INSTITUTE FOR ADVANCED COMPUTING AND SOFTWARE DEVELOPMENT, AKURDI, PUNE

"Skill Forge"

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Submitted By:

Group No: 81

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Project Guide

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Centre Coordinator

ABSTRACT

The rise of digital learning has transformed the traditional educational landscape, necessitating the development of smart, interactive, and scalable course delivery platforms. This project, **Skill Forge**, is a web-based application designed to connect instructors and students in a streamlined environment that enables effective course creation, management, and consumption. The system allows instructors to register, build detailed course structures with content such as videos, PDFs, and descriptions, while students can explore available courses, purchase them, and engage in self-paced learning.

Built using Spring Boot (Java) for the backend and React.js for the frontend, **SkillForge** offers a clean separation of concerns and ensures responsiveness across devices. The application uses MySQL as its relational database, JWT for secure user authentication, and Razorpay as a payment gateway for safe transactions. Additional features include video streaming, instructor-wise content listing, student purchase tracking, and role-based access management. The platform is both scalable and user-friendly, supporting future enhancements and additional integrations.

This system aims to bridge the gap between learners and educators by providing a centralized, efficient, and intuitive interface for delivering and managing knowledge online. It contributes to the digital education movement by supporting accessible, affordable, and quality learning experiences.

ACKNOWLEDGEMENT

I take this occasion to thank God, almighty for blessing us with his grace and taking our endeavor to a successful culmination. I extend my heartfelt thanks to our esteemed guide, **Mrs. Punam S. Salunkhe** and **Mr. Jiva M. Farkade** for providing me with the right guidance and advice at the crucial juncture and showing me the right way. I sincerely thank our respected Centre Co Ordinator, Mr. Prashant Deshpande, for allowing us to use the available facilities. I would also like to thank the other faculty members at this occasion. Last but not least, I would like to thank my friends and family for the support and encouragement they have given me during our work.

Rahul Gupta (250241220153)

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1. INTRODUCTION

In today's rapidly evolving digital era, online learning platforms have gained significant popularity due to their accessibility, flexibility, and ability to cater to a diverse set of learners. A Course Management System (CMS) is a comprehensive web-based application designed to simplify the creation, delivery, management, and tracking of educational content. These systems empower instructors to upload and organize course materials efficiently while allowing students to browse, purchase, and engage with courses at their convenience. The platform aims to streamline the educational process by bridging the gap between educators and learners in a centralized, digital environment.

This project, titled **"Skill Forge"**, is developed using a full-stack approach with Spring Boot for the backend and React.js for the frontend. The system facilitates essential functionalities such as instructor registration, course uploading, student enrollment, secure video streaming, and structured content access. Key technologies like MySQL for database management, JWT for user authentication, and Razorpay for handling payments have been integrated to ensure a seamless and secure user experience. The system also emphasizes modularity and scalability to accommodate future expansion and diverse educational needs.

Overall, this Skill Forge-Course Management System serves as a robust foundation for online learning initiatives. By providing an intuitive and reliable platform for both instructors and students, it contributes meaningfully to the broader vision of digital education.

Roles and Responsibilities:

1. Instructor Role

The Instructor is one of the key actors in the **Skill Forge** platform, responsible for providing quality educational content to students. The following are the core responsibilities and functionalities provided to an Instructor:

· Instructor can register and log in securely using their credentials.

· Instructor can create their profile by submitting essential information like name, email, expertise, and bio.

· Instructor can upload new courses, including details like course title, duration, description, category, and price.

· Instructor can upload content (video lectures, PDFs, or text notes) for each course.

· Instructor can view a list of all their uploaded courses with the option to manage or edit them.

· Instructor can also view the list of students who have purchased/enrolled in any of their courses.

· Instructors cannot view or manage other instructors' data or students from other courses.

2.Student Role：

The Student is the primary consumer of the educational content available on the Skill Forge platform. Their responsibilities and functionalities include:

· Student can register and log in with secure credentials using JWT authentication.

· Student can browse all available courses from the homepage.

· Student can view course details, including title, description, instructor name, price, and duration.

· Student can purchase a course via integrated Razorpay payment gateway.

· After successful purchase, the student can stream video lectures and access downloadable materials uploaded by the instructor.

· Student can view all purchased courses on their personal dashboard.

· Students cannot upload or manage courses, and cannot view other students' data.

1.1 Purpose

The purpose of the **Skill Forge** platform is to create a centralized and user-friendly online learning environment that connects instructors with students seeking to enhance their skills. It aims to bridge the gap between knowledge providers and knowledge seekers by offering a secure, efficient, and interactive platform for course creation, management, and consumption.

For instructors, Skill Forge provides a structured way to create, upload, and manage courses while tracking enrolled students. For students, it delivers a seamless experience to browse, purchase, and access courses from anywhere, at any time. By integrating secure authentication, payment processing, and multimedia content delivery, the platform ensures both convenience and trust for all users.

The system is designed to support scalable growth — accommodating a wide variety of subjects and learners — while maintaining a high standard of performance, security, and usability. Ultimately, the purpose of Skill Forge is to empower continuous learning and skill development in a digital-first, self-paced educational ecosystem.

1.2 Scope

The scope of **Skill Forge** encompasses the complete life cycle of online learning - from course creation by instructors to course consumption by students. The platform is designed to support two main user roles: Instructors and Students, each with distinct functionalities and permissions.

For Instructors, the scope includes secure registration and login, profile management, course creation, adding multimedia content, viewing enrolled students, and tracking course performance. For Students, the scope covers account creation, browsing and

searching for courses, purchasing courses via secure payment gateways, accessing purchased content, and managing personal profiles.

The system integrates key backend and frontend technologies - such as React.js for a responsive user interface and Spring Boot for backend services - along with a MySQL database for secure and reliable data management. Payment transactions are handled through secure gateways to ensure data protection and user trust.

Skill Forge will operate entirely online, accessible through modern web browsers, and will be scalable to support a growing number of users and courses. The platform will not include offline course delivery or live-streaming features in its initial release but can be extended to incorporate them in future versions.

1.3 Objective of Skill Forge

The primary objective of **Skill Forge** is to provide a secure, scalable, and user-friendly e-learning platform that connects instructors and students in an efficient digital environment. The platform is designed to achieve the following goals:

· Facilitate Instructor Empowerment – Enable instructors to easily register, create courses, upload learning materials, and manage enrolled students.

· Enhance Student Learning Experience – Allow students to explore courses, purchase them through secure payment systems, and access learning content anytime, anywhere.

· Ensure Secure User Management – Implement role-based access control to safeguard sensitive data and provide distinct permissions for instructors and students.

· Streamline Course & Content Management – Provide simple tools for adding, updating, and organizing multimedia content for effective learning delivery.

· Support Reliable Transactions – Integrate secure payment gateways to handle purchases and maintain accurate transaction history.

· Maintain System Scalability & Performance – Design the system architecture to handle increasing numbers of users and courses without performance degradation.

1.4 Functionalities Provided by Skill Forge

Skill Forge offers a wide range of functionalities to support seamless interaction between instructors and students while ensuring efficient platform management.

1. Instructor Functionalities

· Registration & Login – Secure sign-up and authentication process.

· Profile Management – View and update personal and professional details.

· Course Creation – Add new courses with titles, descriptions, and pricing.

· Content Management – Upload and manage video lectures, PDFs, quizzes, and assignments.

· Student Overview – View a list of students who have purchased their courses.

· Course Updates – Edit course details, update content, and remove outdated materials.

· Earnings Overview – Track income generated from course sales.

2. Student Functionalities

· Registration & Login – Create a student account and log in securely.

· Course Browsing – Search, filter, and view course details.

· Course Purchase – Buy courses using secure online payment gateways.

· Content Access – Watch videos, download resources, and attempt quizzes after purchase.

· Progress Tracking – Monitor completion status of enrolled courses.

· Profile Management – Update personal details and view purchase history.

3. Common Functionalities (Both Roles)

· Role-Based Access Control – Permissions vary based on user type (instructor/student).

· Secure Authentication & Authorization – Ensures account protection using encrypted credentials.

· Notifications – Receive updates for new courses, purchases, or profile changes.

· Support System – Raise queries or request assistance via a helpdesk or support ticket system.

4. System Functionalities

· Database Management – Store and manage all user, course, and transaction data.

· Payment Integration – Secure handling of transactions through trusted payment gateways.

· Scalability – System capable of handling a growing number of users and courses without performance loss.

· Data Security – Use encryption and secure protocols to protect sensitive information.

2. SOFTWARE REQUIREMENT SPECIFICATION

The functional requirements for **Skill Forge** outline the specific features and capabilities that the system must provide to meet the needs of both instructors and students. These requirements are essential for guiding the development process and ensuring that the final platform aligns with the objectives of creating a secure, interactive, and user-friendly online learning environment.

2.1 Functional Requirements for Skill Forge

1. User Management

· User Registration:

The system shall allow new users (students or instructors) to create an account by providing personal details such as name, email, password, and role selection.

· User Authentication:

The system shall authenticate users during login using their registered email and password, secured through encryption.

· Role-Based Access Control:

The system shall support role-based access, where different users (Admin, Instructor, Student) have specific permissions.

· Profile Management:

Users shall be able to view and update their profiles, including personal details, profile picture, bio, and password.

2. Course Management

· Course Creation (Instructor):

The system shall allow instructors to create new courses by providing details such as course title, description, category, price, and media content (videos, PDFs, quizzes).

· Course Editing:

The system shall allow instructors to update course details or remove outdated content.

· Course Listing (Student):

Students shall be able to browse available courses by categories, filters, or search keywords.

· Course Access:
The system shall grant students lifetime or defined-period access to purchased courses.

3. Enrollment & Learning

· Course Purchase:
Students shall be able to purchase courses through a secure online payment gateway.

· Content Access Control:
Only enrolled students shall have access to full course materials, while others can view only previews.

· Progress Tracking:
The system shall track students' progress through lessons and quizzes.

· Quizzes & Assignments:
Students shall be able to attempt quizzes and submit assignments as part of the learning process.

4. Payment & Transaction Management

· Payment Gateway Integration:
The system shall integrate with a secure payment gateway (e.g., Razorpay/Stripe) to handle transactions.

· Multiple Payment Methods:
The system shall support credit/debit cards, UPI, and wallet payments.

· Invoice Generation:
The system shall automatically generate invoices for completed purchases, available for download.

· Earnings Tracking (Instructor):
The system shall provide instructors with a dashboard showing total earnings and payout history.

5. Communication & Support

· Notifications:

The system shall notify users about course updates, purchases, and important announcements.

· Messaging/Discussion Forums:

The system shall allow communication between students and instructors for queries and feedback.

· Support Requests:

Users shall be able to raise support tickets for technical or course-related issues.

6. Reporting and Analytics

· Instructor Reports:
The system shall generate reports for instructors on course sales, student engagement, and quiz results.

· Student Reports:
The system shall provide students with performance analytics, including quiz scores and completion rates.

· Admin Reports:
The system shall provide admins with analytics on total sales, platform revenue, active users, and course performance.

7. Security

· Data Encryption:
The system shall encrypt sensitive information, such as passwords, payment details, and personal data.

· Authentication & Authorization:
The system shall implement secure login mechanisms and ensure access control based on roles.

· Secure File Handling:
Course materials shall be stored securely to prevent unauthorized access or piracy.

2.2 Non-Functional Requirements for Skill Forge

1. Performance Requirements

· The system shall handle at least 500 concurrent users without degradation in response time.

· Page load time shall not exceed 3 seconds under normal operating conditions.

· The platform shall ensure smooth video streaming for course content at a minimum resolution of 720p, with adaptive quality based on internet speed.

· Database queries shall be optimized to respond within 2 seconds for standard requests.

2. Scalability Requirements

· The system shall be able to scale horizontally by adding additional servers when user demand increases.

· The architecture shall support future integration with mobile applications and third-party tools.

· The database shall be designed to accommodate millions of user records and thousands of courses without performance issues.

· The cloud-based infrastructure shall allow easy resource expansion (CPU, memory, storage) based on platform growth.

3. Usability Requirements

· The system shall have a user-friendly interface with intuitive navigation for all user roles (Admin, Instructor, Student).

· The design shall be responsive, ensuring accessibility across desktops, tablets, and smartphones.

· The platform shall support multi-language capabilities for global reach in future updates.

· The course player shall include progress tracking, bookmarking, and playback controls for better learning experiences.

4. Reliability Requirements

· The system shall maintain 99.9% uptime excluding scheduled maintenance.

· The platform shall automatically back up all data daily and store it securely for at least 30 days.

· The system shall be resilient to failures, with automatic recovery in case of server downtime.

· Payment processing shall be fully reliable, ensuring no loss of transaction data during network interruptions.

· Other Requirements:

Hardware and Network Interfaces:

Back-end Server Configuration:

· Intel Xeon Silver Processor (or equivalent cloud-based CPU)

· 16 GB DDR4 RAM

· 500 GB SSD Storage

· Gigabit Ethernet Network Interface Card (NIC)

· Cloud Hosting Environment (e.g., AWS, Azure, or similar)

Front-end Client Configuration:

· AMD Ryzen 5 Processor (or Intel Core i5 equivalent)

· 8 GB DDR4 RAM

· 256 GB SSD Storage

· 104 Keys Keyboard

· Optical Mouse with Pad

· Stable Broadband Internet Connection (Minimum 10 Mbps)

Software Interfaces:

Back-end Server Configuration:

· Java EE with Spring Boot Framework

· Spring Data JPA for database interaction

· Spring Security for authentication and authorization

· MySQL Database Management System

· Razorpay API for payment processing

· STS 4.x (Spring Tool Suite) for development

Front-end Client Configuration:

· ReactJS with Redux for state management

· HTML5, CSS3, and JavaScript (ES6) for UI development

· Bootstrap and Material UI for responsive design

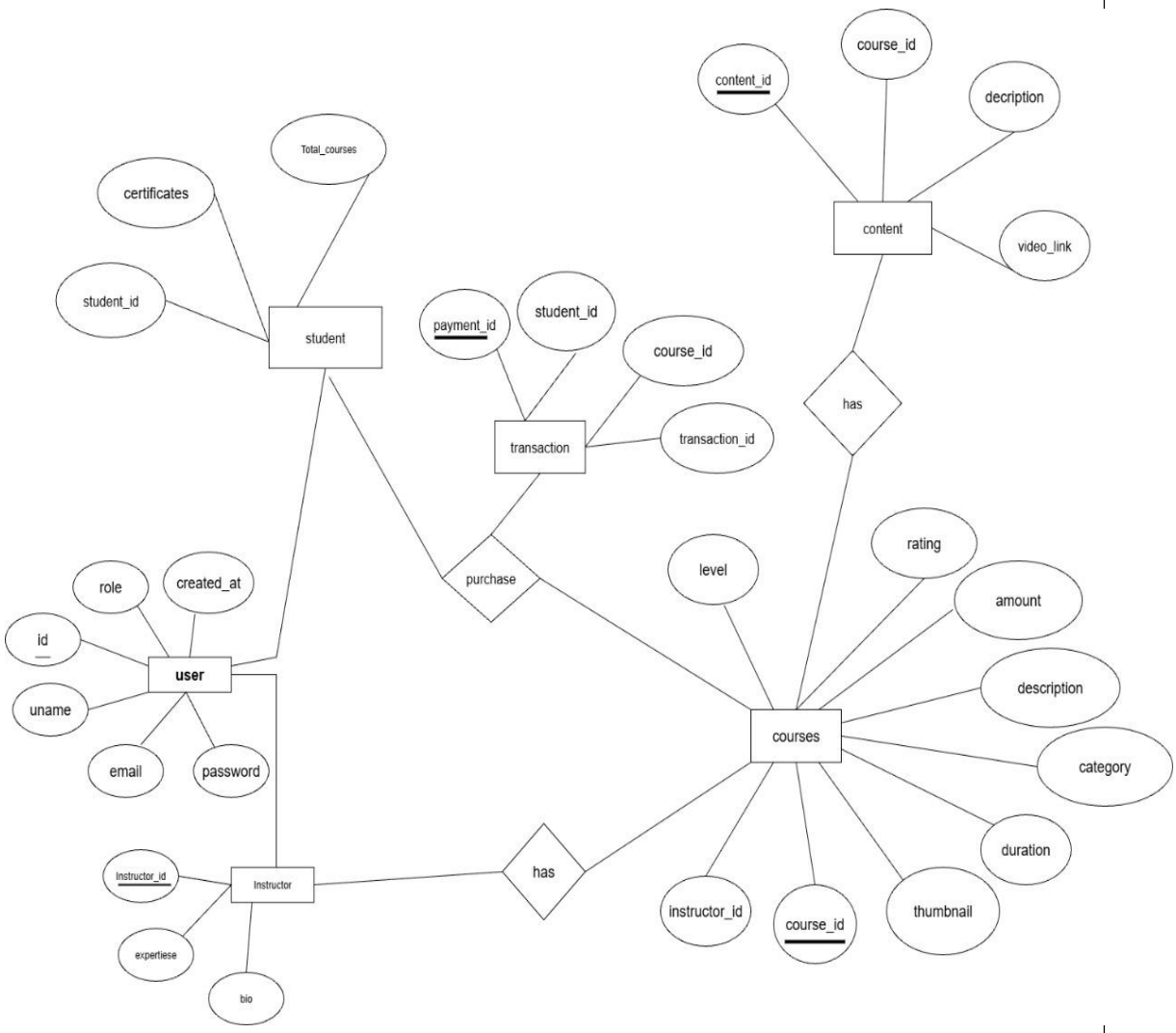
· VS Code as the primary development environment

Software configuration for front-end Services:

- ReactJS 18.2.0
- HTML5, CSS3, JS (ES6)
- Bootstrap 5.3.3
- VS Code 1.90.0

3. DIAGRAMS

3.1 Entity Relationship Diagram:



3.2 Use Case Diagram:

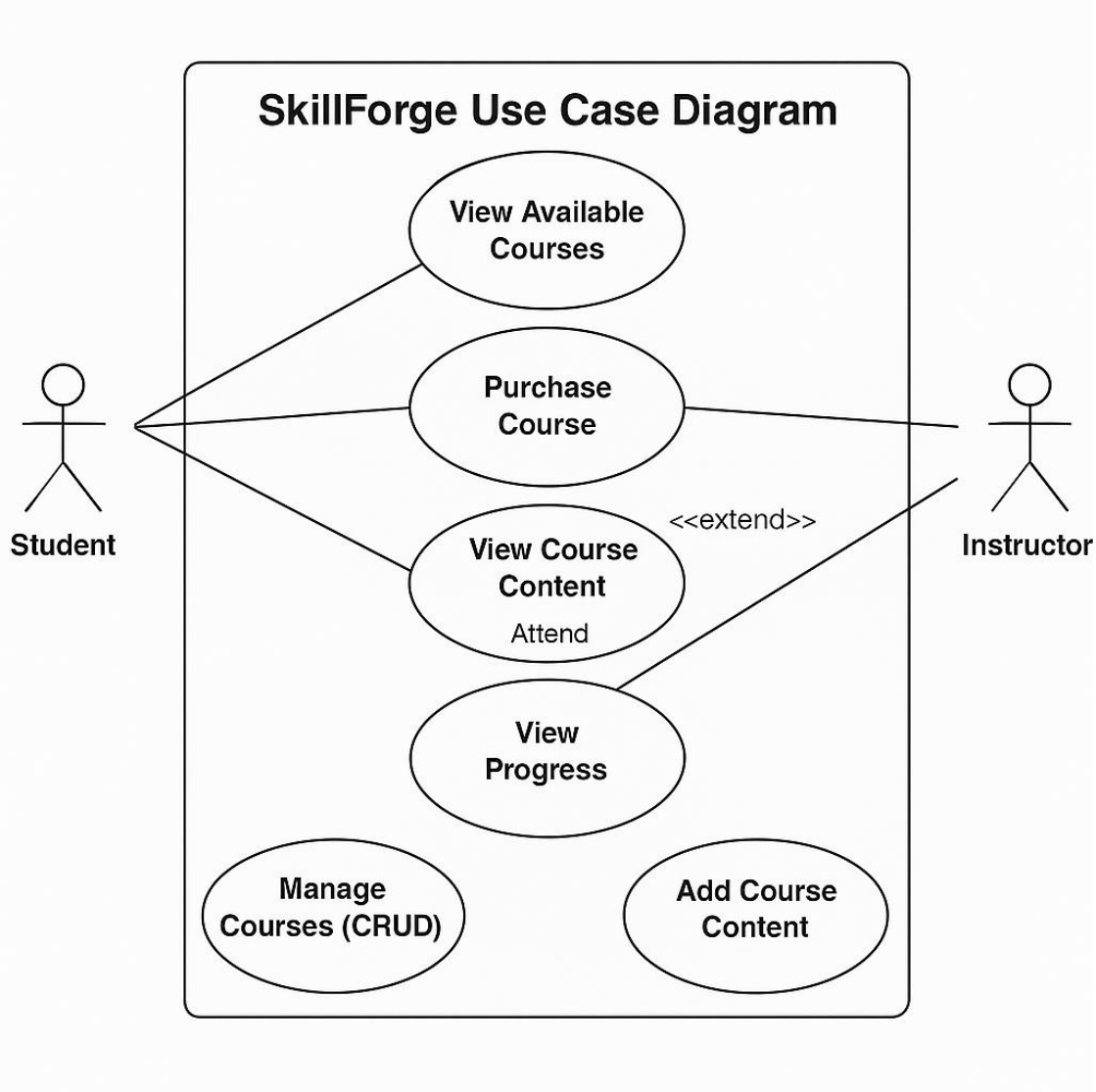
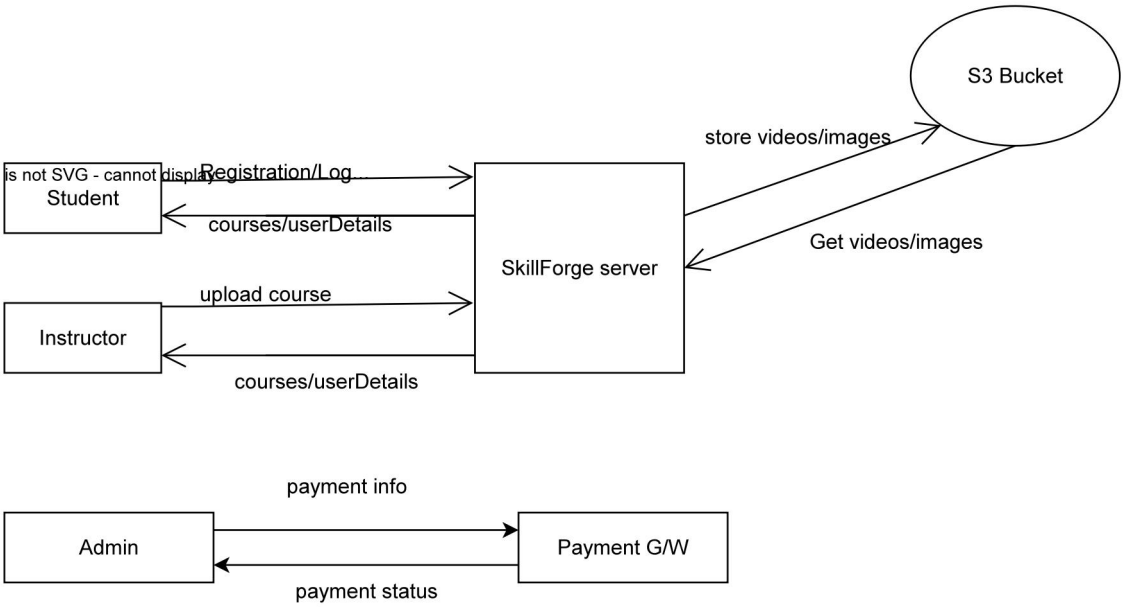


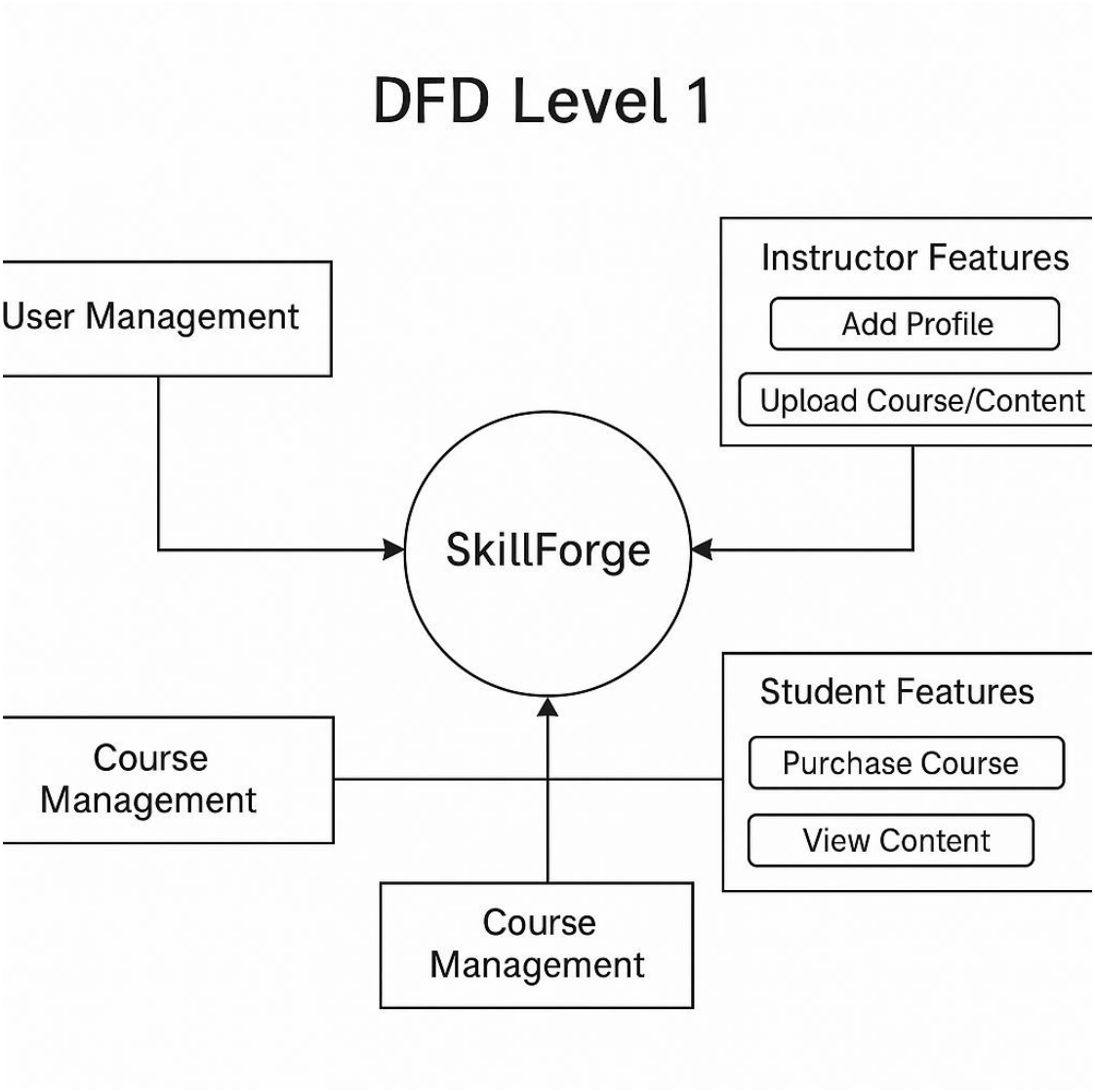
Fig. Use Case Diagram for Skill Forge

3.3 Data Flow Diagram:

DFD Level 0:

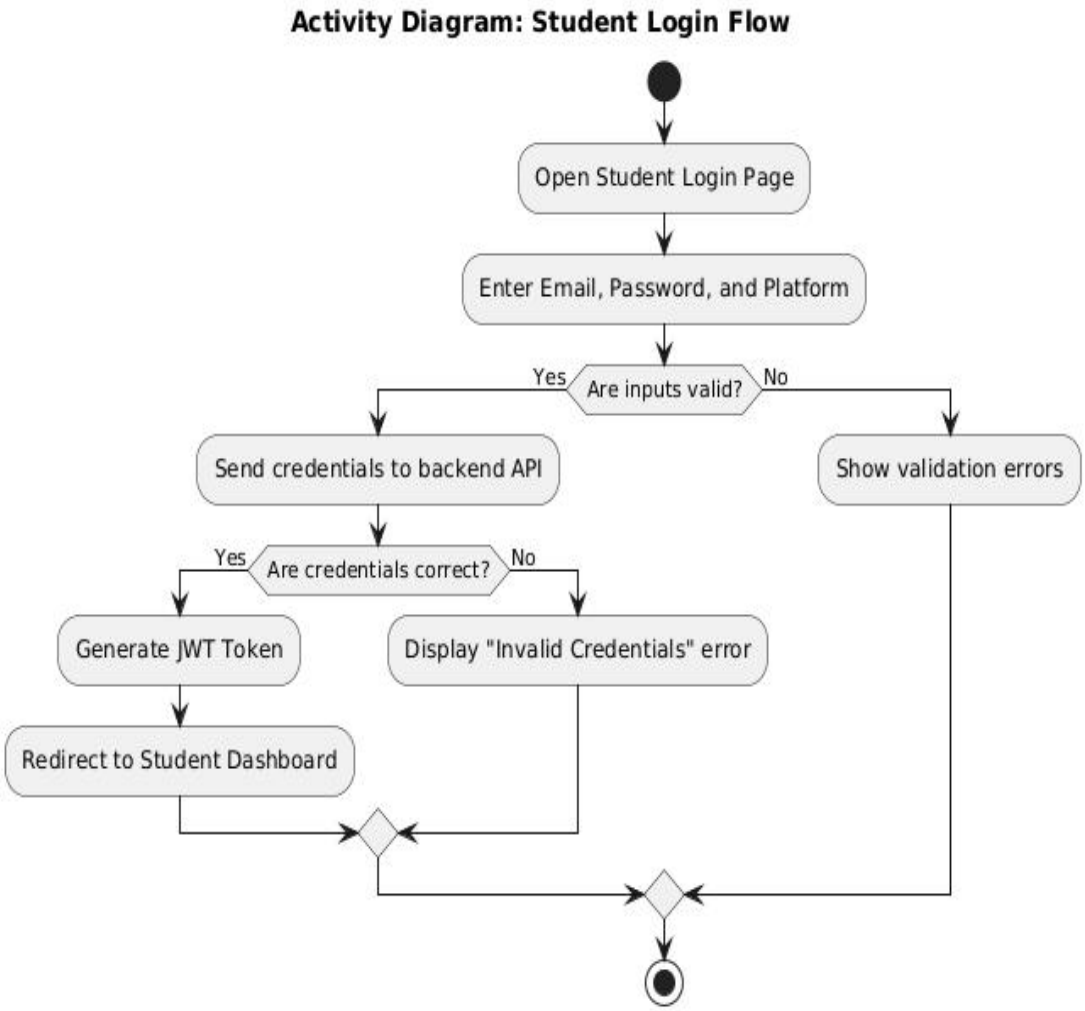


DFD level 1 :

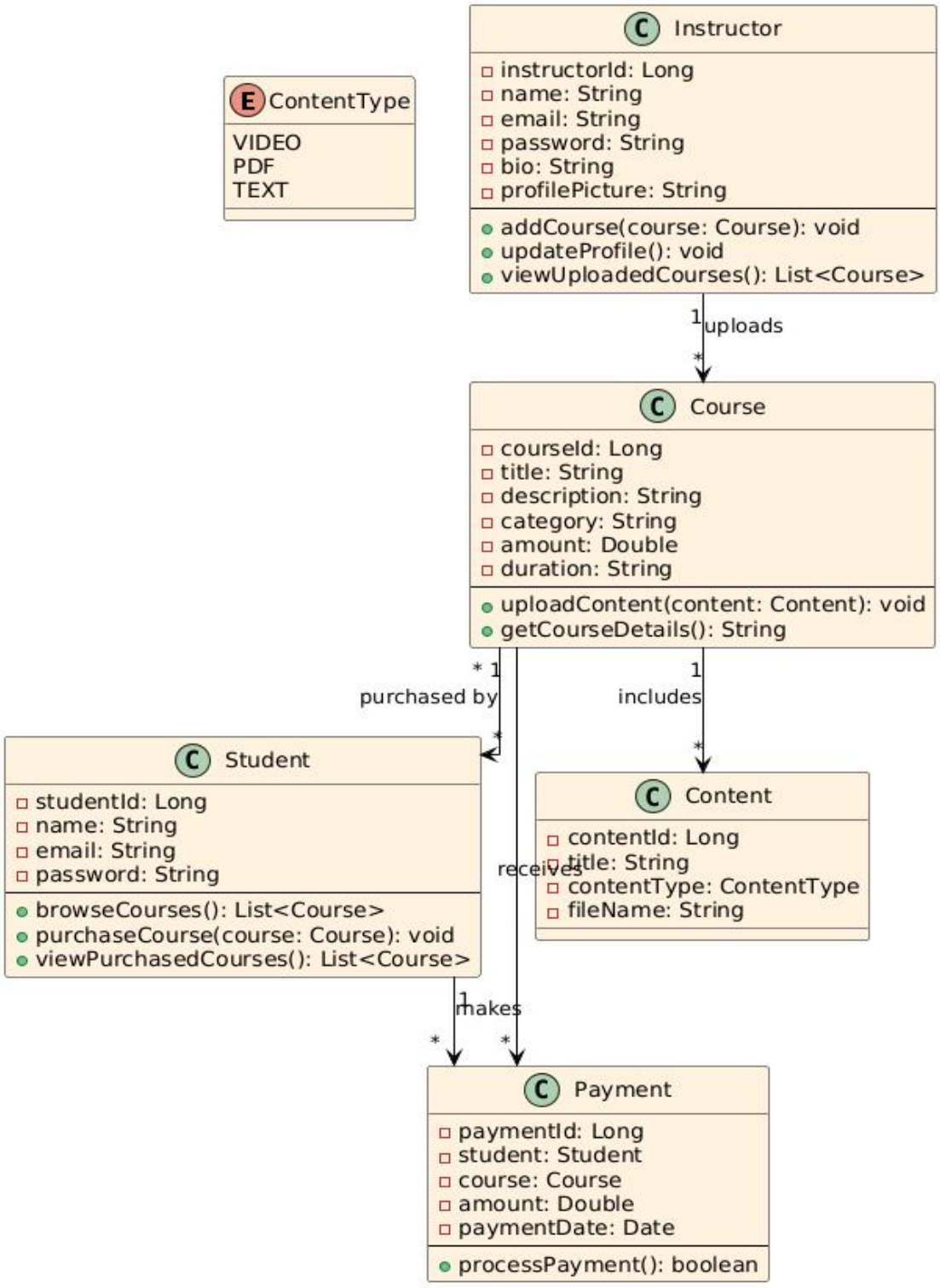

DFD Level 1
User Management
Instructor Features
Add Profile
Upload Course/Content
SkillForge
Student Features
Purchase Course
View Content
Course Management
Course Management

3.4 Activity Diagram :

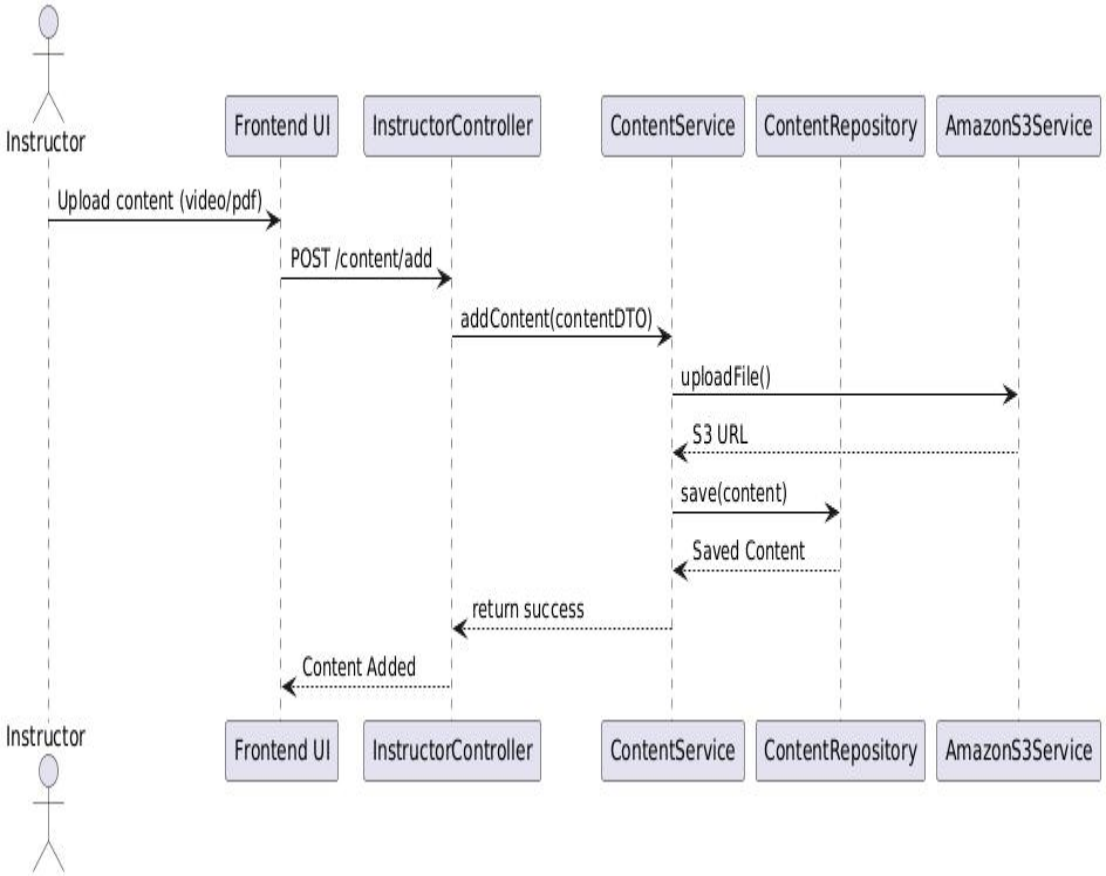
1. Login Activity Diagram

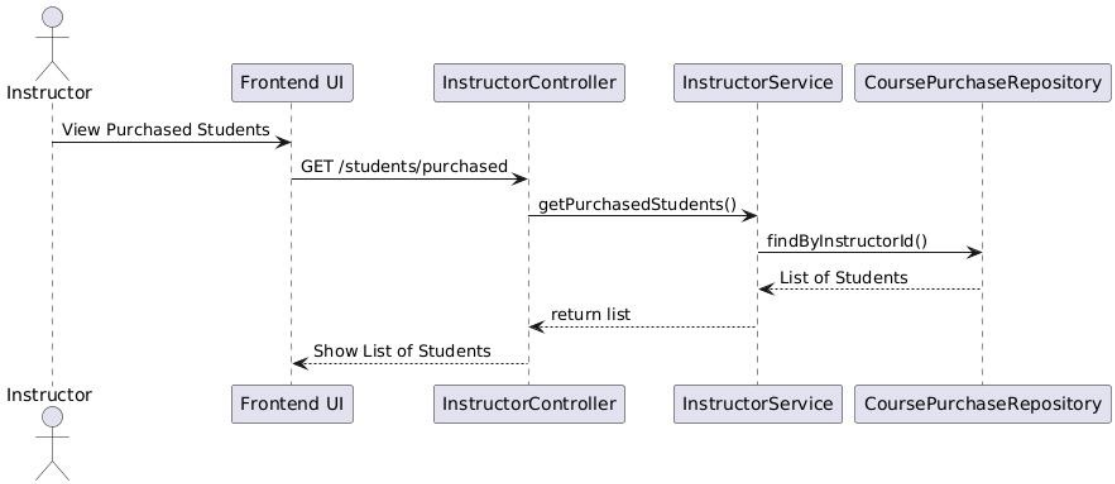


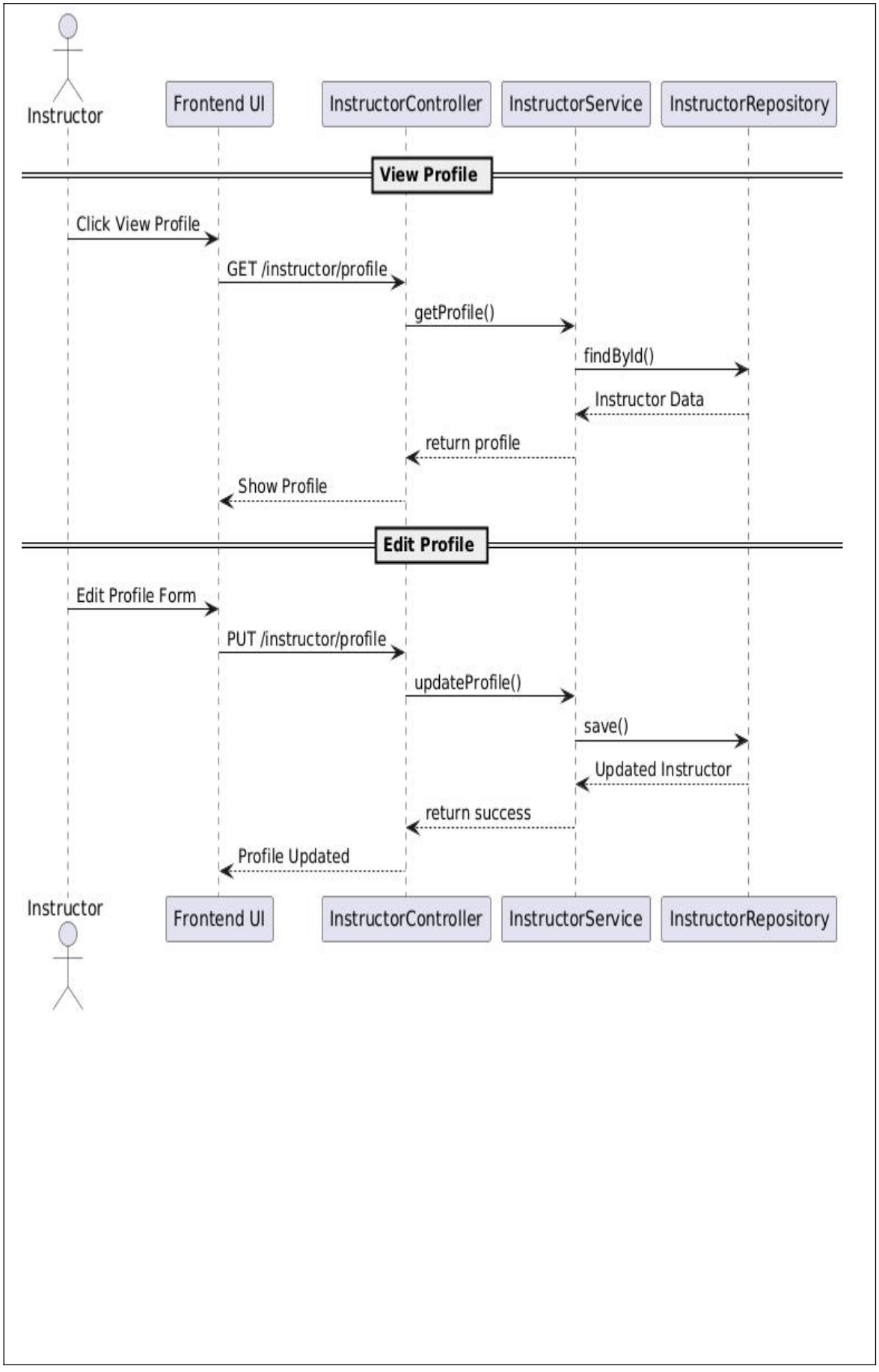
3.5 Class Diagram:

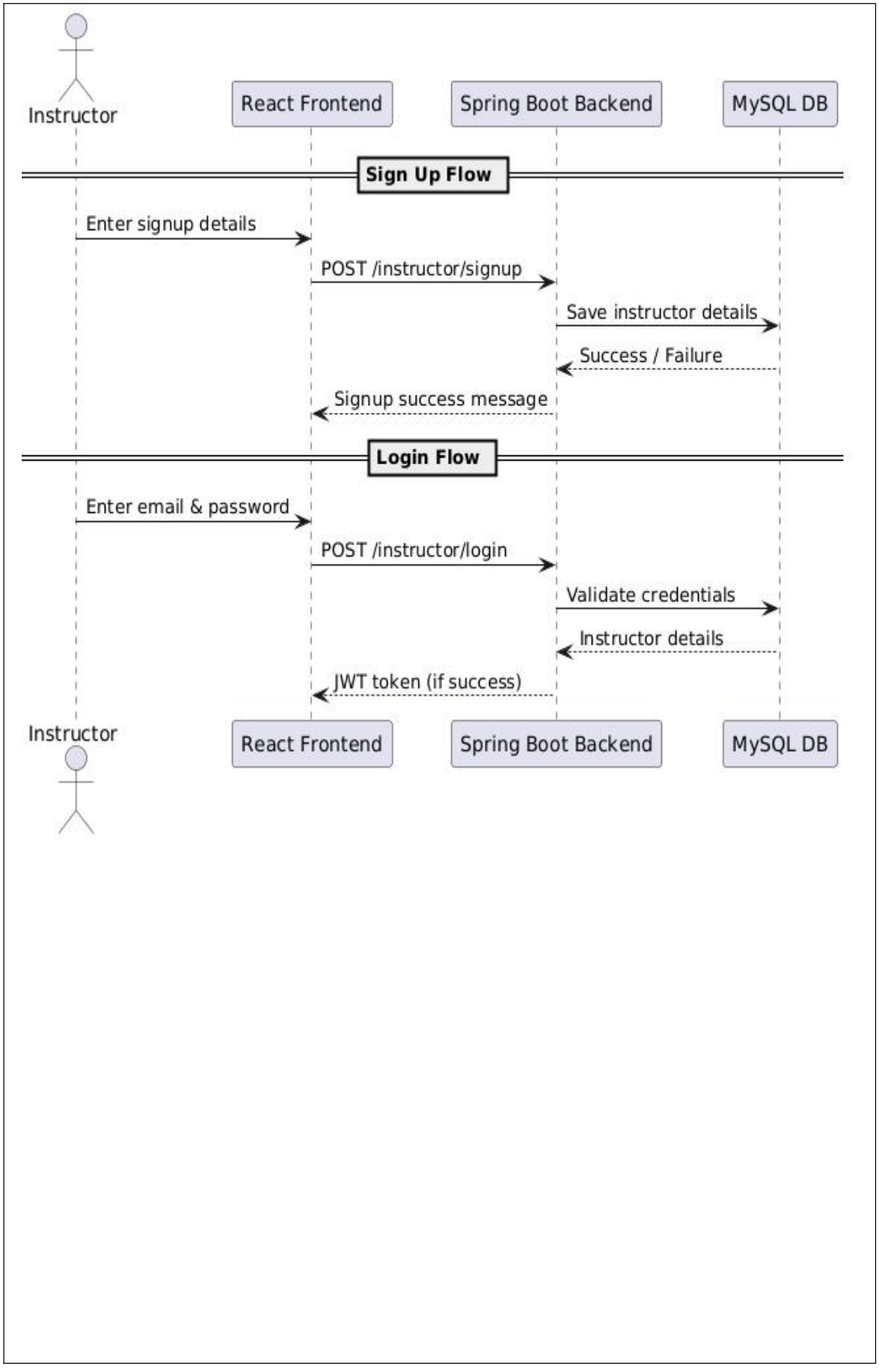


3.7 Sequence Diagram



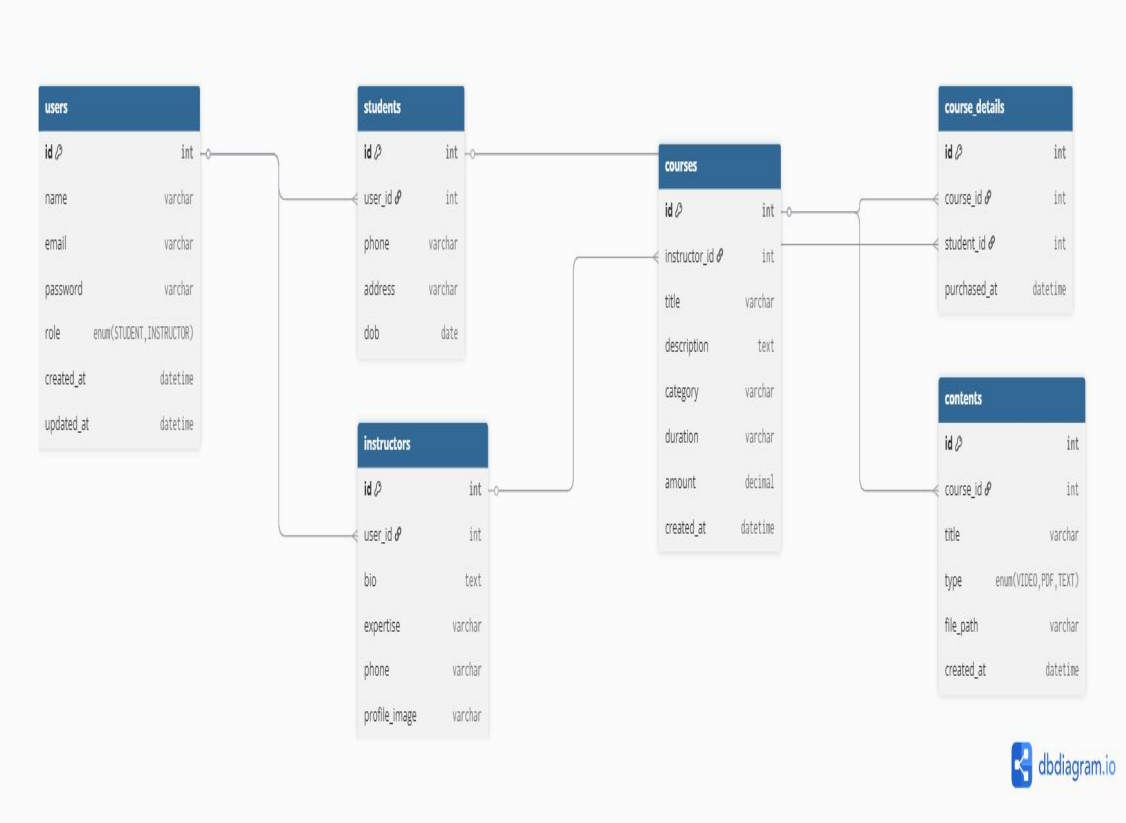



Instructor
Frontend UI
InstructorController
InstructorService
InstructorRepository
View Profile
Click View Profile
GET /instructor/profile
getProfile()
findById()
Instructor Data
return profile
Show Profile
Edit Profile
Edit Profile Form
PUT /instructor/profile
updateProfile()
save()
Updated Instructor
return success
Profile Updated
Instructor
Frontend UI
InstructorController
InstructorService
InstructorRepository


Instructor
React Frontend
Spring Boot Backend
MySQL DB
Sign Up Flow
Enter signup details
POST /instructor/signup
Save instructor details
Success / Failure
Signup success message
Login Flow
Enter email & password
POST /instructor/login
Validate credentials
Instructor details
JWT token (if success)
Instructor
React Frontend
Spring Boot Backend
MySQL DB

4. DATABASE DESIGN

4.1 Design:



4.2 Tables:

The following table structures depict the database design.

```
mysql> desc users;
+----------------+-----------------------------------------+------+-----+---------+----------------+
| Field          | Type                                    | Null | Key | Default | Extra          |
+----------------+-----------------------------------------+------+-----+---------+----------------+
| id             | bigint                                  | NO   | PRI | NULL    | auto_increment |
| created_on     | date                                    | YES  |     | NULL    |                |
| last_updated   | datetime(6)                             | YES  |     | NULL    |                |
| card_no        | varchar(14)                             | YES  | UNI | NULL    |                |
| card_created_on | date                                   | YES  |     | NULL    |                |
| location       | varchar(30)                             | YES  |     | NULL    |                |
| dob            | date                                    | YES  |     | NULL    |                |
| email          | varchar(30)                             | YES  | UNI | NULL    |                |
| first_name     | varchar(20)                             | YES  |     | NULL    |                |
| image          | longblob                                | YES  |     | NULL    |                |
| last_name      | varchar(30)                             | YES  |     | NULL    |                |
| password       | varchar(500)                            | NO   |     | NULL    |                |
| user_role      | enum('ADMIN','CUSTOMER','DELIVERY_PERSON') | YES |     | NULL    |                |
| address_id     | bigint                                  | YES  | UNI | NULL    |                |
| created_at     | date                                    | YES  |     | NULL    |                |
| role           | enum('INSTRUCTOR','STUDENT')            | YES  |     | NULL    |                |
| user_name      | varchar(50)                             | NO   |     | NULL    |                |
+----------------+-----------------------------------------+------+-----+---------+----------------+
```

Table 1: users

```
mysql> desc instructor;
+-----------+--------------+------+-----+---------+-------+
| Field     | Type         | Null | Key | Default | Extra |
+-----------+--------------+------+-----+---------+-------+
| user_id   | bigint       | NO   | PRI | NULL    |       |
| bio       | varchar(500) | YES  |     | NULL    |       |
| expertise | varchar(255) | YES  |     | NULL    |       |
+-----------+--------------+------+-----+---------+-------+
```

Table 2: Instructor

```
mysql> desc student;
+---------------+--------------+------+-----+---------+-------+
| Field         | Type         | Null | Key | Default | Extra |
+---------------+--------------+------+-----+---------+-------+
| student_id    | bigint       | NO   | PRI | NULL    |       |
| certification | varchar(255) | YES  |     | NULL    |       |
+---------------+--------------+------+-----+---------+-------+
```

Table 3: student

```
mysql> desc courses;
+-------------+-----------------------------------------------+------+-----+---------+----------------+
| Field       | Type                                          | Null | Key | Default | Extra          |
+-------------+-----------------------------------------------+------+-----+---------+----------------+
| course_id   | bigint                                        | NO   | PRI | NULL    | auto_increment |
| amount      | double                                        | NO   |     | NULL    |                |
| category    | enum('ANALYST','DEVLOPER','OTHER','TESTER')   | YES  |     | NULL    |                |
| description | varchar(255)                                  | YES  |     | NULL    |                |
| duration    | float                                         | YES  |     | NULL    |                |
| tittle      | varchar(100)                                  | NO   |     | NULL    |                |
| instructor_id | bigint                                      | NO   | MUL | NULL    |                |
+-------------+-----------------------------------------------+------+-----+---------+----------------+
```

Table 4: courses

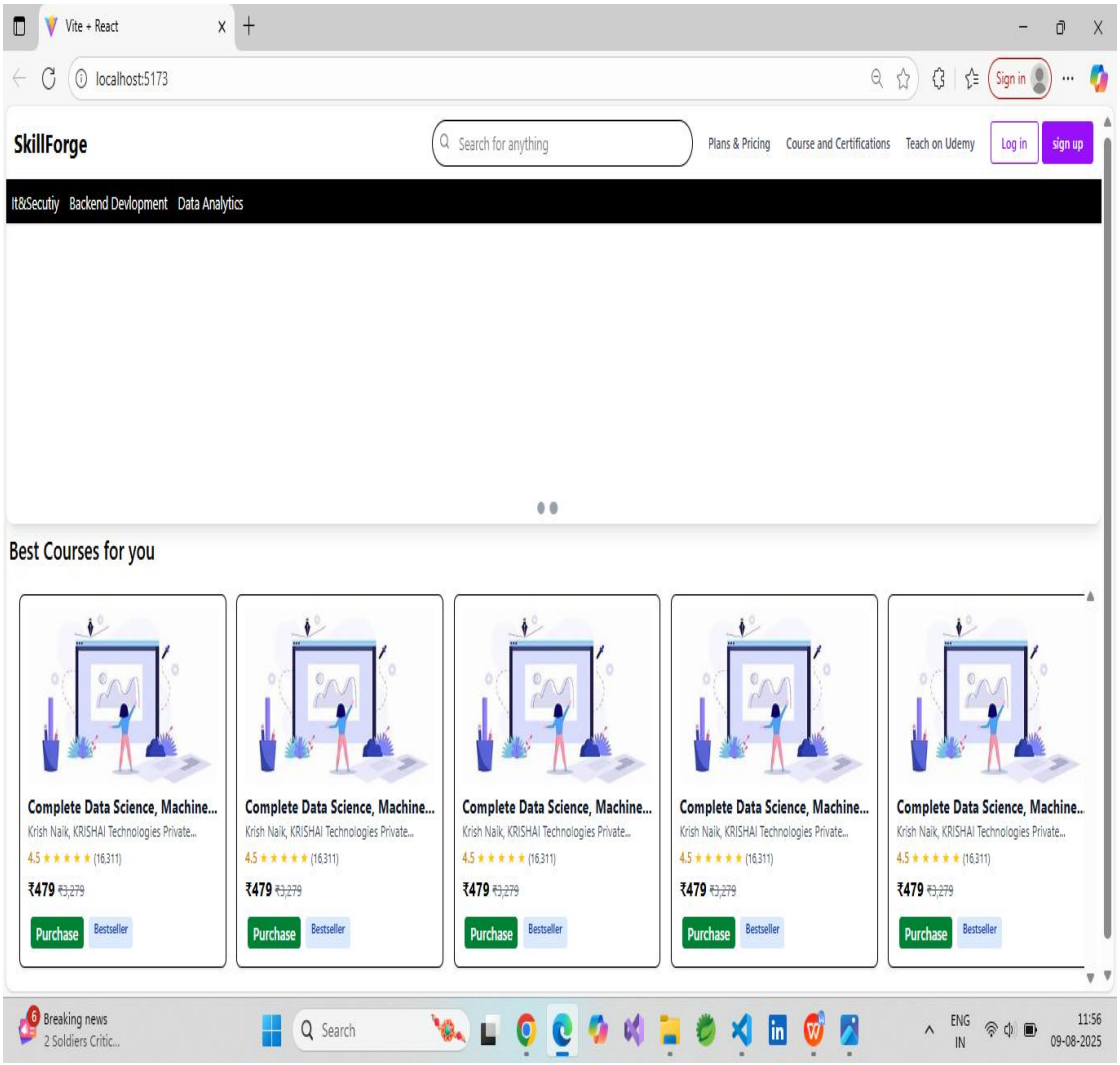
```
mysql> desc course_details;
+------------+--------+------+-----+---------+----------------+
| Field      | Type   | Null | Key | Default | Extra          |
+------------+--------+------+-----+---------+----------------+
| id         | bigint | NO   | PRI | NULL    | auto_increment |
| created_at | date   | YES  |     | NULL    |                |
| expiry     | date   | NO   |     | NULL    |                |
| course_id  | bigint | NO   | UNI | NULL    |                |
| student_id | bigint | NO   | MUL | NULL    |                |
+------------+--------+------+-----+---------+----------------+
```

Table 5: course_details

```
mysql> desc contents;
+------------+--------------+------+-----+---------+----------------+
| Field      | Type         | Null | Key | Default | Extra          |
+------------+--------------+------+-----+---------+----------------+
| content_id | bigint       | NO   | PRI | NULL    | auto_increment |
| description| varchar(255) | YES  |     | NULL    |                |
| tittle     | varchar(255) | YES  |     | NULL    |                |
| url        | varchar(255) | NO   |     | NULL    |                |
| course_id  | bigint       | NO   | MUL | NULL    |                |
+------------+--------------+------+-----+---------+----------------+
```

Table 6: content

5. SNAPSHOTS


Vite + React
localhost:5173
Sign in
SkillForge
Search for anything
Plans & Pricing
Course and Certifications
Teach on Udemy
Log in
sign up
It&Secutiy
Backend Devlopment
Data Analytics
Best Courses for you
Complete Data Science, Machine...
Krish Naik, KRISHAI Technologies Private...
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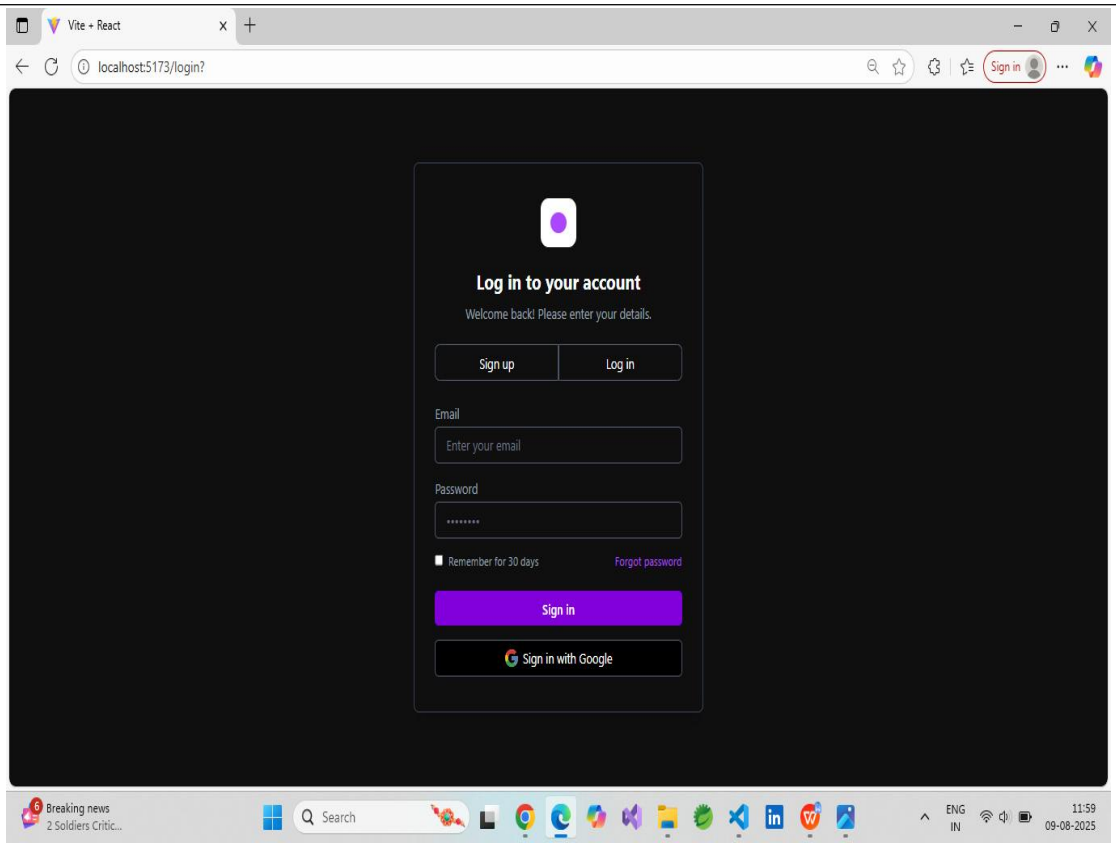
Vite + React
localhost:5173/login?
Sign in
Log in to your account
Welcome back! Please enter your details.
Sign up
Log in
Email
Enter your email
Password
Remember for 30 days
Forgot password
Sign in
Sign in with Google
Breaking news
2 Soldiers Critic...
Search
ENG
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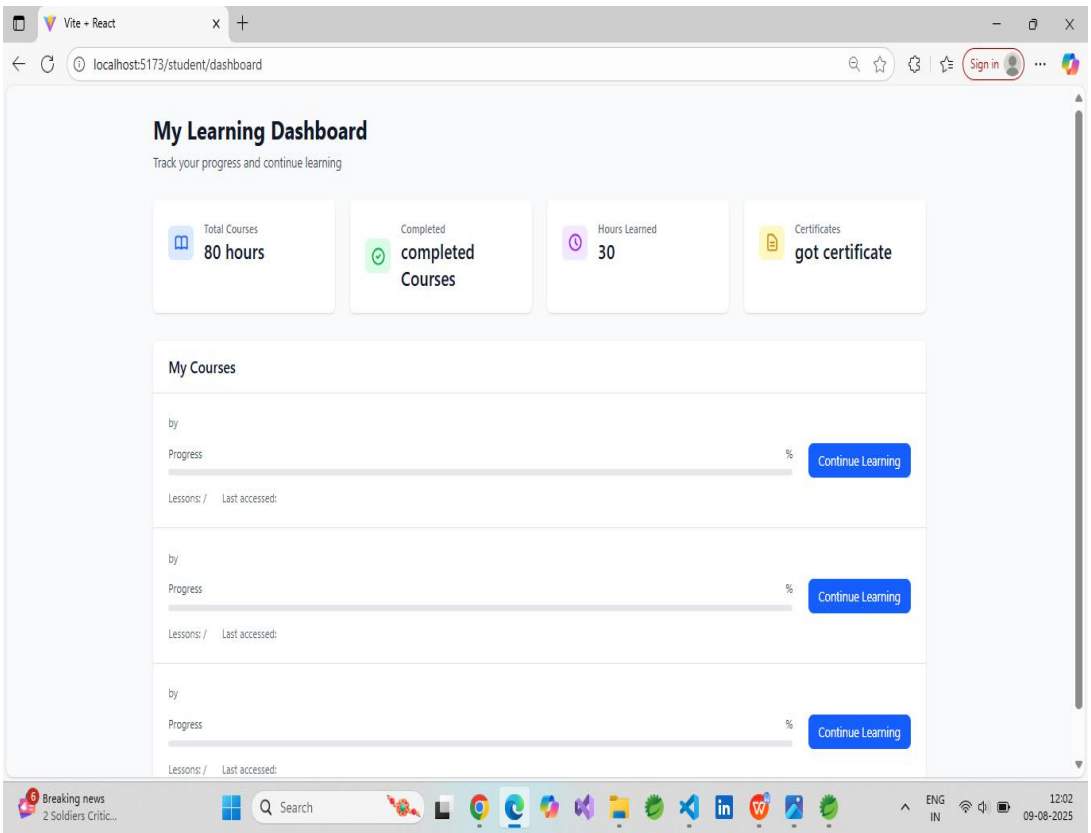
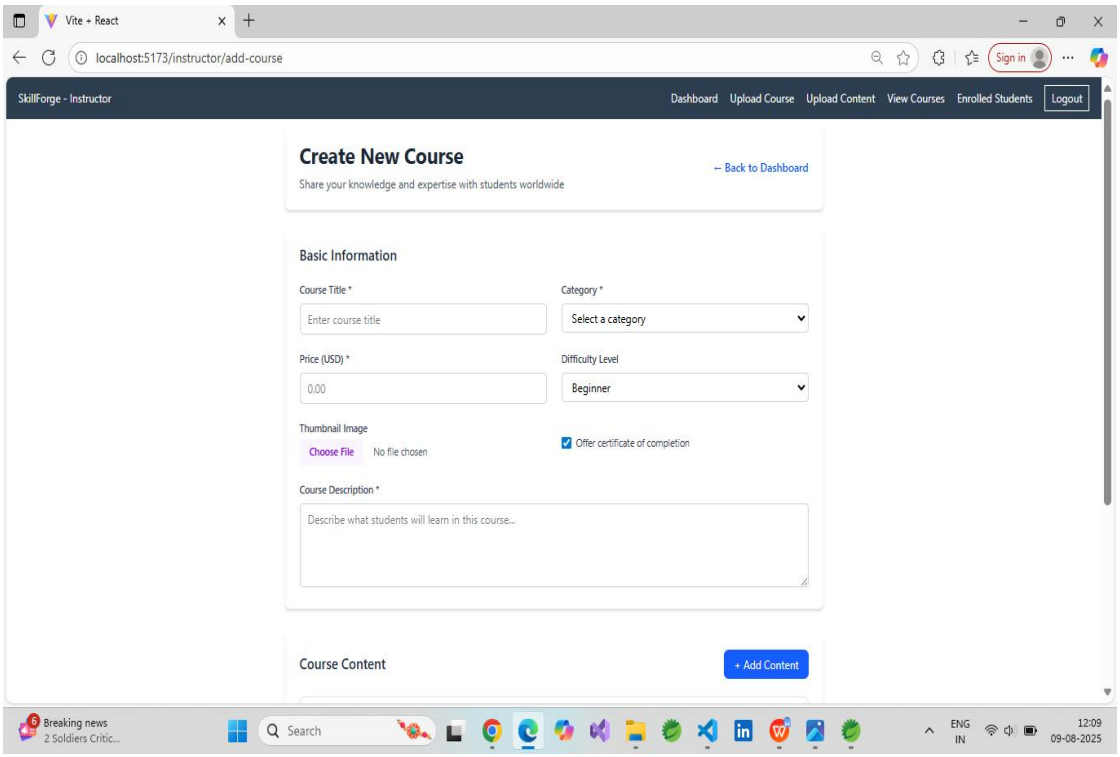
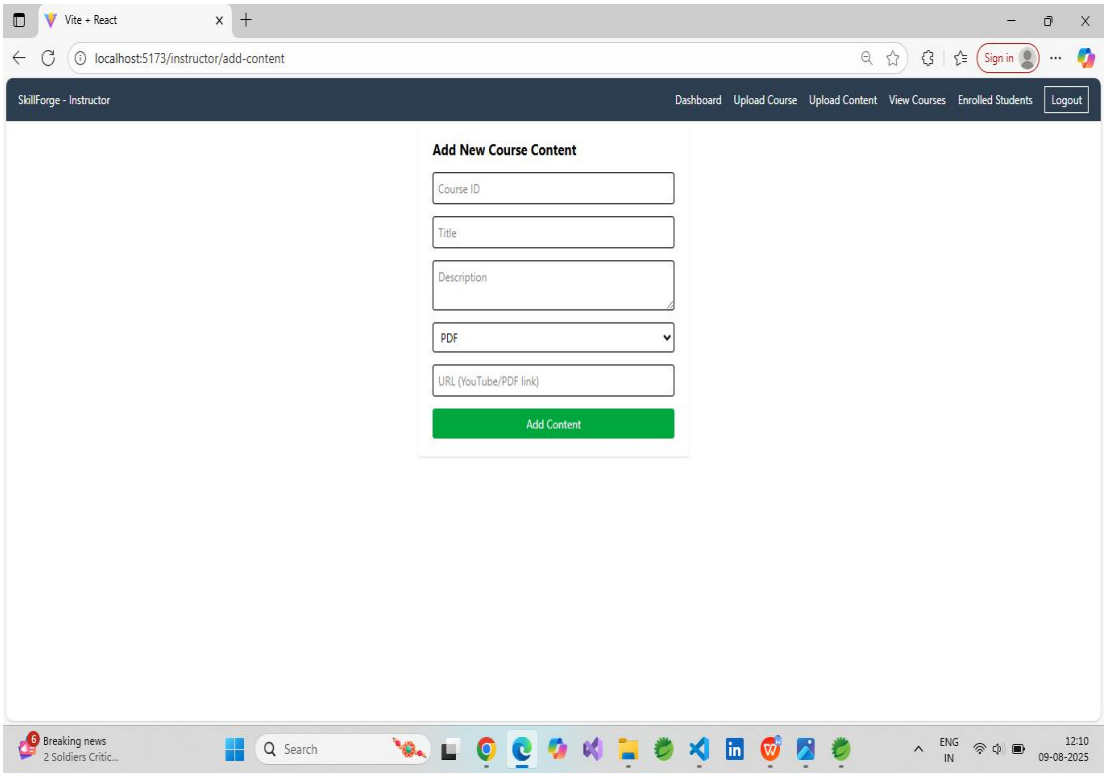
11:59
09-08-2025


Vite + React
localhost:5173/student/dashboard
Sign in
My Learning Dashboard
Track your progress and continue learning
Total Courses
80 hours
Completed
completed
Courses
Hours Learned
30
Certificates
got certificate
My Courses
by
Progress
%
Continue Learning
Lessons: /
Last accessed:
by
Progress
%
Continue Learning
Lessons: /
Last accessed:
by
Progress
%
Continue Learning
Lessons: /
Last accessed:
Breaking news
2 Soldiers Critic...
Search
ENG
IN
12:02
09-08-2025


Vite + React
localhost:5173/instructor/add-course
SkillForge - Instructor
Dashboard
Upload Course
Upload Content
View Courses
Enrolled Students
Logout
Create New Course
Share your knowledge and expertise with students worldwide
← Back to Dashboard
Basic Information
Course Title *
Enter course title
Category *
Select a category
Price (USD) *
0.00
Difficulty Level
Beginner
Thumbnail Image
Choose File
No file chosen
Offer certificate of completion
Course Description *
Describe what students will learn in this course...
Course Content
+ Add Content


Vite + React
localhost:5173/instructor/add-content
SkillForge - Instructor
Dashboard
Upload Course
Upload Content
View Courses
Enrolled Students
Logout
Add New Course Content
Course ID
Title
Description
PDF
URL (YouTube/PDF link)
Add Content

6. CONCLUSION

The **Skill Forge** platform has been successfully designed and developed as a comprehensive online course management system that bridges the gap between instructors and learners. The system enables instructors to efficiently create, manage, and share course content, while providing students with an intuitive interface to browse, purchase, and access quality educational resources.

By integrating modern technologies such as Spring Boot for the backend, React.js for the frontend, MySQL for data management, and Razorpay for secure payments, the project ensures scalability, reliability, and user-friendly interaction. The implementation of JWT-based authentication enhances data security and privacy, ensuring that only authorized users can access restricted functionalities.

The platform addresses real-world challenges faced by both educators and learners by streamlining processes like course uploads, content management, and online learning engagement. With its modular architecture, *Skill Forge* is flexible for future enhancements, such as advanced analytics, AI-driven course recommendations, and mobile application support.

In conclusion, **Skill Forge** is a robust, scalable, and efficient solution that not only fulfills the core objectives of the project but also lays the foundation for further innovation in the field of online education.

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