no. **(037522)**, **Nida Butt** Roll no. **(037504),** and **Hina Shabbir** Roll no. **(037519)** have successfully completed the final project named as: **Learn Hub** , at the F.G Postgraduate College for Women Kashmir Road, Rawalpindi, affiliated with University of Punjab, Lahore, to fulfil the partial requirement of the degree of **BS in Information Technology**.

_____

Project Supervisor

Ms. Lubna Zakia

_____

Head of the Department

Ms. Lubna Zakia

_____

External Examiner

Name:

Designation

Abstract

Teaching or learning is not an easy task. E-learning is important for businesses that want to empower their employees and achieve financial results from it. This is why online learning has become so important in education and business. This web service will allow teachers to create online courses in the form of short videos. Those interested in learning can search for courses by category or name. Using this web-based application, you can easily teach or learn using a web browser on any device with internet access. Any class taught by the instructor is open to enrollment. Students can view the content. Students will receive an email notification after registering for the course. After completing the course, students can receive a certificate and review the course.

CERTIFICATE FOR CORRECTNESS AND APPROVAL

It is certified that **Nimra Ikram** Roll no. **(037522), Nida Butt** Roll no. **(037504),** and **Hina Shabbir** Roll no. **(037519)** have worked under my supervision. Their project entitled **"Learn Hub"** has been found satisfactory for submission in its present form for the requirement of a degree of BS- Information Technology. I am convinced that the resultant document has been reviewed, validated, and approved as accurate and complete. All in all, I find this document well organized, and I am in no doubt that its objectives have been successfully met.

_____

Supervisor

Ms. Lubna Zakia

IT Department

F.G Postgraduate College for Women Kashmir Road, Rawalpindi

Dated: _____

DECLARATION

We **Nimra Ikram** Roll no. **(037522)** , **Nida Butt** Roll no**. (037504)** and **Hina Shabbir** Roll no**. (037519)** session **(2019-2023)** from Department of Information Technology, F.G Postgraduate College (W), Rawalpindi, hereby solemnly declare that the work submitted in this research report entitled **"Learn Hub"** is our own work. This work has been completed at the Department of Information Technology, F.G Postgraduate College (W), Rawalpindi under the supervision of **Ms. Lubna Zakia (Associate Professor)**. It has not been previously presented to any other institution or university for the degree.

DEDICATION

In the name of Allah, the Most Merciful, the Most Beneficent.

To our Family and Teachers, without whose unflinching support and cooperation,

a work of this magnitude would not have been possible.

ACKNOWLEDGEMENT

First of all, we would like to extend our sincere and humble gratitude to Allah Almighty, whose blessing and guidance have been a real source of all our achievements in our lives, who gave us the ability and knowledge to undertake this project, and who showed us the right that God bestows on us with his guidance.

We're honored to work under the kind supervision of Ms. Lubna Zakia**.**We would like to express our extended felicitations to her for helping me out and guiding me through this Project. She inspired us with her quest for research and to work with great zeal and zest.

Finally, there comes personalities, our beloved parents, whose incessant prayers, infinite love, flawless vision and unending support made us able to get through all this process. Time by time motivation provided by our families boosted us and worked wonders within ourselves to empower and strengthen our nerves.

Project in Brief

Project Title	Learn Hub
Objective	1. Provide an online learning platform. 2. Enhance the productivity of students.
Undertaken By	Nimra Ikram (037522) Nida Butt (037504) Hina Shabbir (037519)
Supervised By	Ma'am Lubna Zakia
Date Started	17/12/2022
Date Completion	10/10/2023
Language and Technology Used	1. JavaScript ES6 2. Node.js 3. Express.js 4. React.js 5. MongoDB 6. ContextAPI 7. MUI 8. Git
Tools Used	1. Visual studio code 2. MongoDB Compass 3. Postman 4. MongoDB Atlas Cloud 5. Git/Github
Operating System	Microsoft Windows 10

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Chapter 1

Introduction

1.1- Introduction

Learn Hub is an Internet-based distance learning platform that allows students to enroll in courses of their choice and study at home. This web service will allow teachers to create online courses with short videos. Those interested in learning can search for courses by category or name. Students can enroll in any class the instructor provides. Students will receive an email notification after registering for the course. After completing the course, students can receive a certificate and review the course.

1.2- Problem Statement:

The global demand for accessible and flexible education is on the rise, with students seeking convenient learning options that cater to their diverse needs. Traditional education systems often struggle to provide such flexibility.

Currently available systems are either paid and having no flexibility of time. Our System is addressing this issue by providing free Courses to students and providing flexibility of time so that student can watch course at their own pace and convenience.

Limited access to quality education is a pervasive issue, especially for those in remote areas or with constrained schedules. Our E-Learning platform named **"Learn Hub"** aims to bridge this gap by offering education to a broader, worldwide audience.

Traditional education systems often struggle with scalability. With a digital platform, we can efficiently handle a potentially large user base, ensuring that education is accessible to all who seek it.

1.3- Introduction to Existing System:

Overview of Existing Systems:

The E-Learning landscape comprises numerous platforms each with its strength and limitations.
We studied different online E-Learning Systems like DigiSkills , Udemy , Coursera which either provide paid courses, less flexible, lack of progress measurement.
Although YouTube is offering free courses but has its own limitations like it don't measure progress and don't provide any certification.

1.4- Proposed System:

This system will provide users with all the necessary features and help them go through the entire process better and faster.
The system provides the following functions:

(1) Uploading courses

(2) Lifetime registration

(3) Free lessons

(5) Get a certificate after passing the exam

(6) Enroll in courses

(7) Review courses

Advantages of the Proposed System

(1) Users will have easy-to-use software where they can enroll in multiple courses at a time.

(2) Users will be able to check their project's progress which will help them increase their productivity.

(3) Students will receive appreciation certificates which will boost their motivation.

(4) Users will get alerted on almost every status.

1.5- Problem Statement:

The global demand for accessible and flexible education is on the rise, with students seeking convenient learning options that cater to their diverse needs. Traditional education systems often struggle to provide such flexibility.

Access to Education:

Limited access to quality education is a pervasive issue, especially for those in remote areas or with constrained schedules. Our E-Learning platform named **"Learn Hub"** aims to bridge this gap by offering education to a broader, worldwide audience.

Flexibility and Convenience:

The need for self-paced learning is more evident than ever. Our platform is designed to provide students with the flexibility and convenience they require, allowing them to learn at their own pace and convenience.

Scalability:

Traditional education systems often struggle with scalability. With a digital platform, we can efficiently handle a potentially large user base, ensuring that education is accessible to all who seek it.

Quality and Engagement:

Effective online learning requires engaging content and learning experiences. Our platform prioritizes high-quality, interactive, and engaging education, ensuring that students stay motivated and informed.
All the current systems don't provide these features at single platform.

1.6- Goals & Objectives:

The main goals and objectives of **Learn Hub** are:

- Improve the quality of learning and teaching
- Meet the learning or needs of students
- Increase efficiency and effectiveness
- Improve user accessibility and time flexibility to engage learners in the learning process.
- This web service will allow teachers to create online courses consisting of short videos.
- Those interested in learning can search easily for courses by category or name.

1.7- Scope of Project

Creating a Learn Hub that offers free courses and certifications can have a huge impact on providing accessible education. Key considerations include different types of training, quality assurance, data privacy. Establishing the right standards and building a community of learners is critical to long-term success.

Chapter 2

System Analysis

2.1- Proposed Methodology:

We chose to use agile development methods to develop our new Learn Hub system. Agile provides an efficient and flexible approach to software development that fits the goals and challenges of our E-Learning projects.

2.1.1- Reason:

There are many important reasons to choose Agile:

1. Change in a dynamic environment:

Agile methods are designed to adapt. Learning preferences, learning skills, and technology are evolving in the e-learning industry. Agile allows us to respond quickly to these changes, keep our platform up-to-date, and meet the needs of our users.

2. User-Centric development:

The basis of our Learn Hub is our users; students and teachers. By prioritizing constant user feedback and continuous improvement, Agile allows us to create a platform that resonates with our audience and provides the best learning experiences.

3. Deliver value quickly:

Agile promotes a minimum viable product (MVP) at the beginning of the project. This means we can release versions of the platform faster and allows us to collect real-world data and insights for future improvements.

4. Collaborative Working:

Agile refers to the collaboration of cross-functional teams. This collaboration fosters communication, creativity, and shared ownership of the project's success, resulting in greater efficiency and innovation.

5. Risk Mitigation:

Agile helps identify and reduce risks in the early stages of the development process by breaking projects into manageable parts. This preventative measure reduces the likelihood of costly problems occurring later in the project.

6. Continuous improvement:

Agile is not just a method; It is a state of mind. We embrace agile concepts such as continuous improvement and adaptability to help us stay competitive and keep up with changes in the e-learning environment.

2.2- Software Requirement Specification

Software Requirements Specification (SRS) is a comprehensive document that specifies detailed requirements for a software system. It is an important communication tool between stakeholders, including customers, users, and development teams.

2.2.1: Functional Requirements:

Functional requirements are specific and detailed descriptions of the intended functionality of a software system or application. These rules define the system's functionality, features, and interactions with users and other system components. They form the basis for designing, building, and testing software products.

Following are abstract-level requirements of the project.

a- Registration Module

Students can register themselves.

A tutor can register himself.

b- Student

Register Himself

Enroll in a course

Access to course material

Get a certificate upon completing

c- Tutor

Register Himself

Make a course

Add content

d- Email notification

Email notification at the time of registration.

Email notification when a course is enrolled or dropped.

e- User Interface

It is the primary point of interaction for users, allowing them to view available courses, select courses, and enroll in the course. The user interface should be designed to be intuitive, easy to use, and accessible from multiple devices.

f- Internet Connectivity:

System must have internet connection and supported internet browsers to run project.

2.2.2: Non-Functional Requirements:

Non-functional requirements (NFRs) for an E-learning program are specific instructions that describe how the system should perform and behave, focusing on things like speed, security, usability, and reliability. They focus on the "how" rather than the "what" of the system and ensure that the system meets quality standards and constraints.

a- Hardware Requirement:

Workstation to implement and run.

b- Software Requirement:

1-Operating System:

The server and workstations should have a compatible operating system installed, such as Windows Server or Linux.

2- Database Management System:

A database management system such as MongoDB Compass to manage the database and store information.

3-Programming Languages and Development Framework:

The programming languages and frameworks used to develop are: React.js, Node.js, Express.js.

4-IDE:

Visual Studio code.

c- Security:

The system will provide authentication through email verification.

d- Interoperability:

1- Browser compatibility:

Show supported web browsers and versions for the best user experience**.**

e- Performance

Application should be designed and developed in such a way that it should not utilize too many resources.

f- Usability:

Usability defines how well the applications meet the requirements of the user and consumer, providing a good overall user experience.

2.3- Use Case Model

A use case model is a representation or diagram that shows how a system, application, or software interacts with its users (actors) to accomplish a task or function. It shows the various situations or scenarios in which the system is used and describes the tasks or steps involved in each situation. Use Case models are often used in software development and business to capture and communicate system requirements in a clear and consistent manner. They help stakeholders understand how the system will behave in different situations and provide the basis for subsequent design and development.

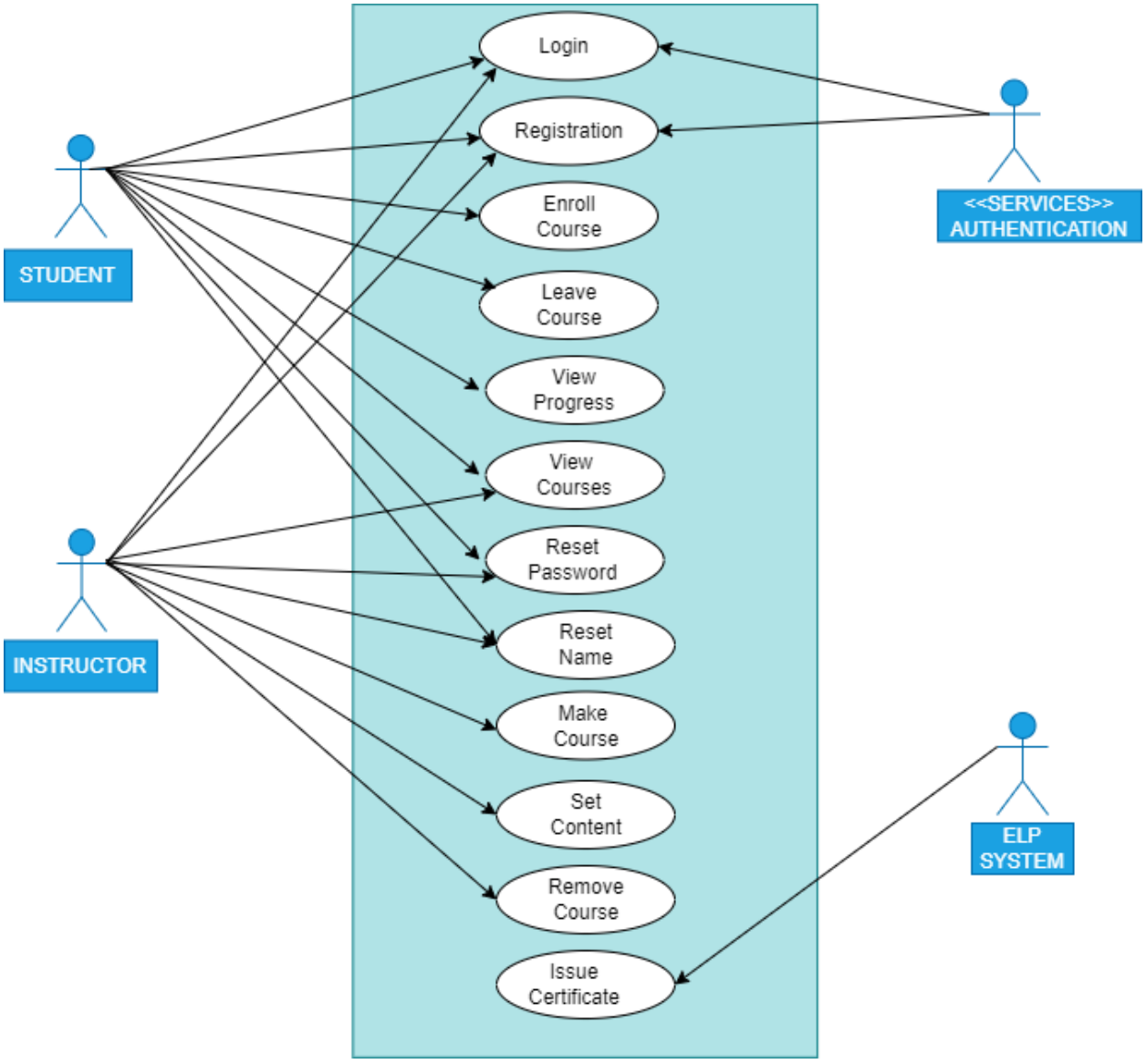

Figure 1: Use Case Learn Hub

2.4- Use Case Analysis:

2.4.1 Use Case Brief Detail

Registration

Use Case ID:	UC-01
Use Case Name:	Registration
Description:	This use case describes the process by which users can sign up for the first time
Actors:	Student, Tutor

Login

Use Case ID:	UC-02
Use Case Name:	Login
Description:	This use case describes the process by which user can login to the system
Actors:	Student, Tutor

Enroll Course

Use Case ID:	UC-03
Use Case Name:	Enroll Course
Description:	This use case describes the process by which user can enroll a course
Actors:	Student

Leave Course

Use Case ID:	UC-04
Use Case Name:	Leave Course
Description:	This use case describes the process by which users can unroll the course if user change their mind.
Actors:	Student

View Progress

Use Case ID:	UC-05
Use Case Name:	View Progress
Description:	This use case describes the process by which the user can view their progress in a particular course.
Actors:	Student, Tutor

Make Course

Use Case ID:	UC-06
Use Case Name:	Make Course
Description:	This use case describes the process by which tutor can create and start a new course.
Actors:	Tutor

Set Content

Use Case ID:	UC-07
Use Case Name:	Set Content
Description:	This use case describes the process by which a tutor can add course material for a particular course.
Actors:	Tutor

Remove Course

Use Case ID:	UC-08
Use Case Name:	Remove Course
Description:	This use case describes the process by which tutor can remove a course that he is offering.
Actors:	Tutor

Issue Certificate

Use Case ID:	UC-09
Use Case Name:	Issue Certificate
Description:	This use case describes the process by which ELP System issues a certificate to the successful candidates/students.
Actors:	ELP System

2.4.2 Use Case Description Detail

Registration

Use Case ID:	UC-01
Use Case Name:	Registration
Description:	This use case describes the process by which users can sign up for the first time
Actors:	Student, Tutor
Pre-condition:	1. Working internet connection 2. Valid Email account 3. Web App is fully loaded
Post-condition:	Student(s) will be redirected to log-in page, Other Users will receive account credentials in their email.
Includes:	Web App, MongoDB
Basic Flow:	1. Student will click on signup. 2. Student will enter credentials. 3. An email verification code will be sent. 4. After verification user is redirected to the log-in page. 5. User will get an email with login credentials. 6. User can now login with their credentials.
Exception:	Provided email is valid. Email should be unique.
Frequency of use:	Once per registration.

Login

Use Case ID:	UC-02
Use Case Name:	Login
Description:	This use case describes the process by which user can login to the system.
Actors:	Student, Tutor
Pre-condition:	1. Working internet connection 2. Valid Email address 3. Web App is fully loaded
Post-condition:	User will be redirected to their panel
Includes:	Web App, MongoDB
Basic Flow:	1. The user will click on Log In. 2. User will enter credentials. 3. Web app will verify user from database. 4. After verification user is logged in.
Exception:	N/A
Frequency of use:	Once per session

Enroll Course

Use Case ID:	UC-003
Use Case Name:	Enroll Course
Description:	This use case describes the process by which a user can enroll a course.
Actors:	Student
Pre-condition:	1. Working internet connection. 2. The user is logged in. 3. Web App is fully loaded. 4. Course should exist.
Post-condition:	The student is enrolled in the course.
Includes:	Web App, MongoDB

Basic Flow:	1. The user will search the course. 2. The user will choose to enroll in the course.
Exception:	N/A
Frequency of use:	Once per course, Numerous

Leave Course

Use Case ID:	UC-004
Use Case Name:	Leave Course
Description:	This use case describes the process by which users can unroll the course if user change their mind.
Actors:	Student
Pre-condition:	1. Working internet connection. 2. Account is activated. 3. Web App is fully loaded. 4. User enrolled in the course.
Post-condition:	Students will be unrolled from the course.
Includes:	Web App, MongoDB
Basic Flow:	1. The user will search for the enrolled course. 2. User will choose to leave the course.
Exception:	N/A
Frequency of use:	Once per course, Numerous

View Progress

Use Case ID:	UC-005
Use Case Name:	View Progress
Description:	This use case describes the process by which the user can View their progress in a particular course.
Actors:	Student, Tutor
Pre-condition:	1. Working internet connection. 2. The user is logged in.

Post-condition:	Progress will show.
Includes:	Web App, MongoDB
Basic Flow:	1. The user will log in to his account. 2. User click on the course whose process he want to see. 3. System will show the progress of the course.
Exception:	N/A
Frequency of use:	Numerous

Make Course

Use Case ID:	UC-006
Use Case Name:	Make Course
Description:	This use case describes the process by which tutor can create and start a new course.
Actors:	Tutor
Pre-condition:	1. Working internet connection 2. User is logged in. 3. Created course was not exist in database.
Post-condition:	Course will create and ready for enrolment.
Includes:	Web App, MongoDB
Basic Flow:	1. User will enter the details about course 2. User will click on make course. 3. Student can enroll the course
Exception:	N/A
Frequency of use:	Numerous

Set Content

Use Case ID:	UC-007
Use Case Name:	Set Content
Description:	This use case describes the process by which tutor can add course material for a particular course.
Actors:	Tutor
Pre-condition:	1. Working internet connection. 2. Course must be created.
Post-condition:	A list of Contents is displayed.
Includes:	Web App, MongoDB
Basic Flow:	1. The user will click on make the course. 2. User will add details about the flow of the course. 3. System will display contents.
Frequency of use:	Once per course

Remove Course

Use Case ID:	UC-008
Use Case Name:	Remove Course
Description:	This use case describes the process by which tutor can remove a course that he is offering.
Actors:	Tutor
Pre-condition:	1. Working internet connection. 2. The user should be offered.
Post-condition:	User have no longer access on that course
Includes:	Web App, MongoDB
Basic Flow:	1. The user will check the offered course. 2. Click on remove the course.
Exception:	N/A
Frequency of use:	Once

Issue Certificate

Use Case ID:	UC-009
Use Case Name:	Issue Certificate
Description:	This use case describes the process by which ELP System issues a certificate to the successful candidates/students.
Actors:	ELP System
Pre-condition:	1. Working internet connection. 2. Student must be completed the course.
Post-condition:	System will generate the certificate
Includes:	Web App, MongoDB
Basic Flow:	1. User will complete the course. 2. System will issue certificate.
Exception:	N/A
Frequency of use:	Numerous

Chapter 3

System Development

Introduction to System Development

In the context of our E-learning platform project **"Learn Hub"**, system development plays a pivotal role in bringing our vision to life. This section provides an overview of our system development approach and methodology.

Significance of System Development

System development is the disciplined process by which we design, build, and deploy our Learn Hub. It ensures that our platform meets the needs and expectations of our users while maintaining quality, reliability, and security.

System Development Life Cycle (SDLC)

Our project follows a well-structured System Development Life Cycle (SDLC), which serves as the foundation for the development process. We have chosen the agile model because of its suitability for our project's goals.

Key Phases of SDLC

Requirements Analysis and Gathering: In this phase, we meticulously gather and analyze the requirements from various stakeholders, ensuring a clear understanding of what our E-learning platform " Learn Hub" must achieve.

System Design: The design phase focuses on defining the architecture, components, and data flow of the platform. It transforms requirements into a tangible system design.

Coding and Implementation: This phase involves the actual development of the platform, adhering to coding standards and best practices.

Testing and Quality Assurance: Rigorous testing is performed to verify the platform's functionality, ensuring it meets our quality standards. This includes unit testing, integration testing, and user acceptance testing.

Deployment and Rollout: We carefully plan and execute the deployment phase, making the platform ready for release to our users. This phase encompasses hardware and software requirements and data migration, where applicable.

User Training and Documentation: To ensure users can effectively use our platform, we provide comprehensive training and user documentation, including user manuals and FAQs.

Maintenance and Support: Post-launch, our team remains dedicated to ongoing maintenance, updates, and user support. This includes addressing user feedback, resolving issues, and implementing system enhancements.

3.1- Data Flow Diagram

"Data from a diagram" refers to the information or content that can be extracted, interpreted, or collected by analyzing a visual diagram. This data can include facts, relationships, patterns, or any meaningful insights that the diagram conveys through its visual elements, such as shapes, lines, labels, and symbols. Extracting data from a diagram often involves visual inspection and analysis to gain a better understanding of the depicted information.

The two Levels of DFD are:

DFD-0

DFD-1

3.1.1 DFD-0

"Data Flow Diagram Level 0," is a graphical representation that provides an overview of the entire system or process being analyzed. It is a high-level diagram that shows the major processes or functions within the system and the interactions between them, typically using simple shapes and arrows to depict data flow.

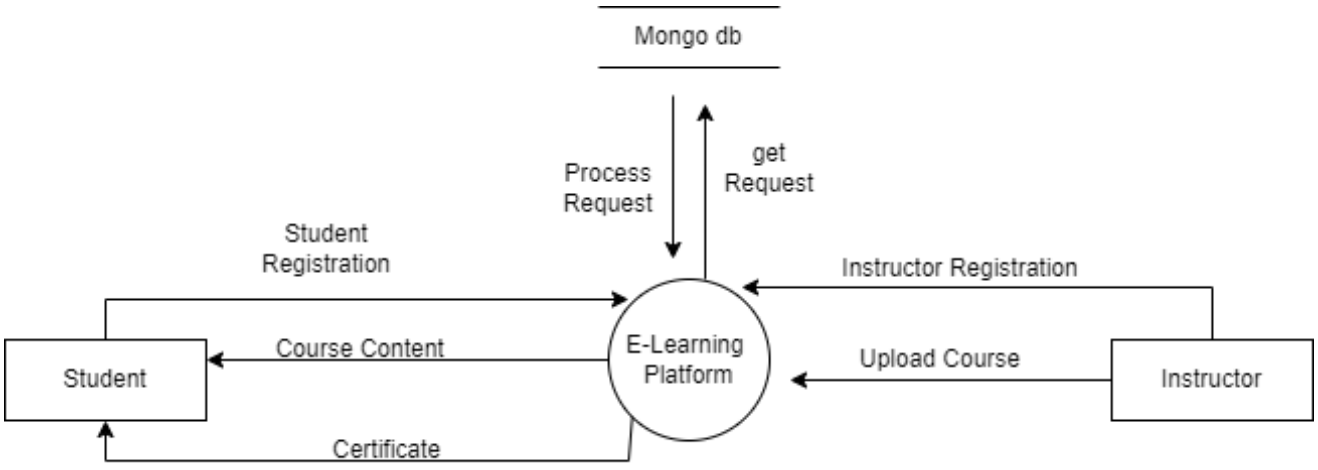

Figure 2: DFD-0 for Learn Hub

3.1.2 DFD-1

"Data Flow Diagram Level 1," is a detailed graphical representation used in systems analysis and design to provide a deeper understanding of a specific process or function within a system. It expands on the higher-level DFD-0 diagram by breaking down a single process into its sub-processes or tasks and illustrating the data flow among them.

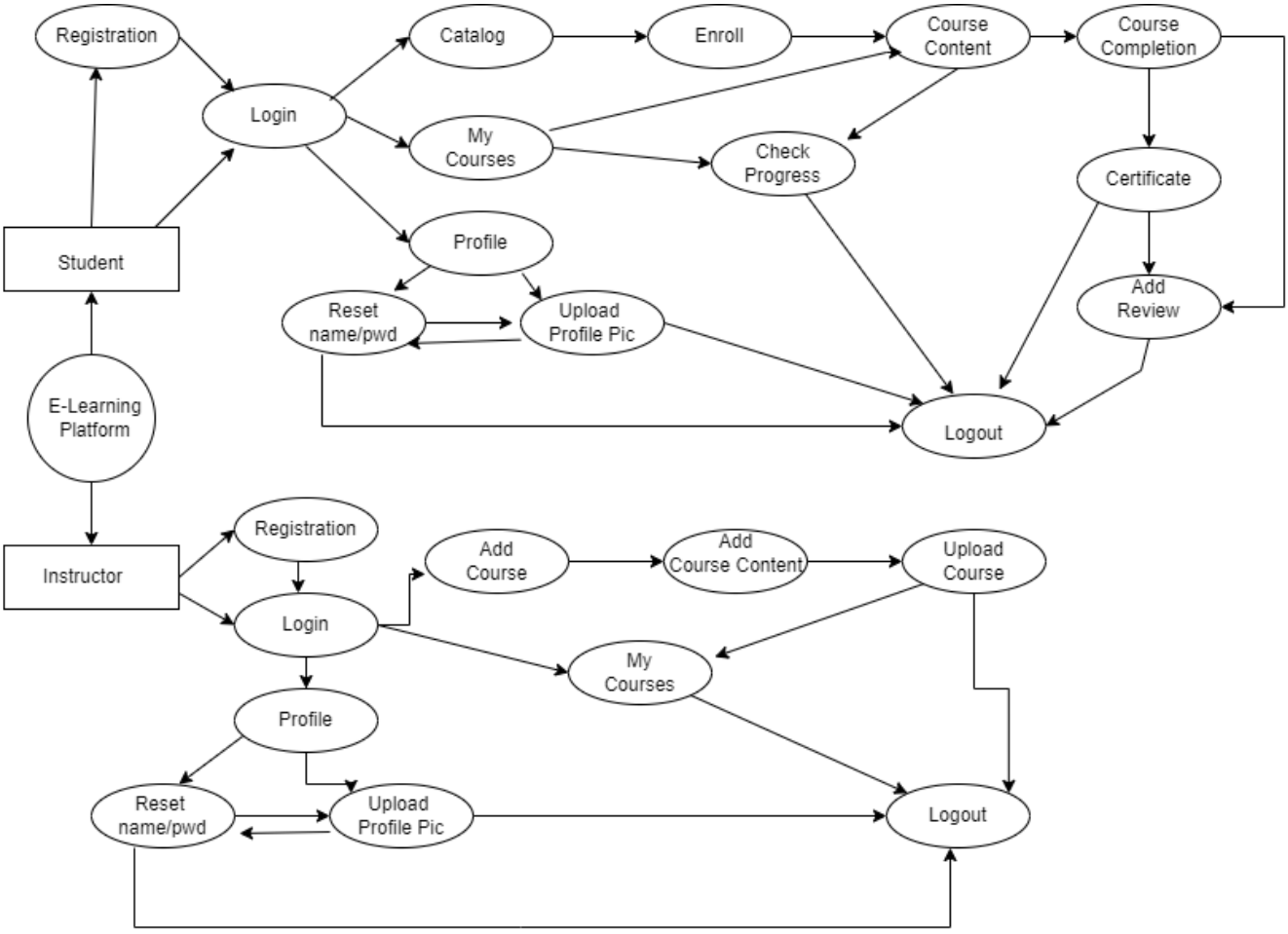

Figure 3: DFD-1 for Learn Hub

3.2- ERD

An Entity-Relationship Diagram (ERD) is a visual representation that illustrates the various entities (or data objects) in your system and the relationships between them. It provides a structured way to understand how different pieces of data are organized and connected within your E-learning platform **"Learn Hub** .

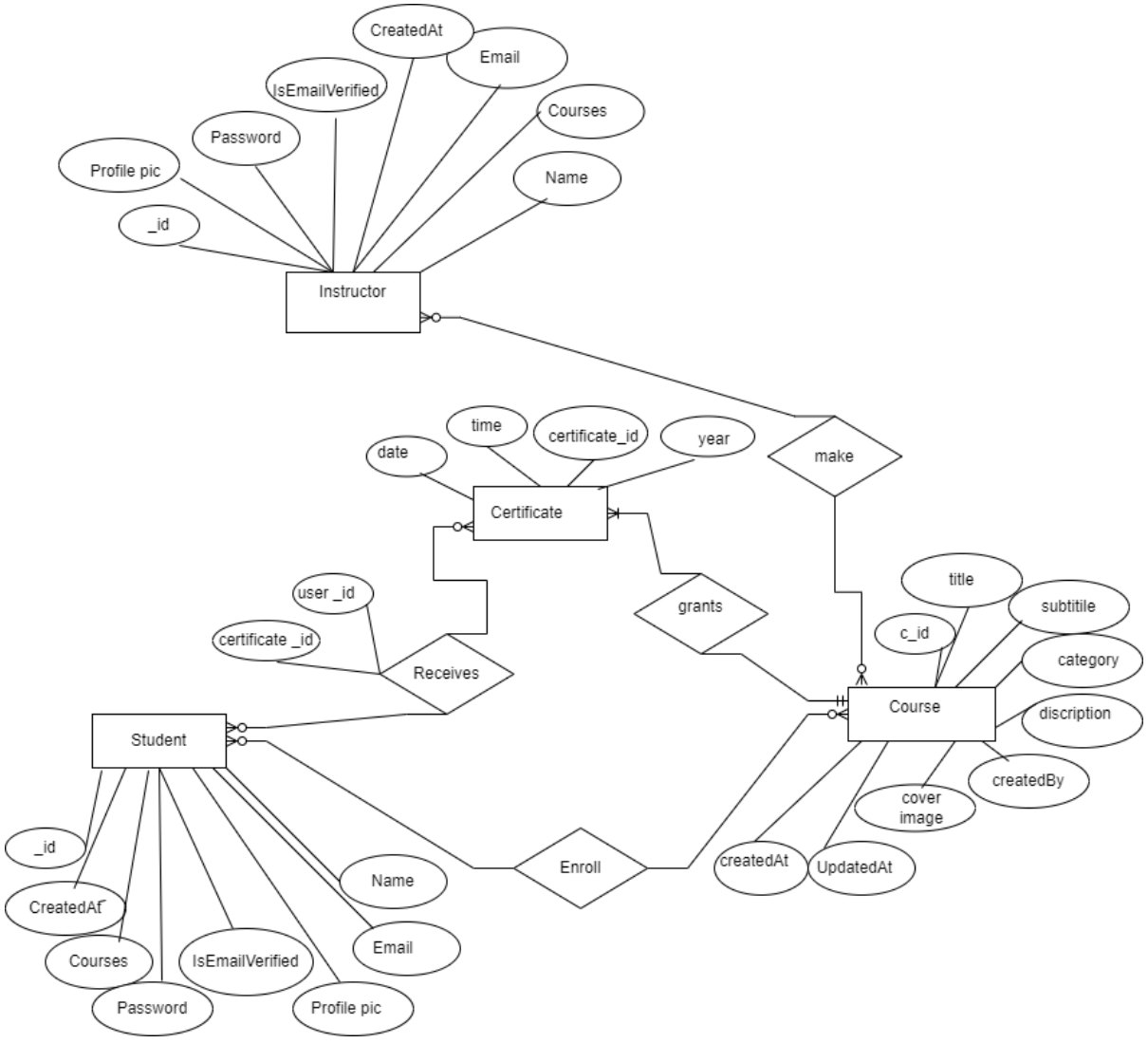

Figure 4: ERD diagram for Learn Hub

3.3- Activity Diagram

An activity diagram, in the context of software engineering and system design, is a visual representation that illustrates the flow of activities or actions within a system, process, or workflow. It helps depict the dynamic aspects of a system, focusing on the sequence of actions, decisions, and transitions involved in achieving a particular goal.

3.3.1 Activity Diagram for Student:

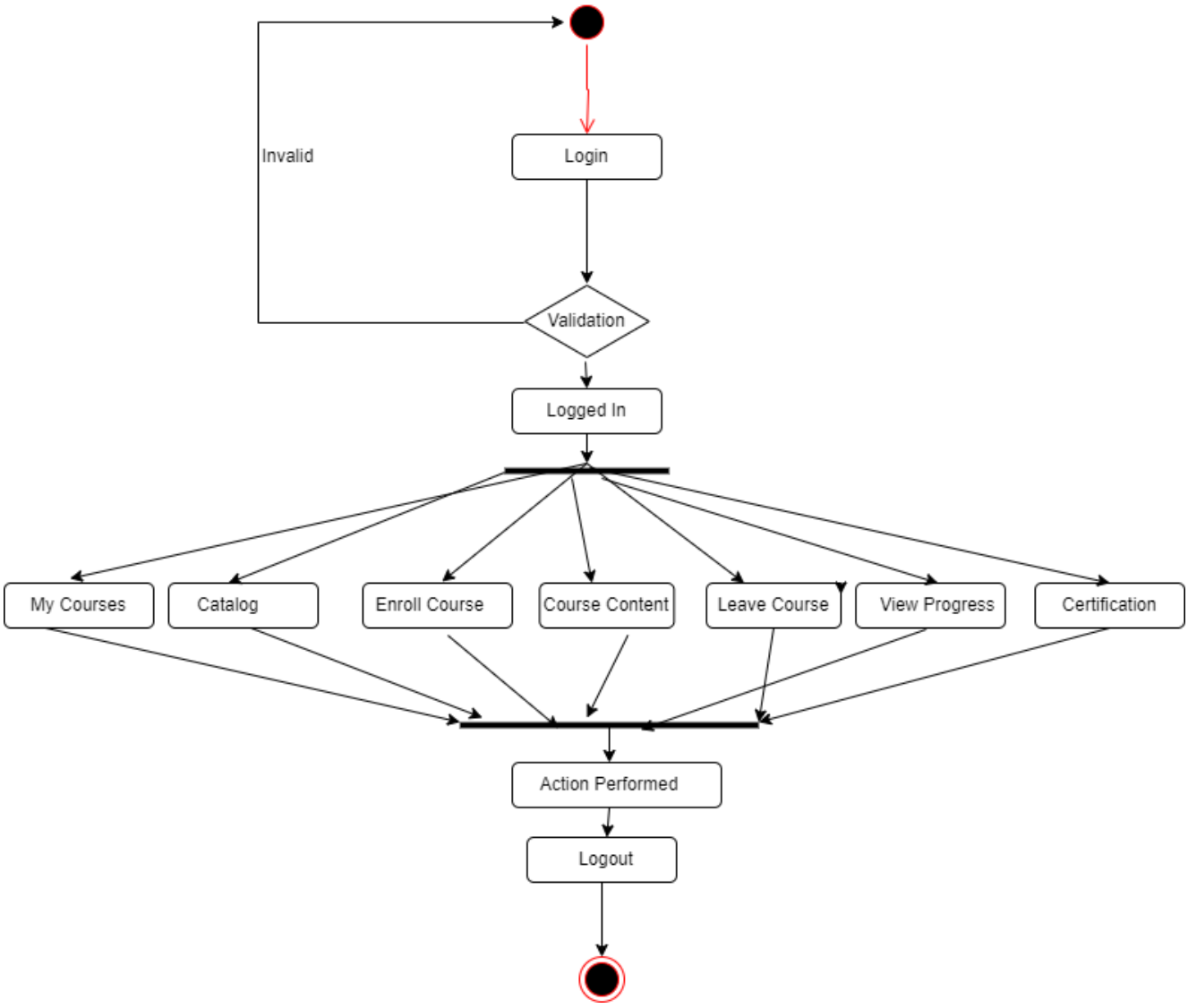

Figure 5: Activity Diagram for Student

3.3.2 Activity Diagram for Instructor:

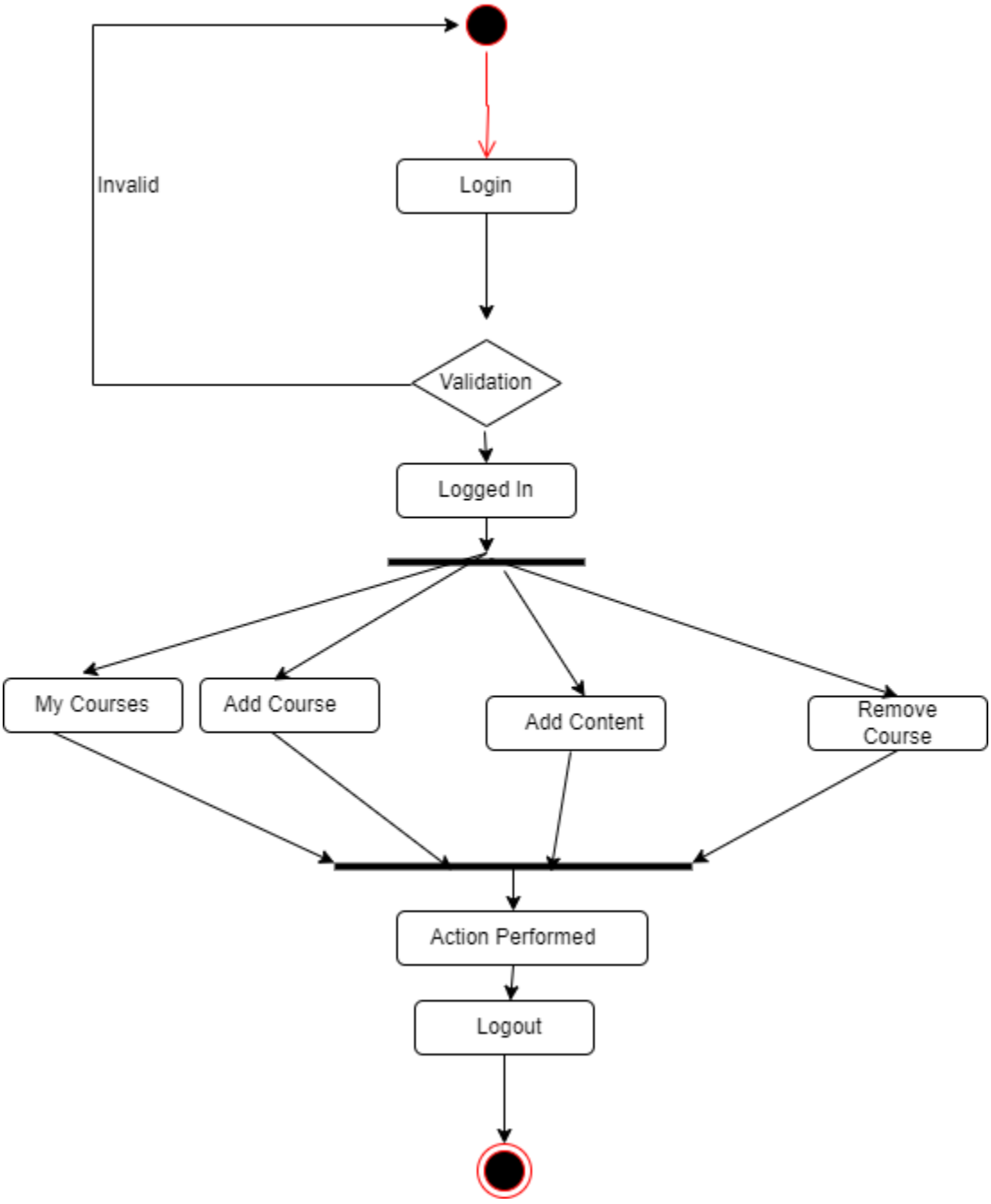

Figure 6: Activity Diagram for Instructor

3.4- Sequence Diagram

A sequence diagram is a type of interaction diagram in UML (Unified Modeling Language) that depicts the interactions and communication between different objects or components within a system over time. It focuses on showing the chronological order of messages and method calls exchanged between these objects to accomplish a specific task or scenario.

3.4.1.Sign Up

This sequence diagram describes the process by which users can sign up for the system.

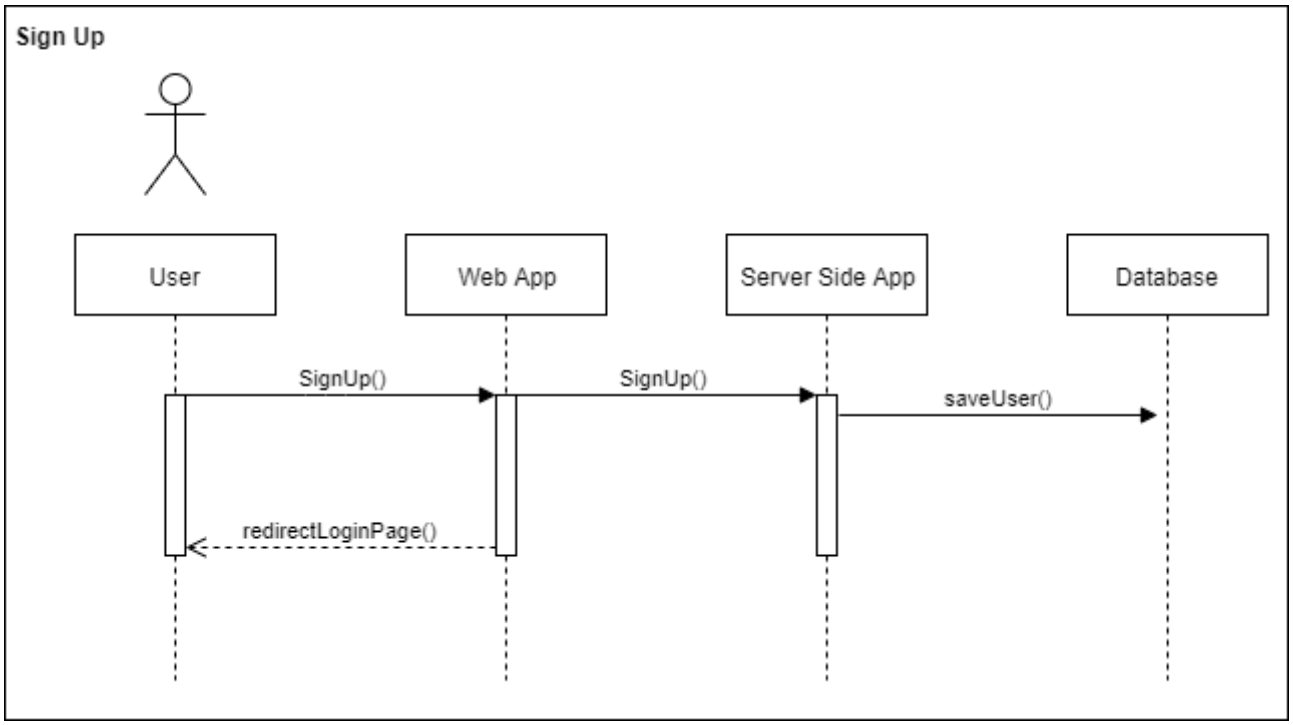

Figure 7: Sequence diagram for sign up

3.4.2.Sign In

This sequence diagram describes how the users can Sign in to the system.

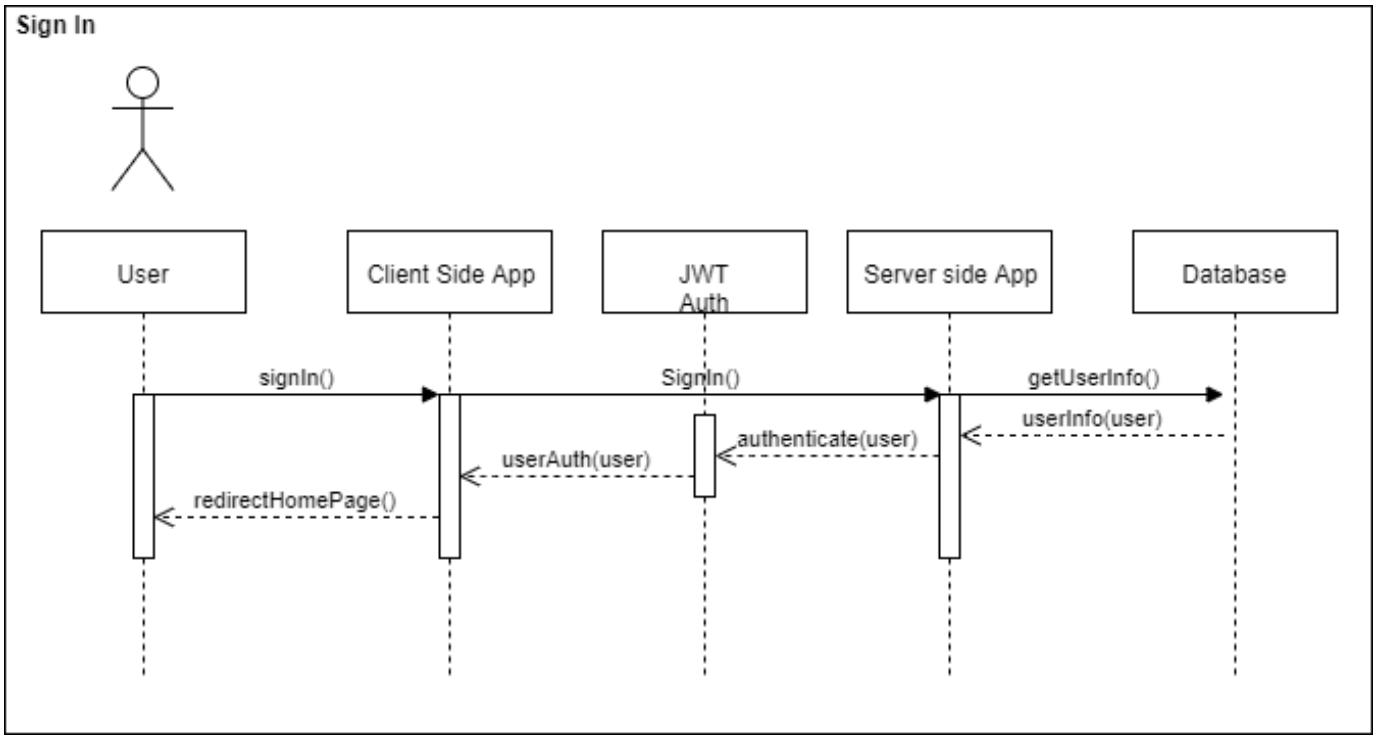

Figure 8: sequence diagram for sign in

3.4.3 Make Course

This sequence diagram describes how the instructor can make course.

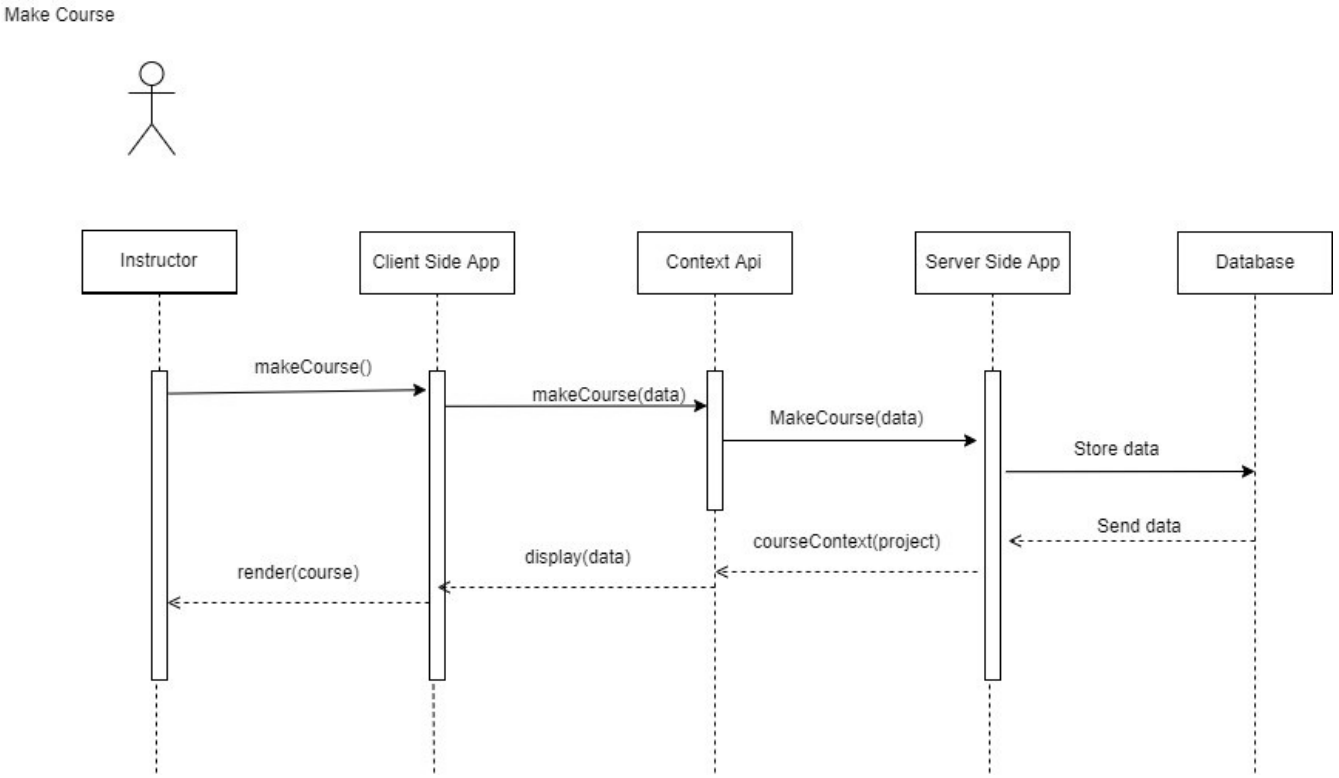

Figure 9: Sequence diagram for making course

3.4.4 Set Content

This sequence diagram describes the process by which instructor can create a project.

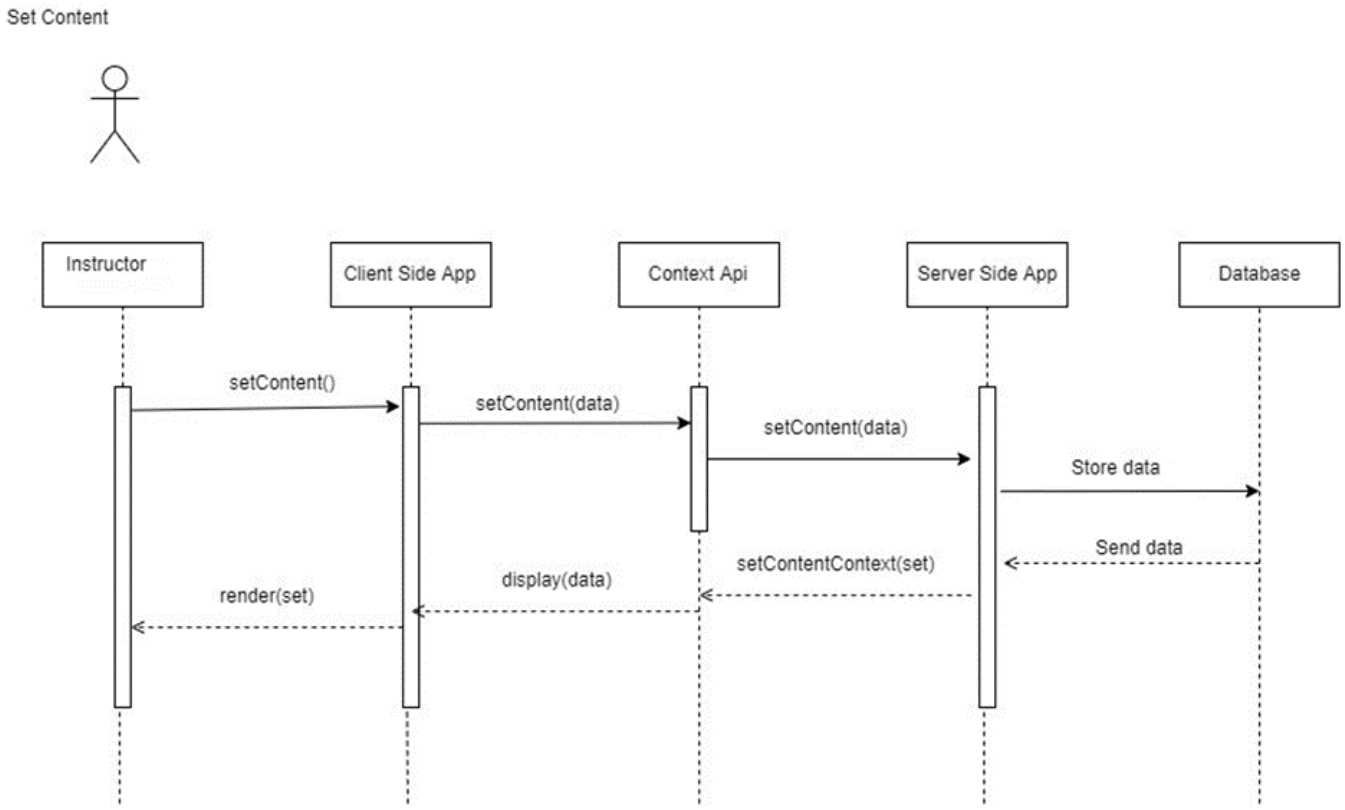

Figure 10: Sequence diagram for content setting.

3.4.5 Enroll Course

This sequence diagram describes the process by which students can enroll in a course.

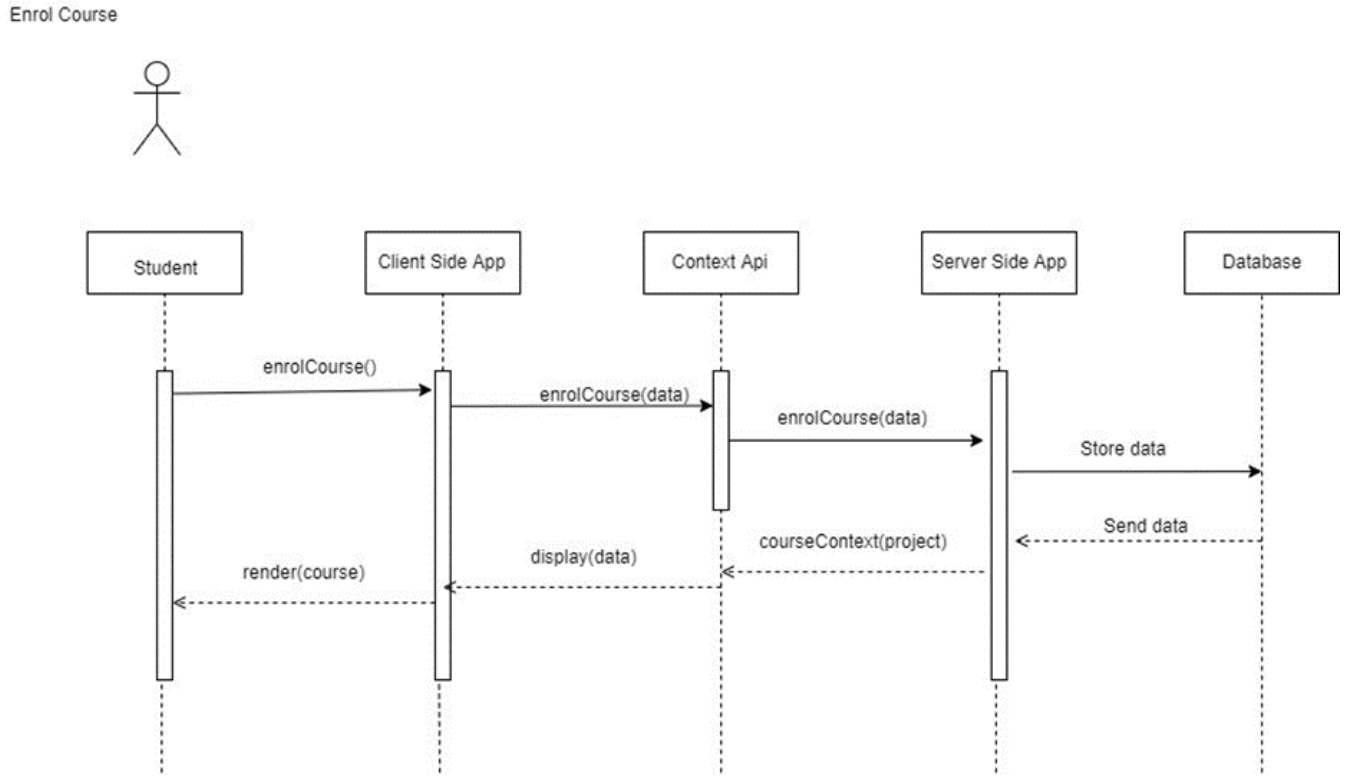

Figure 11: Sequence diagram for course enrollment

3.4.6. View Progress

This sequence diagram describes the process by which student can view progress.

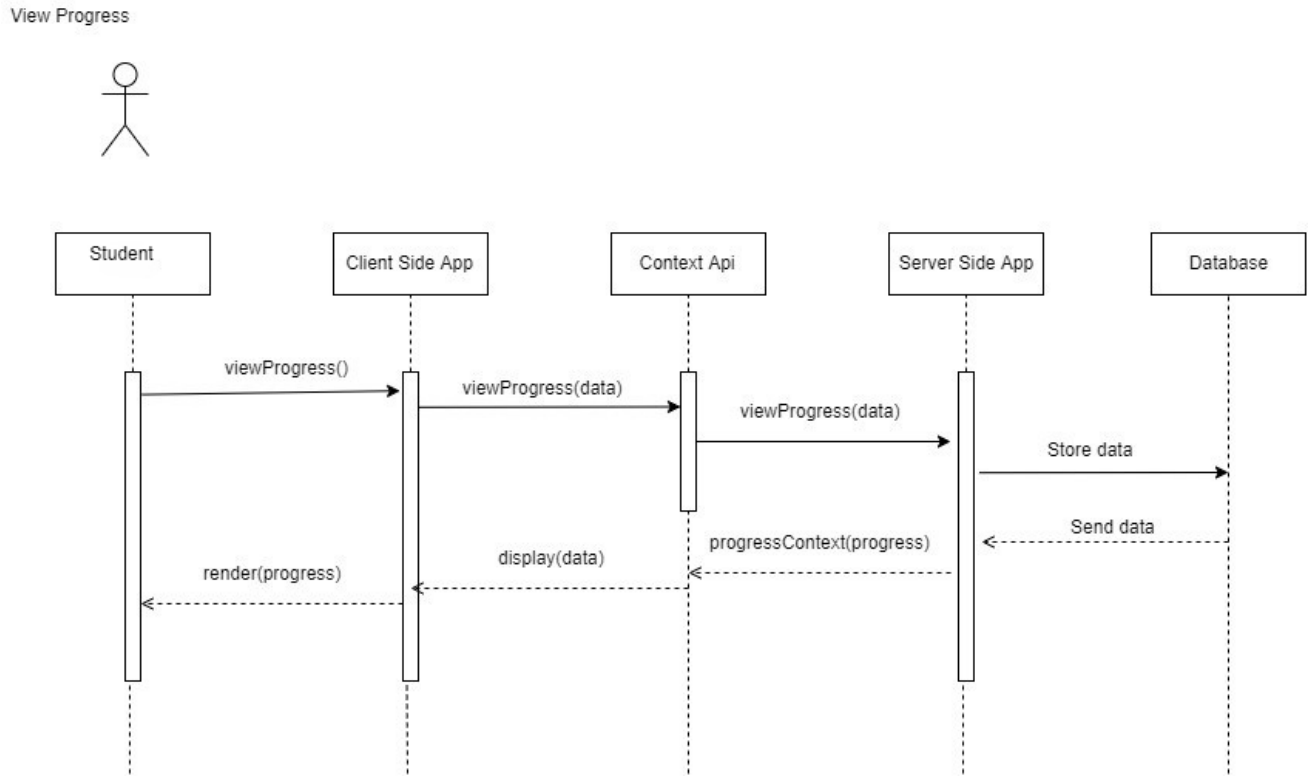

Figure 12: Sequence diagram for viewing progress

3.4.7 Leave Course

This sequence diagram describes the process by which student can leave course.

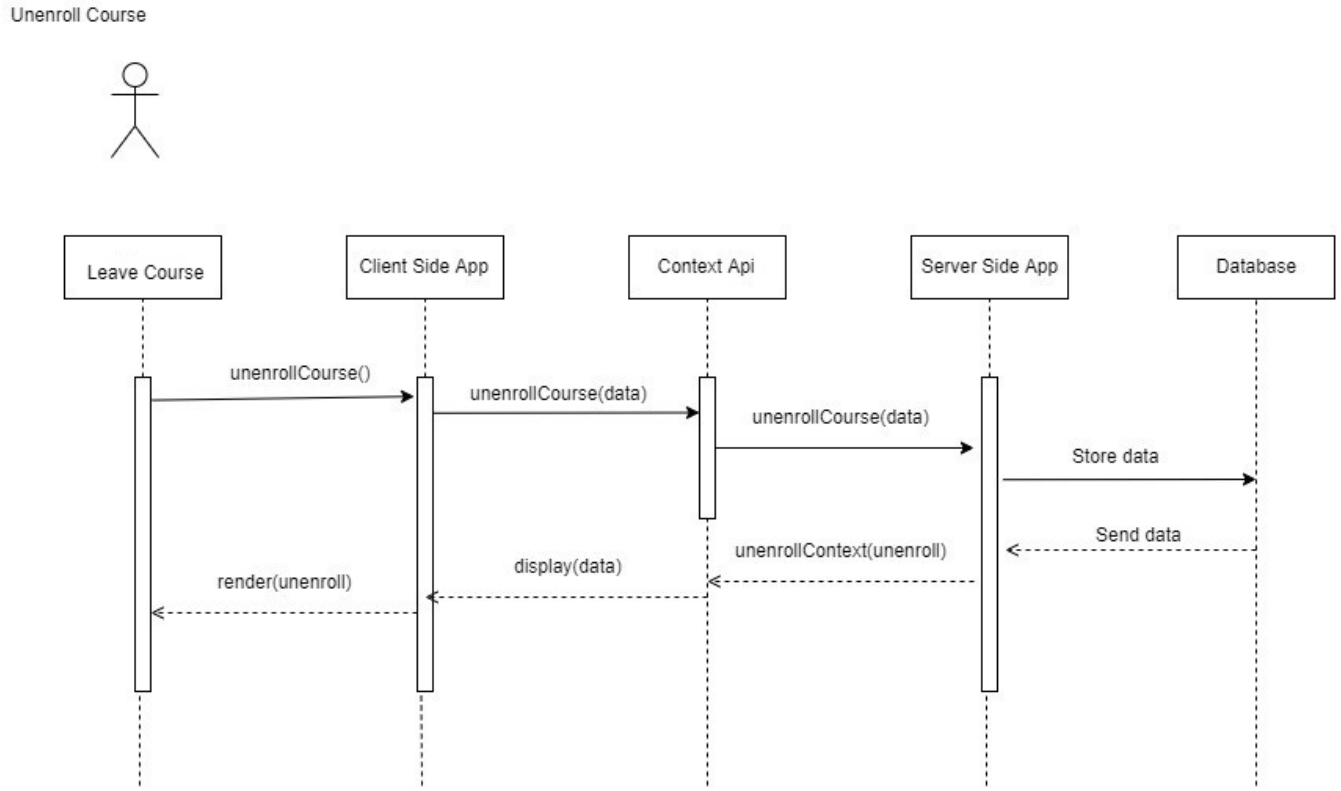

Figure 13: Sequence diagram for leaving course

3.4.8 Remove Course

This sequence diagram describes the process by which instructor can remove course.

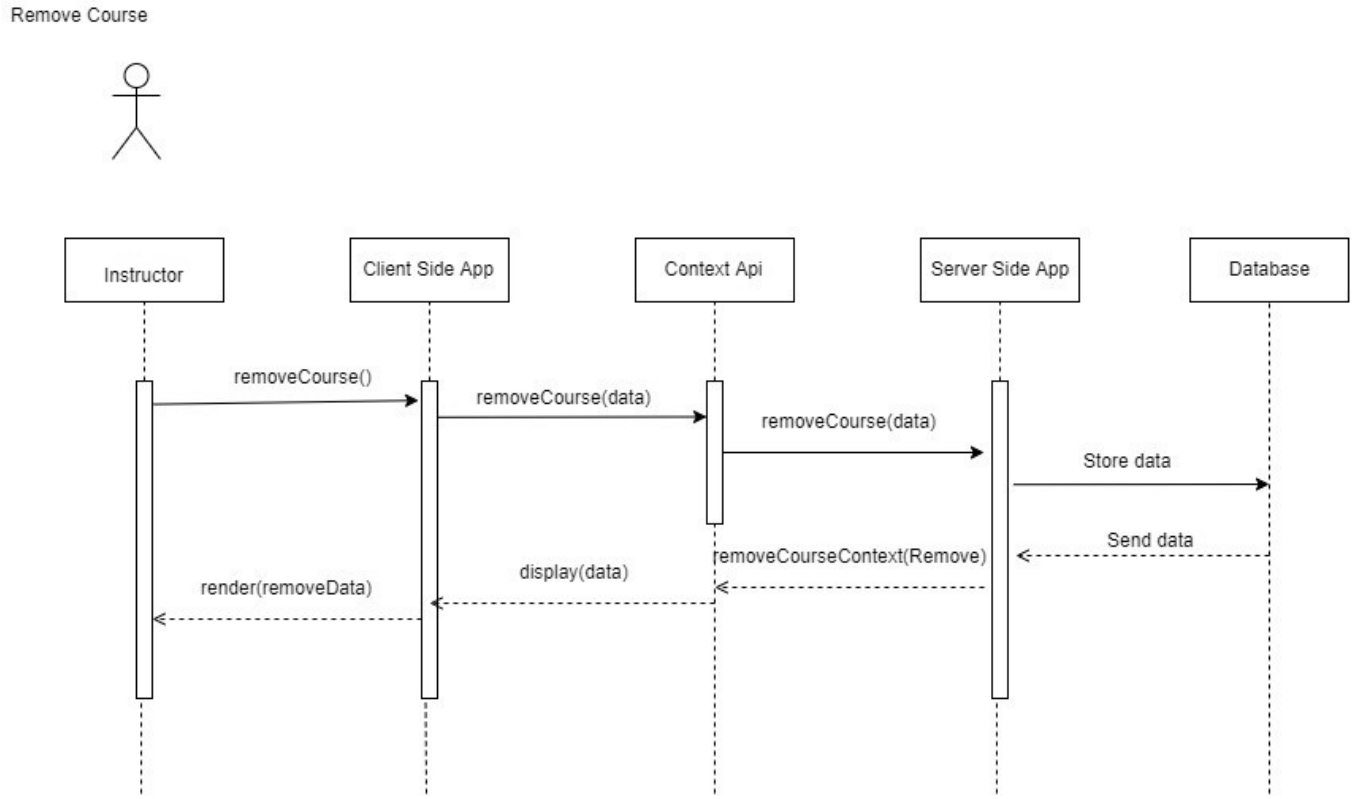

Figure 14: Sequence diagram for removing course

3.4.9 Issue Certificate

This sequence diagram describes the process by which system will issue certificate.

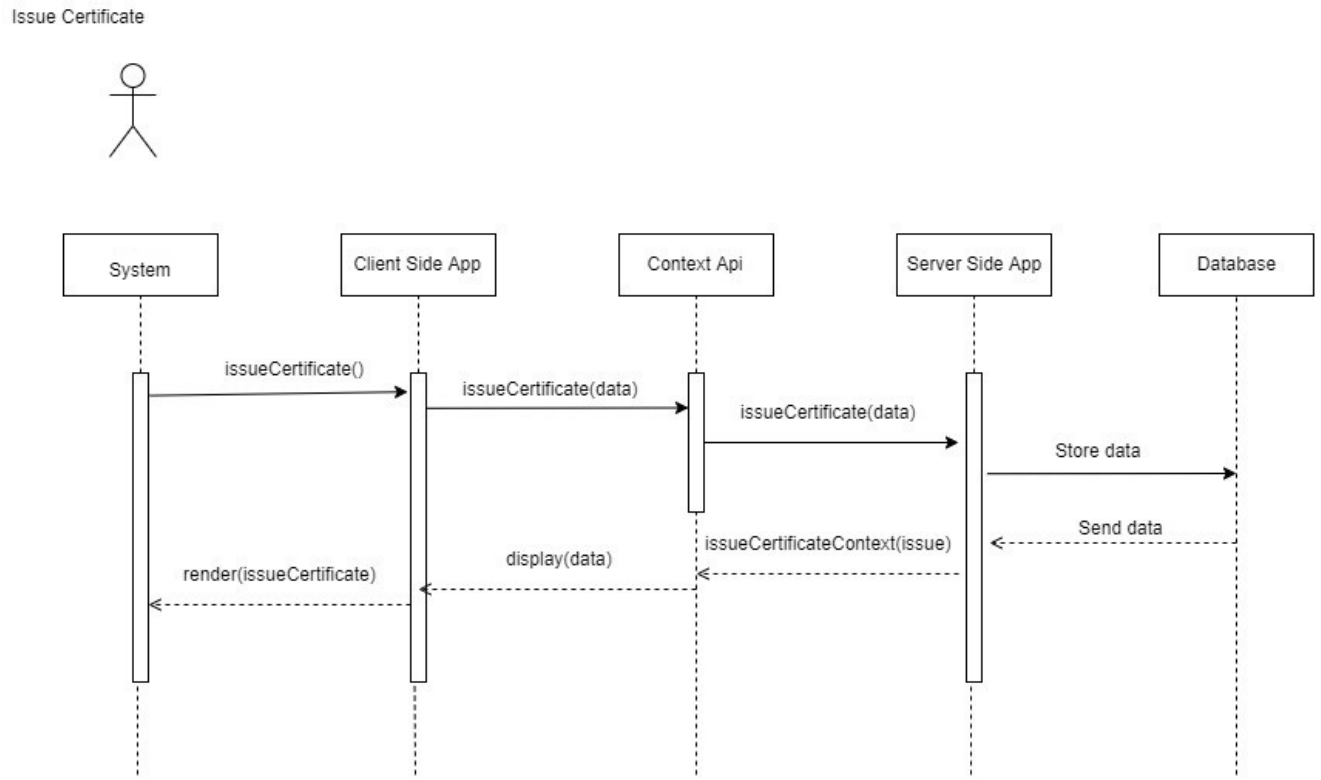

Figure 15: Sequence diagram for issuing certificate

3.5. Deployment Diagram

A deployment diagram is a simple and short visual representation used in system modeling to show how software components and hardware devices are distributed and physically arranged within a system or network. It illustrates where software runs and how it interacts with hardware in a deployment environment.

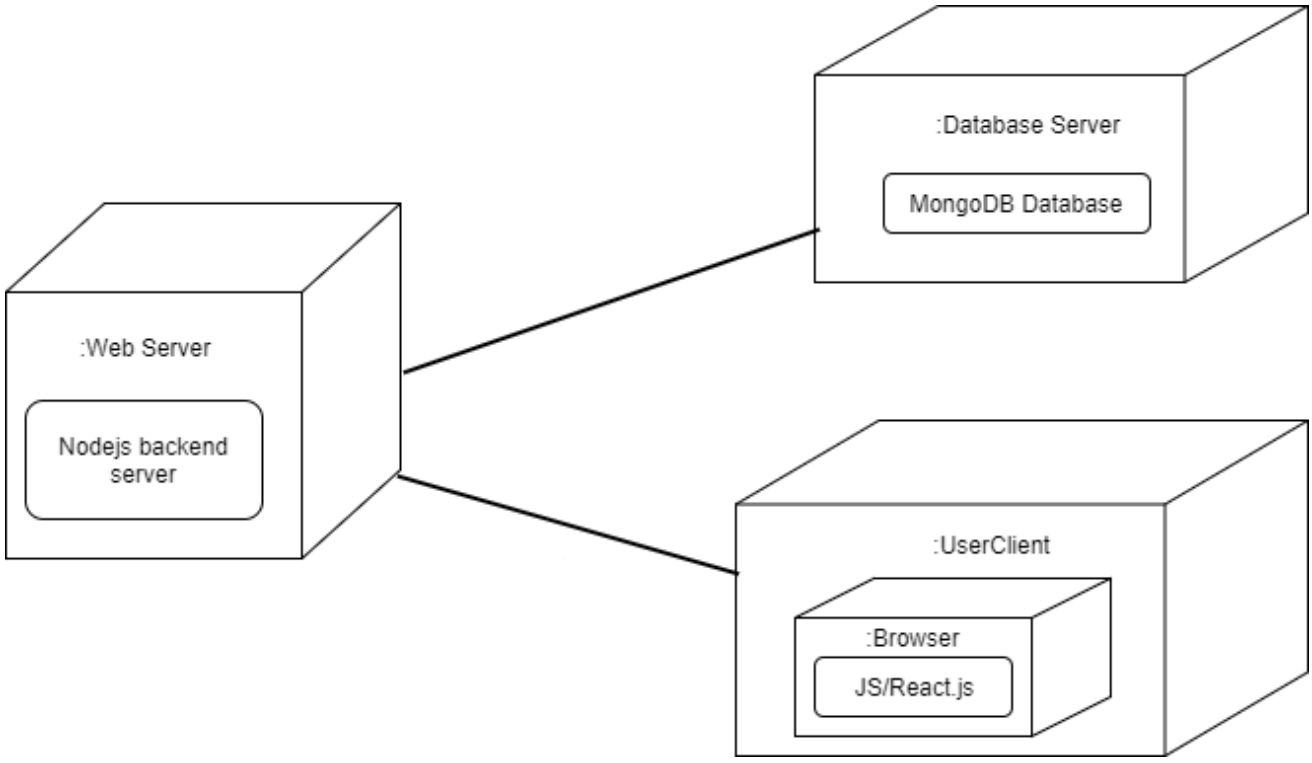

Figure 16: Deployment diagram for Learn Hub

3.6. Component Diagram

A component diagram is a simple and concise visual representation used in system modeling to illustrate the high-level organization of software components and their relationships within a system. It focuses on the building blocks of a system and how they collaborate to achieve specific functionalities.

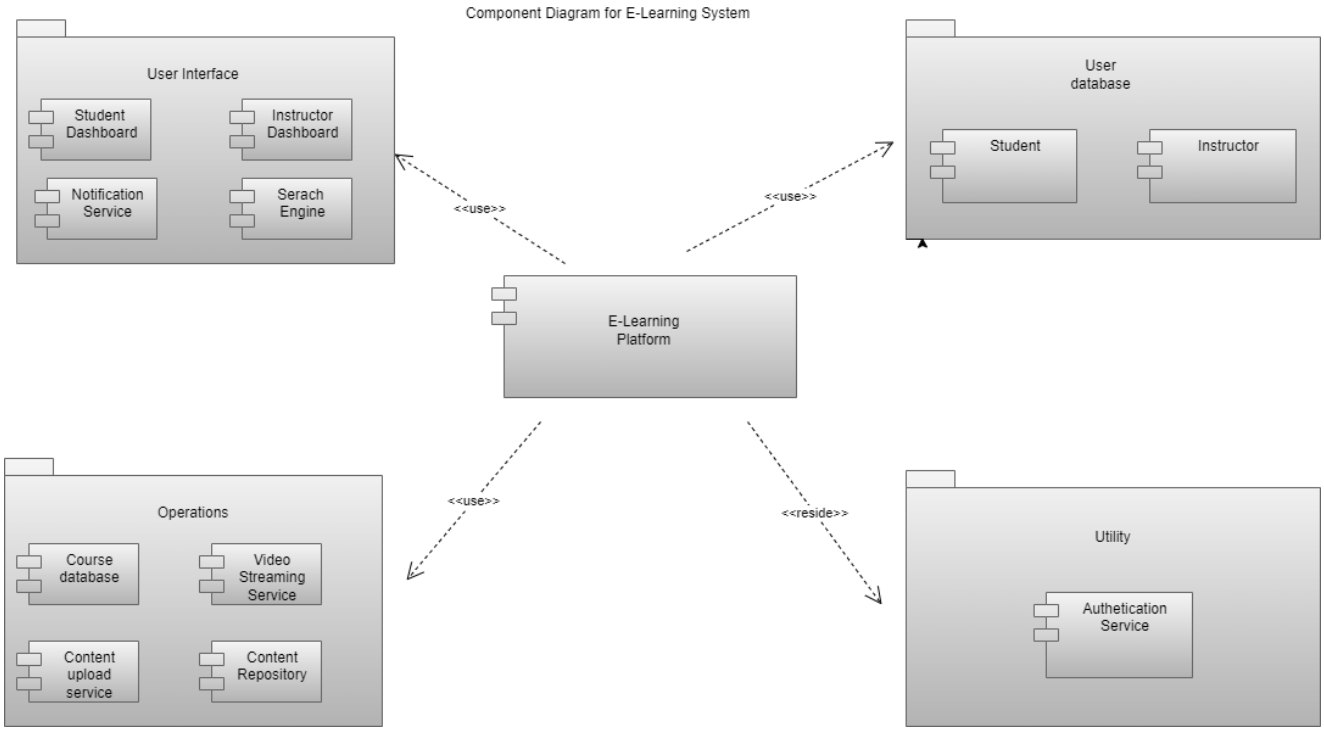

Figure 17: Component diagram for Learn Hub

3.7. Collaboration Diagram

A collaboration diagram is a simple and concise visual representation used in system modeling to show how objects or components interact and collaborate to achieve a specific task or function within a system. It highlights the relationships and messages exchanged between these objects during the execution of a scenario or use case.

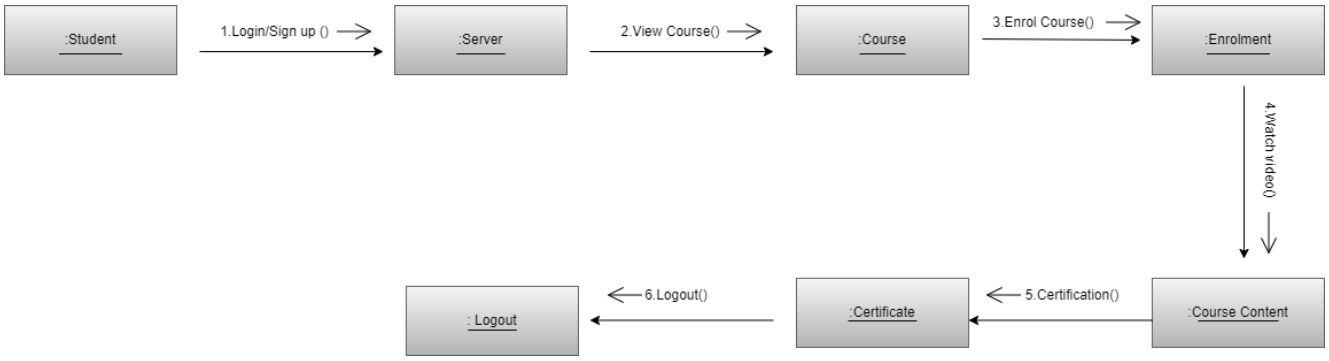

Figure 18: Student Collaboration Diagram

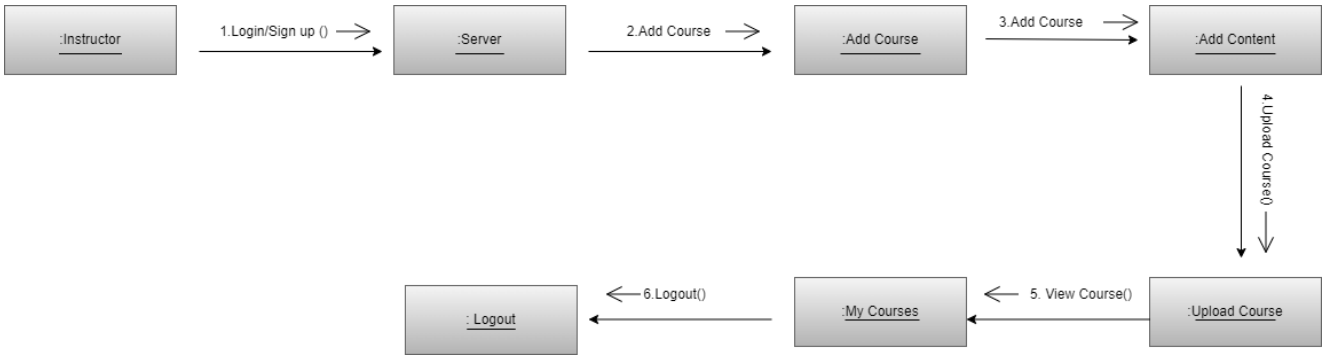

Figure 19: Instructor Collaboration Diagram

3.8. State Transition Diagram

A state diagram is a simple and concise visual representation used in system modeling to illustrate the various states that an object or system can be in and how it transitions between those states based on events or conditions. It provides a clear picture of how a system behaves over time.

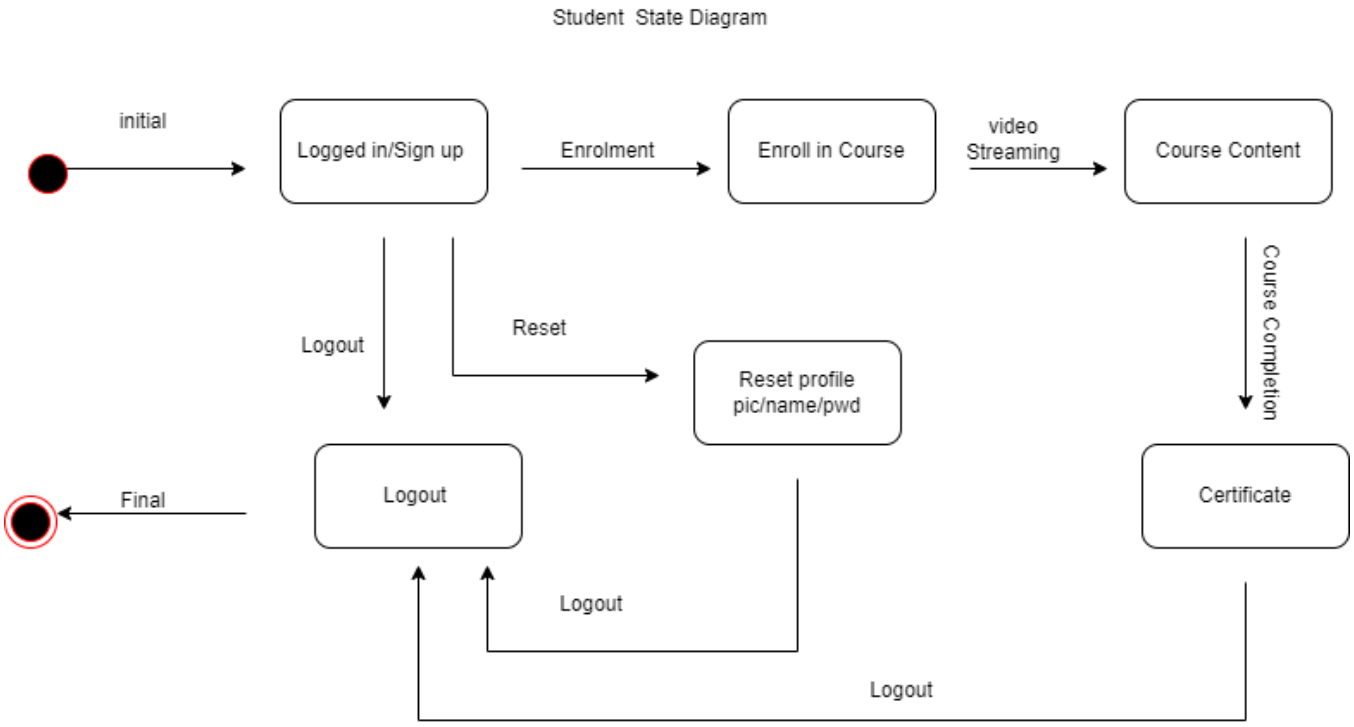

Figure 20: State Transition Diagram for Student

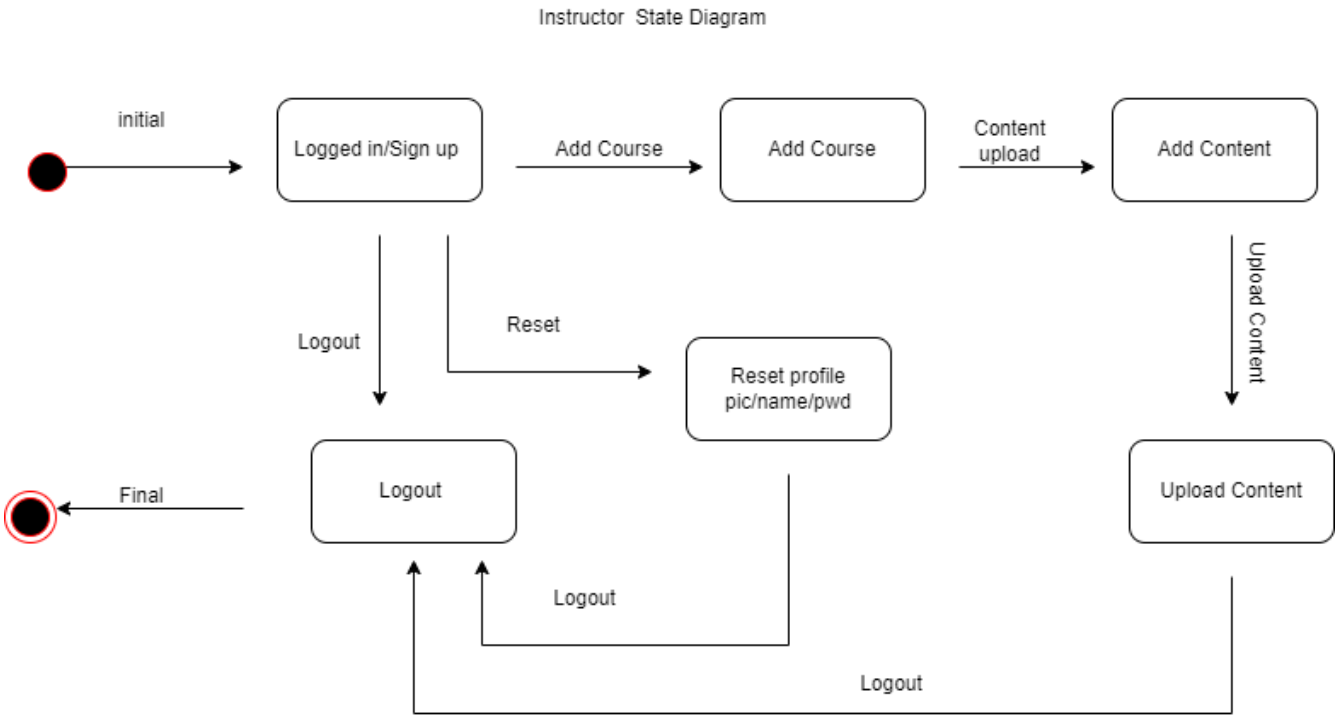

Figure 21: State Transition Diagram for Instructor

Chapter 4

System Architecture

Introduction:

In this project, we are creating a web application system that is easy for people to learn. Users can register to our application using email. Students can register for courses. After signing up, he can watch videos and check his progress. Students can review the lesson. Upon completion you will receive a certificate. On the other hand, the teacher can create a class or multiple classes, determine the content of the class, and see the progress of his students. We created this responsive app that works well on mobile devices. We use modern technologies to make web applications synchronous, responsive and easy to manage.

4.1 Architecture Design:

Architecture design, also known as software architecture design or system architecture design, refers to the process of defining the fundamental structure and organization of a software system or application. It involves making high-level decisions about how different components of the system will interact, how data and control flow within the system, and how various software modules or services will work together to achieve the desired functionality, performance, scalability, and maintainability.

The Architectural style we used for our system is a **Layered Architecture.** Where all of the modules are working at different layer. There are total 4 layers. Layers and its components.

1- **Presentation Layer:** It includes the user Interface of our Learn Hub. The Users involved are the vistors, students, Instructors.
2- **Application Layer:** It contains the core business logic of our Platform. Its components involves login authentication, student management, instructor management, course management, certificate management.
3- **Integration Layer:** This layer connects our webservices with database. Its components are the APIs used to connect to the databse.
4- **Data Layer:** This is a core Layer where all our database is stored. Its Components is the stored data like student, instructor, courses etc records and everything.

The Diagrammatic view of our system architecture is shown in **Fig 4.1.**

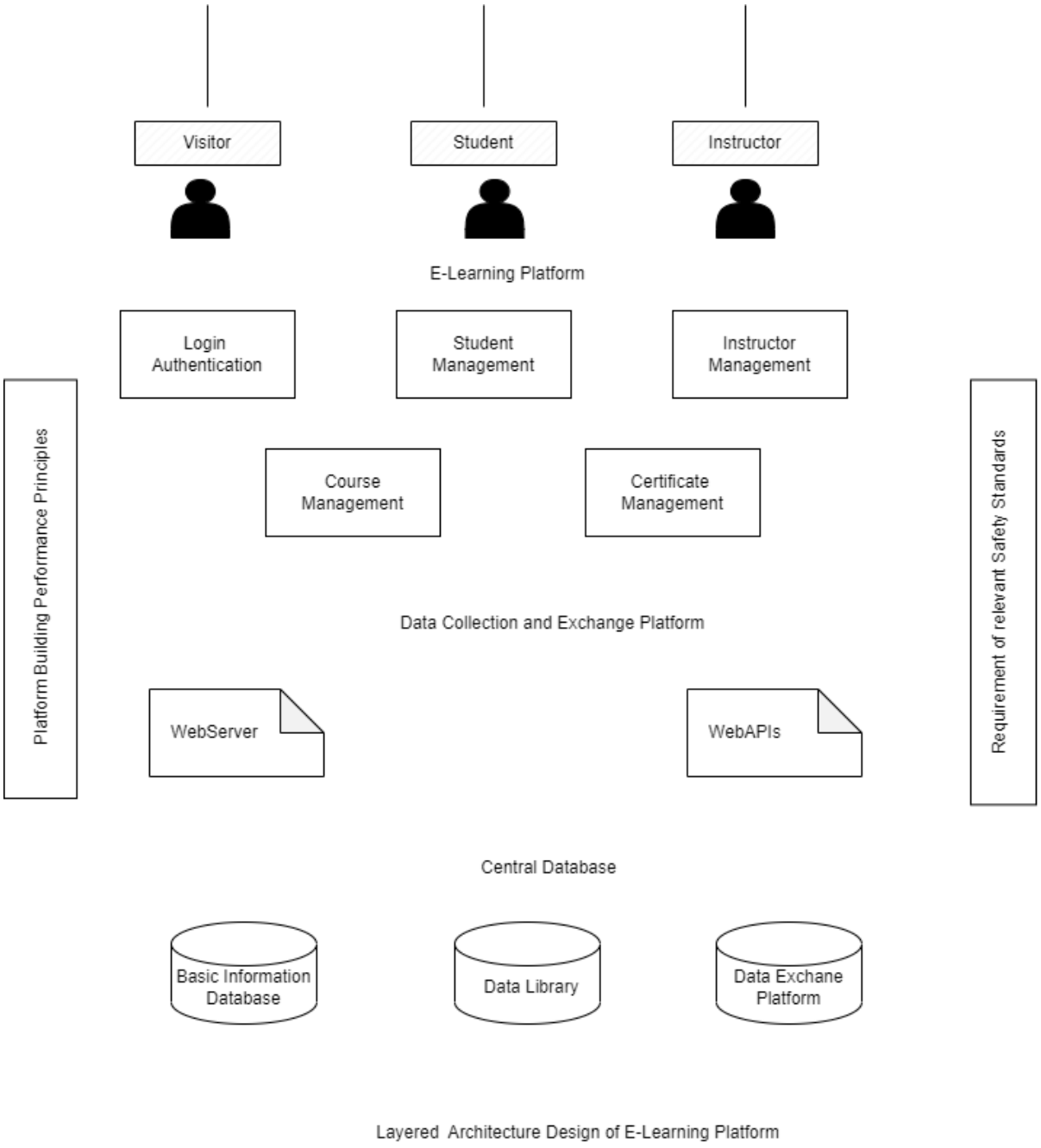

Figure 22: Architecture diagram for Learn Hub

4.2 Architecture Interface:

Architectural interfaces define the connection and communication conditions between different parts of a software system. It specifies how to exchange data and commands, encapsulates functionality, and allows components to work together while eliminating internal complexity. Interfaces are important in system design for modularity, interoperability and change management.

4.2.1 Project Screen Shots:

Below are some screenshots of our Project:

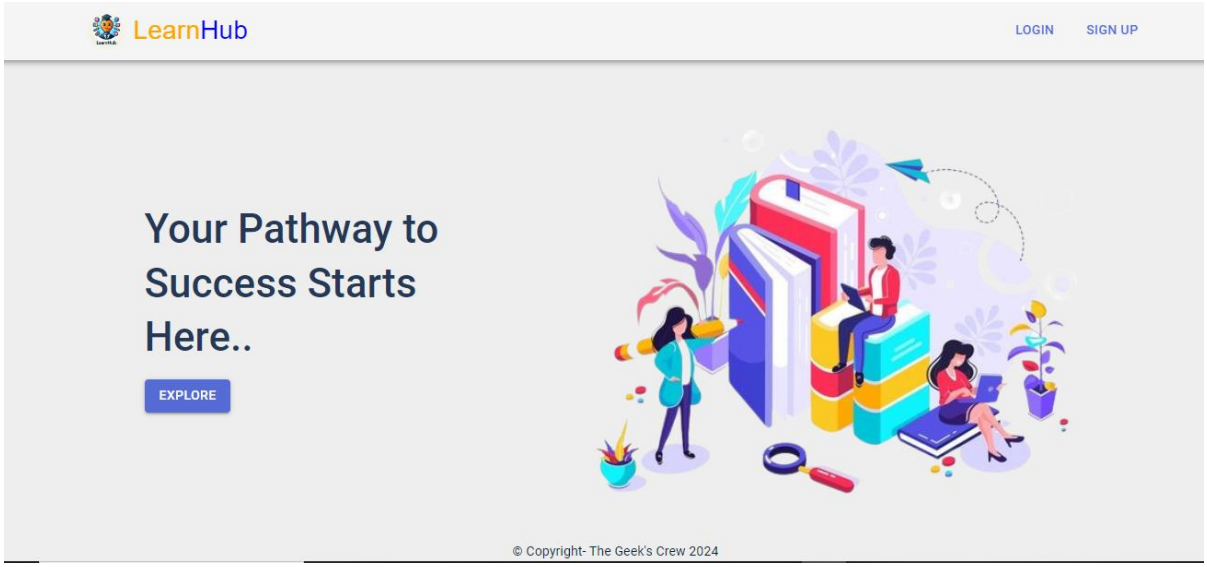

Figure 23: Home page

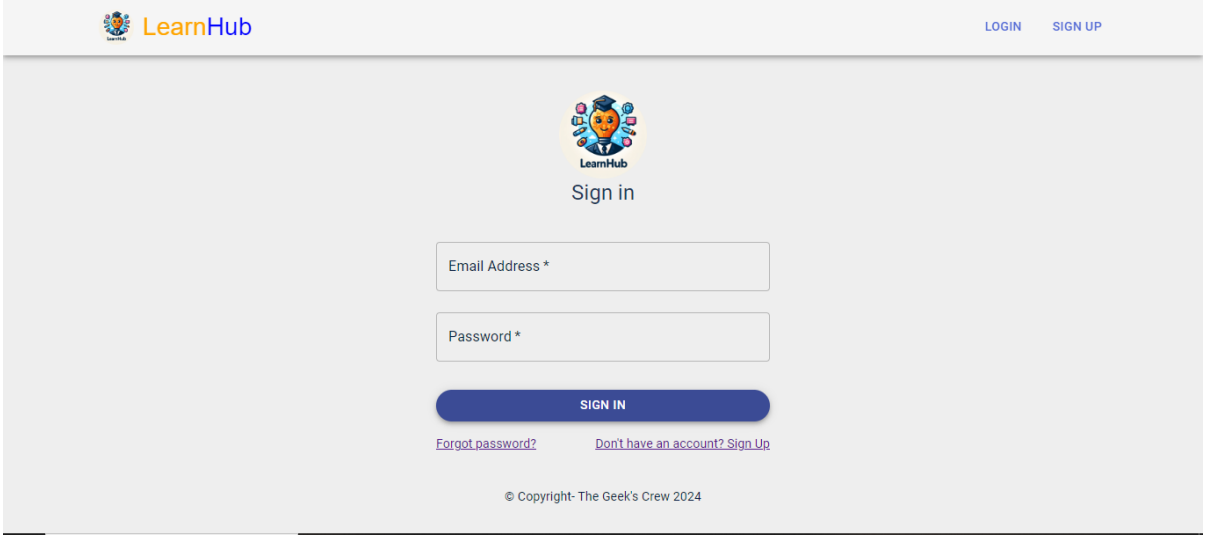

Figure 24: Sign In Page

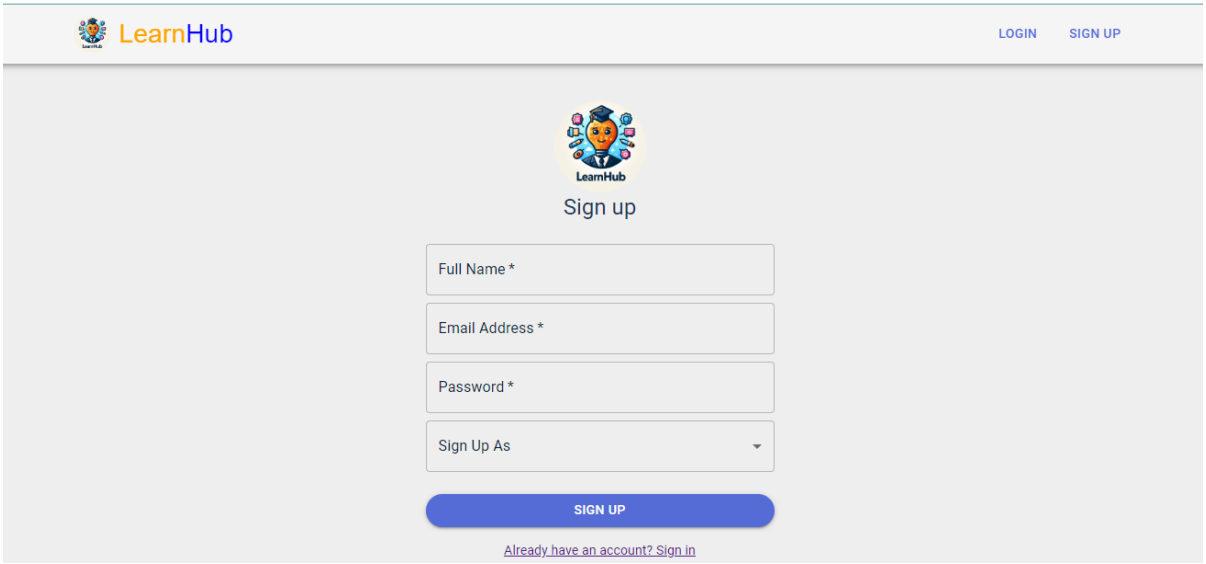

Figure 25:: Sign Up Page

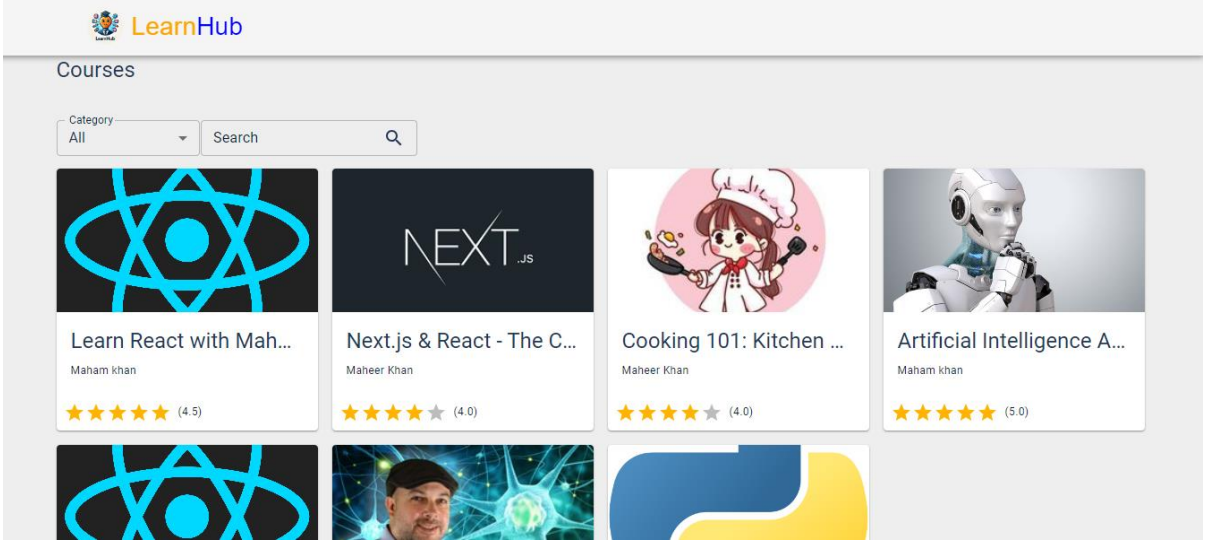

Figure 26: Courses

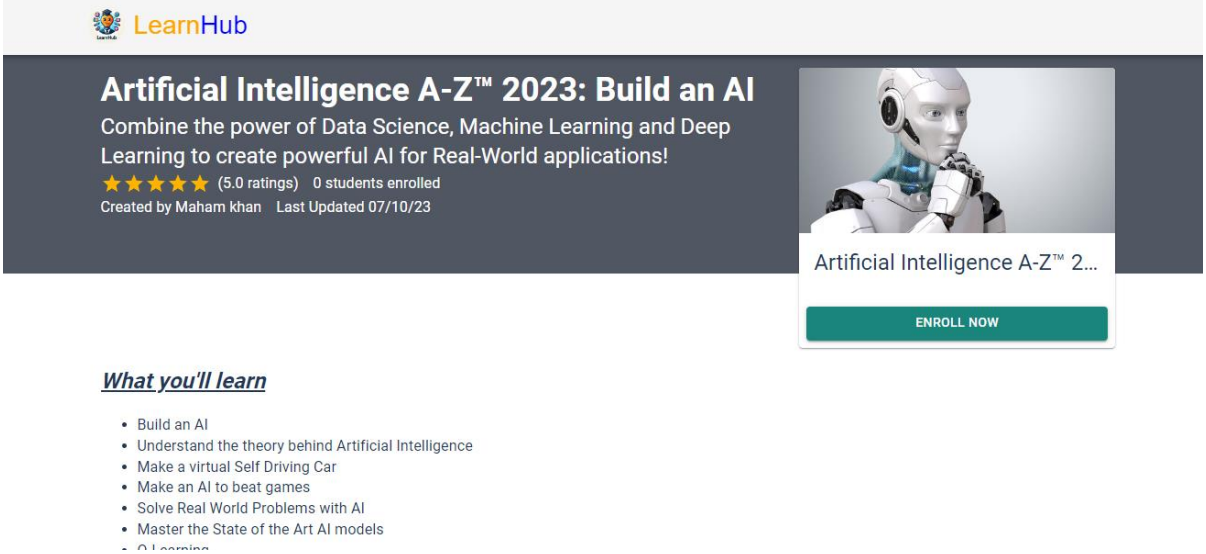

Figure 27: Courses Inner Page

Figure 28: Certificate

Chapter 5
System Testing

Introduction:

Software testing is the process of testing a software application or system to identify and fix defects, ensure that it meets requirements, and verify that it works as expected. It involves creating test scenarios, executing tests, analyzing results, and reporting any issues found. The purpose of software testing is to ensure the quality, reliability and accuracy of the software, ultimately providing confidence in its performance and readiness for release.

5.1. Software Testing Techniques:

Software testing techniques are methods used to determine and verify the quality and accuracy of software applications.

5.1.1. White-Box Testing

White box testing is a testing approach in which internal structure, design, code, and implementation is known to the tester. This kind of testing method is known as clear box testing, open box testing, primary testing and straightforward box testing. Its activity is inverse to black-box testing. The main aim of this testing is to check the quality of code, design etc.

Unit Testing:

Unit testing is a method for testing individual parts (units) of a software to ensure they work correctly and meet their intended functionality. It helps detect and fix errors early in the development process.

Modules:

1- **Sign In:**

Purpose: The Sign In module provides users with the ability to log in to their accounts on the Learn Hub.

Unit Testing: Unit testing for this module focuses on validating the authentication process, user access control, and any error handling mechanisms in place.

2- **Sign Up:**

Purpose: The Sign Up module facilitates new users in creating accounts on the Learn Hub.

Unit Testing: Unit testing for this module aims to verify user registration.

3- **Enroll Course:**

Purpose: The Enroll Course module is responsible for allowing users to enroll in courses offered on the Learn Hub.

Unit Testing: Unit testing for this module involves ensuring that users can successfully enroll in a course, that the course data is updated correctly, and that any associated notifications or alerts are triggered as expected.

4- View Progress:

Purpose: The View Progress module provides users with insights into their progress within a course.

Unit Testing: Unit testing for this module focuses on retrieving and displaying accurate progress data for users, taking into account various course completion scenarios.

5- Issue Certificate:

Purpose: The Issue Certificate module automates the process of awarding certificates to users upon course completion.

Unit Testing: Unit testing for this module should validate that certificates are generated correctly, include the student's name, instructor's name and course details, and are issued to the right individuals upon course completion.

6- Leave Course:

Purpose: The Leave Course module allows users to discontinue their enrollment in a course.

Unit Testing: Unit testing for this module includes testing the removal of a user from a course, updating their progress and related database entries, and triggering any necessary notifications.

7- Make Course:

Purpose: The Make Course module is responsible for course creation and management by instructors.

Unit Testing: Unit testing for this module should cover course creation and data validation. It should also ensure that new courses are accessible to enrolled users.

8- Set Content:

Purpose: The Set Content module allows instructors to add and manage course content, such as lessons.

Unit Testing: Unit testing for this module includes verifying the successful addition, modification, and deletion of course content.

9- Remove Course:

Purpose: The Instructor's Remove Course module allows course instructors to remove a course that they have created or manage.

Unit Testing: Unit testing for this module should focus on ensuring that instructors can successfully remove a course they own or manage. This includes verifying that the course is no longer accessible to enrolled users, associated content is correctly archived or deleted.

White Box Test Case:

SignUp:

TC1: SignUp	
Test Case ID:	UC-001
Written By:	Nimra Ikram, Nida Butt, and Hina Shabbir
Test Type:	White box testing
Product Name:	E- Learning Platform
Documented Date:	10/7/2023
Test case description:	This test case is designed to successfully sign up
Pass Criteria:	If all the credential provided are right then, The user can successfully register, log in, and access their dashboard.
Fail Criteria:	If the credentials provided are wrong or Name Length = 0, Email Length = 0, Password Length < 8, Password doesn't Contain any number then User registration fails.

Sign In:

TC1: SignIn	
Test Case ID:	UC-002
Written By:	Nimra Ikram, Nida Butt, and Hina Shabbir
Test Type:	White box testing
Product Name:	E- Learning Platform

Documented Date:	10/7/2023
Test case description:	This test case is designed to successfully sign In.
Pass Criteria:	If all the credential provided are right then, The user can successfully sign in and access their dashboard and course content.
Fail Criteria:	1- User sign-in or access to the dashboard fails. 2- Any errors or unexpected behaviors are encountered during the sign-in process or while accessing the dashboard.

5.1.2. Black Box Testing

Black box testing is also known as specification-based testing. Black box testing refers to test activities using specification-based testing methods and criteria to discover program errors based on program requirements and product specifications.
The major testing focuses:

(1) Specification-based function errors

(2) Specification-based component/system behavior errors

(3) Specification-based performance errors

(4) User-oriented usage errors

(5) Black box interface errors

5.2. Test Case Specification:

5.2.1 Test Case

Following are the Test Cases for our project (Learn Hub):

Sign Up

TC1: Sign Up	
Test Case ID:	UC-001

Written By:	Nimra Ikram, Nida Butt, and Hina Shabbir
Test Type:	Black box testing
Product Name:	E- Learning Platform
Test Item:	Web App
Documented Date:	10/7/2023
Test case description:	This test case is designed to successfully sign up
Operation procedure:	1. Go to the homepage of the Learn Hub 2. Click on the signup 3. Clicking on signup will open the signup page which allows students to sign up using their email address. 4. Credentials are then sent to the server which saves them into MongoDB 5. The Web App redirects to the email verification page. 6. After verification Web App redirects to the login page.
Pre-conditions:	Internet is required and a Web App must be running
Post-conditions:	The credentials are verified and stored in MongoDB

Login

TC2: Login	
Test Case ID:	UC-002
Written By:	Nimra Ikram, Nida Butt, and Hina Shabbir
Test Type:	Black box testing
Product Name:	Learn Hub
Test Item:	Web App, MongoDB

Documented Date:	10/7/2023
Test case description:	This test case is designed to successfully sign in
Operation procedure:	1. Go to the homepage of Learn Hub 2. Click on the login 3. Clicking on login will open the login page which allows the option to log in with an Email address. 4. The user is verified and his credentials are sent to the Web App. 5. Web App redirects to the home page which then redirects to the user's panel/dashboard.
Pre-conditions:	Internet is required, The User must have an account on E-learning Platform.
Post-conditions:	Web App redirects to the home page.

Enroll Course

TC3: Enroll Course	
Test Case ID:	UC-003
Written By:	Nimra Ikram, Nida Butt, and Hina Shabbir
Test Type:	Black box testing
Product Name:	Learn Hub
Test Item:	Web App, MongoDB
Documented Date:	10/7/2023
Test case description:	This test case is designed to successfully test course enrolment.
Operation procedure:	1. The user will go to his app page. 2. The user will select a course from the list.

	3. Web App will prompt for confirmation. 4. User will click on confirm. 5. Web App will update eligibility status of student. 6. Web App will update UI.
Pre-conditions:	Internet is required, Web App must be running and user must be logged in.
Post-conditions:	Course Enrolled.

Leave Course

TC4: Leave Course	
Test Case ID:	UC-004
Written By:	Nimra Ikram, Nida Butt, and Hina Shabbir
Test Type:	Black box testing
Product Name:	E- Learning Platform
Test Item:	Web App, MongoDB
Documented Date:	10/7/2023
Test case description:	This test case is designed to successfully test course enrolment.
Operation procedure:	1. User will search the enrolled course. 2. User will choose to unroll the course.
Pre-conditions:	Internet is required, Web App must be running and user must be logged in.
Post-conditions:	Course Unrolled.

View Progress

TC5: View Progress	
Test Case ID:	UC-005
Written By:	Nimra Ikram, Nida Butt, and Hina Shabbir
Test Type:	Black box testing
Product Name:	E- Learning Platform
Test Item:	Web App, MongoDB
Documented Date:	10/7/2023
Test case description:	This test case describes the process by which the user can view their progress in a particular course.
Operation procedure:	1. The user will log in to his account. 2. The user clicks on the course whose process he wants to see. 3. System will show the progress of the course.
Pre-conditions:	Internet is required, the Web App must be fully loaded, the user must be logged in and the vision document's status must be "accepted for presentation"
Post-conditions:	Progress will show.

Make Course

TC6: Make Course	
Test Case ID:	UC-006
Written By:	Nimra Ikram, Nida Butt, and Hina Shabbir

Test Type:	Black box testing
Product Name:	E- Learning Platform
Test Item:	Web App, MongoDB
Documented Date:	10/7/2023
Test case description:	This test case describes the process by which the user can view their progress in a particular course.
Operation procedure:	1. User will login his account. 2. User click on the course whose process he wants to see. 3. System will show the progress of the course.
Pre-conditions:	Course will create and ready for enrollment.
Post-conditions:	Course will create and ready for enrollment.

Set Content

TC7: Set Content	
Test Case ID:	UC-007
Written By:	Nimra Ikram, Nida Butt, and Hina Shabbir
Test Type:	Black box testing
Product Name:	Learn Hub
Test Item:	Web App, Auto-Generated Acceptance Letter
Documented Date:	10/7/2023
Test case description:	This test case is designed to generate acceptance letter
Operation procedure:	1. User will click on make course. 2. User will add details about the flow of the course. 3. System will display contents.

Pre-conditions:	Internet is required, Web App must be fully loaded, user must be logged in and project is approved.
Post-conditions:	List of Contents is displayed.

Remove Course

TC8: Remove Course	
Test Case ID:	UC-008
Written By:	Nimra Ikram, Nida Butt, and Hina Shabbir
Test Type:	Black box testing
Product Name:	Learn Hub
Test Item:	Web App, MongoDB
Documented Date:	10/7/2023
Test case description:	This test case describes the process by which a tutor can remove a course that he is offering.
Operation procedure:	1. The user will check the offered course. 2. Click on remove the course.
Pre-conditions:	Internet is required, the Web App must be fully loaded, the user must be logged in and the task in created.
Post-conditions:	User have no longer access on that course.

Issue Certificate

TC9: View Progress	
Test Case ID:	UC-009
Written By:	Nimra Ikram, Nida Butt, and Hina Shabbir
Test Type:	Black box testing
Product Name:	Learn Hub
Test Item:	Web App
Documented Date:	10/7/2023
Test case description:	This test case describes the process by which ELP System issues a certificate to the successful candidates/students.
Operation procedure:	1. User will complete the course. 2. System will issue certificate.
Pre-conditions:	Internet is required, Web App must be fully loaded, user must be logged in.
Post-conditions:	System will generate the certificate

Chapter 6
Future Work

6.1- Future Work

The work we did in this project presents many opportunities for future work. The following is a list of ideas that can improve upon this project and provide a guideline in this heading.

CRON Jobs

This feature would allow application to send notifications/emails/sms before the deadline of any kind.

SMS notifications

User can get alerts via sms. User will first have to verify their number to have access to this functionality.

In-App notifications

This feature will enhance user experience by getting push notifications in Web App.

Communication:

This feature will allow enrolled students to communicate with each other and their Instructor as well.

PWA (Progressive Web App)

We have built this app responsive that it can even run fine on mobile devices. Next work is to add PWA (Progressive Web App) functionality so that it will run as app in mobile devices.

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