INSTITUTE FOR ADVANCED COMPUTING AND SOFTWARE DEVELOPMENT, AKURDI, PUNE

"Shiksha-Setu"

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Submitted By:

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ABSTRACT

Education is a fundamental right, and technology has revolutionized the way knowledge is accessed and delivered. **"Shiksha-Setu"** is an e-learning platform designed to bridge the gap between learners and educators by providing a seamless, interactive, and accessible online learning environment. Developed using Java, Spring Boot, HTML, CSS, and JavaScript, this platform offers a user-friendly interface, robust backend support, and dynamic content delivery.

The primary objective of **Shiksha-Setu** is to facilitate online education by enabling students to access courses, take assessments, and interact with instructors efficiently. The system follows a modular architecture, ensuring scalability and maintainability. The backend, powered by Spring Boot, handles user authentication, course management, and database interactions, while the frontend ensures an intuitive user experience through responsive web design.

Key features of the platform include user authentication, course enrollment, video lectures, quizzes, discussion forums, and performance tracking. The platform also implements RESTful APIs for smooth communication between the client and server. Security measures such as JWT authentication and role-based access control have been integrated to protect user data and enhance reliability.

This report provides a detailed overview of the development process, system architecture, and the various technologies utilized in building **Shiksha-Setu**. The platform has the potential to revolutionize online learning by making education more accessible, efficient, and interactive. Future enhancements may include AI-driven personalized recommendations and mobile app integration to further improve user engagement.

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. Monika Sindhikar** 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. Rohit Puranik, 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.

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1. INTRODUCTION

The rapid advancement of technology has revolutionized various sectors, and education is no exception. Traditional classroom learning, while effective, often comes with limitations such as geographical constraints, lack of flexibility, and accessibility challenges. The need for a digital learning solution that overcomes these barriers has become more crucial than ever. **"Shiksha-Setu"** is designed to be that solution—an innovative e-learning platform that connects students and educators through a seamless, interactive, and technology-driven learning experience.

This report delves into the complete development process of **Shiksha-Setu**, covering aspects such as system architecture, core functionalities, technical implementation, testing strategies, deployment, and potential future improvements. As online education continues to evolve, Shiksha-Setu aspires to be a leading platform that fosters an enriched and accessible learning experience for all.
With its emphasis on flexibility, accessibility, and quality education, Shiksha-Setu is more than just a digital learning tool—it is a step toward transforming education for the future.

In the **Shiksha-Setu**, both User and Admin roles play crucial roles in the management and operation of the platform. Each role comes with specific responsibilities, permissions, and access levels to ensure that the system operates smoothly and securely.

1. Admin Role

In **Shiksha-Setu**, the **Admin** plays a crucial role in managing and maintaining the platform to ensure a smooth and efficient e-learning experience for students and instructors. The admin acts as the backbone of the system, overseeing various operations, ensuring data security, and maintaining the integrity of the platform.

❖ **Responsibilities:**

- **User Management:**
  - Add, update, and remove users (students, teachers, and other admins).
  - Manage user roles and permissions.
  - Handle account verification and password resets.

- **Content Moderation:**
  - Oversee discussion forums and comments to prevent misuse.
  - Remove inappropriate or harmful content.
  - Manage reports or complaints from users.

- **Course Management:**
  - Monitor courses created by instructors.
  - Approve or reject course content if needed.
  - Ensure the quality and relevance of the courses offered.

- **System Maintenance:**
  - Ensure smooth functioning of the platform by monitoring system performance.
  - Troubleshoot technical issues and coordinate with the development team for bug fixes.
  - Perform regular data backups to prevent data loss.

- **Security and Compliance:**

- Implement security measures such as role-based access control (RBAC) and data encryption.
  - Manage user authentication using techniques like JWT (JSON Web Token).
- Monitor and prevent unauthorized access or cyber threats.

- **Reporting & Analytics:**
  - Generate reports on student progress, course engagement, and platform usage.
  - Track key performance indicators (KPIs) for continuous improvement.
  - Use data insights to enhance user experience and optimize learning outcomes.

- **Support Management:**
  - Address queries and complaints from students and instructors.
  - Improve platform usability based on feedback.
  - Provide support for technical issues or account-related concerns.

2. User Role

Students are the primary beneficiaries of the **Shiksha-Setu** platform. They use the system to enroll in courses, access learning materials, interact with instructors, and track their progress.

❖ **Responsibilities & Features for Students:**

- **User Registration & Authentication:**
    - Sign up and log in using secure credentials.
    - Manage profile details (name, email, password, etc.).
- **Course Enrollment & Learning:**
    - Browse available courses and enroll in desired subjects.
    - Access video lectures, reading materials, assignments, and quizzes**.**
    - Download learning materials if allowed by the instructor.
- **Assessments & Progress Tracking:**
    - Attempt quizzes, assignments, and exams.
    - View grades, feedback, and overall performance reports.
    - Track course completion percentage.
- **Discussion & Collaboration:**
    - Participate in course discussion forums.
    - Interact with instructors and fellow students by asking and answering questions.
    - Provide feedback on courses and instructors.
- **Certification & Completion:**
    - Receive certificates upon successful course completion (if applicable).
    - Maintain a learning history for future reference.

Role-Based Access Control (RBAC)

Role-Based Access Control (RBAC) is a security mechanism implemented in **Shiksha-Setu** to restrict system access based on user roles. This ensures that users can only perform actions relevant to their roles, enhancing security, efficiency, and maintainability. The platform defines three primary roles: Admin, Instructor (Teacher), and Student, each with specific access privileges.

Security Considerations

Both roles are secured through robust authentication mechanisms provided by Spring Security.

This includes:

- **Authentication:** Verifying the identity of users before granting access to the system.
- **Authorization:** Ensuring that users can only access the resources permitted by their role.
- **Session Management:** Secure handling of user sessions to prevent unauthorized access.

Feature / Action	Admin	Instructor (Teacher)	Student
User Management	✅ Create,update,delete users	✗	✗
Course Management	✅ Approve/monitor all courses	✅ Create, update, delete own courses	✅ Enroll & access courses
Content Upload	✗	✅ Upload lectures, assignments, and quizzes	✗
Enroll in Courses	✗	✗	✅ Enroll in available courses
Assessments & Grading	✗	✅ Create & grade quizzes/assignments	✅ Attempt quizzes/assignments
Discussion Forums	✅ Monitor and remove inappropriate content	✅ Answer student queries	✅ Post questions & interact
Security & Authentication	✅ Manage authentication & access levels	✗	✗
Reports & Analytics	✅ Generate platform-wide reports	✅ Track student performance	✅ View personal progress
Certificate Issuance	✅ Approve certificates	✅ Issue course completion certificates	✅ Receive certificates

1.1 Purpose

The purpose of **"Shiksha-Setu"** is to create an accessible, flexible, and interactive e-learning platform that bridges the gap between students and educators. The platform aims to:

1. **Enhance accessibility** to education, enabling students to learn anytime and anywhere.
2. **Facilitate student-teacher interaction** through tools like discussion forums and feedback mechanisms.
3. **Improve learning efficiency** by offering structured courses, progress tracking, and interactive content.
4. **Empower educators** to create, manage, and assess courses easily.
5. **Provide data-driven insights** to improve learning outcomes and decisions.
6. Ensure **scalability and flexibility**, allowing future enhancements and a growing user base.

1.2 Scope

The scope of **"Shiksha-Setu"** is to develop a comprehensive online learning platform that caters to the needs of students, instructors, and administrators. It includes features for course management, allowing instructors to create, update, and assess courses and assessments. The project also supports interactive learning with features like quizzes, assignments, discussion forums, and performance tracking. Designed for scalability, the platform can handle an increasing number of users and content over time while ensuring data security through secure authentication and role-based access control. Overall, the project aims to enhance the accessibility, flexibility, and quality of education in an online environment.

1.3 Objective of Shiksha Setu:

The objective of "Shiksha-Setu" is to create an efficient, scalable, and interactive e-learning platform that enhances the accessibility of education. It aims to provide students with the ability to access courses, engage with instructors, and track their progress online. For instructors, the platform offers tools to create, manage, and evaluate courses while facilitating effective communication with students

2. SOFTWARE REQUIREMENT SPECIFICATION

The functional requirements for Shiskha-Setu outline the specific features and capabilities that the system must provide to meet the needs of its users. These requirements are essential for guiding the development process and ensuring that the final product aligns with the objectives.

2.1 Functional Requirements for Shiksha-Setu

User Management

- **User Registration:**

  The system shall allow new users to create an account by providing personal details, such as name, email, and password.

- **User Authentication:**

  The system shall authenticate users during login using their registered email and password.

- **Role-Based Access Control:**

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

- **Profile Management:**

  Users shall be able to view and update their profiles, including personal details and passwords.

Inventory Management

- **Course Management:**

  The system shall allow admins to add, update, and delete products from the inventory.
  The system shall store product details such as name, description, SKU, price, category, and images.

- **Progress Level Monitoring:**

  The system shall monitor progress levels in real time and display current Progress levels.

Course Management

- **Order Placement:**

  Student shall be able to place payments for course.

- **Order Processing:**

  The system shall process orders, updating Course levels accordingly.

- **Payment Processing:**

  The system shall integrate with Razorpay to handle online payments securely.

  The system shall support various payment methods, including credit/debit cards, UPI, and wallets.

- **Order Tracking:**

  students shall be able to track the status of their orders from processing to delivery.

- **Invoicing:**

  The system shall automatically generate invoices for completed orders, available for download.

2.2 Non-Functional Requirements for Shiksha-Setu

1. Performance

- Response Time:

  The system shall respond to user actions within 2 seconds under normal operating conditions.
- Scalability:

  The system shall handle an increasing number of users and transactions without performance degradation. It should support at least 10,000 concurrent users.
- Throughput:

  The system shall process at least 100 transactions per second during peak usage times.

2. Reliability

- Availability:

  The system shall have an uptime of 99.9% over a 12-month period, ensuring high availability for users.
- Fault Tolerance:

  The system shall continue to operate in the event of hardware or software failures, with minimal disruption to users.
- Error Handling:

  The system shall gracefully handle errors and provide meaningful feedback to users when issues occur.

3. Usability

- User Interface:

  The system shall have a user-friendly interface that is easy to navigate, with clear instructions and minimal learning curve.

4. Maintainability

- Modularity:

  The system shall be designed in a modular fashion, allowing for easy updates and enhancements to individual components without affecting the entire system.

- **Other Requirements:**

1. Operating System

- Windows, Linux, or macOS (for development and deployment).
- Ubuntu or other Linux distributions (recommended for production deployment).

2. Development Tools and IDEs

- Spring Tool Suite 4 (for Java and Spring Boot development).
- Visual Studio Code or IntelliJ IDEA (for frontend development using HTML, CSS, JavaScript, and React).
- Postman (for API testing).
- MySQL Workbench or Admin (for database management).

3. Web Technologies

- Java (for backend development).
- Spring Boot (for building and running the backend).
- React.js (for building interactive frontend interfaces).
- HTML5, CSS3, JavaScript (for frontend development).
- Bootstrap (for responsive design).

4. Database

- MySQL or PostgreSQL (for relational database management).
- Hibernate ORM (for database interaction in Java).

5. Version Control

- Git (for version control and code collaboration).
- GitHub or GitLab (for hosting the codebase and collaboration).

6. Web Server and Deployment

- Apache Tomcat or Jetty (for deploying Java web applications).
- Docker (optional for containerization).
- Nginx or Apache HTTP Server (optional for serving frontend assets and load balancing).

7. Security Tools

- JWT (JSON Web Tokens) (for authentication and session management).
- OAuth 2.0 (for secure login and third-party integrations).

8. Testing Frameworks

- JUnit (for unit testing in Java).
- Mockito (for mocking dependencies in tests).
- Selenium (for frontend testing).

3. DIAGRAMS

3.1 Entity Relationship Diagram:

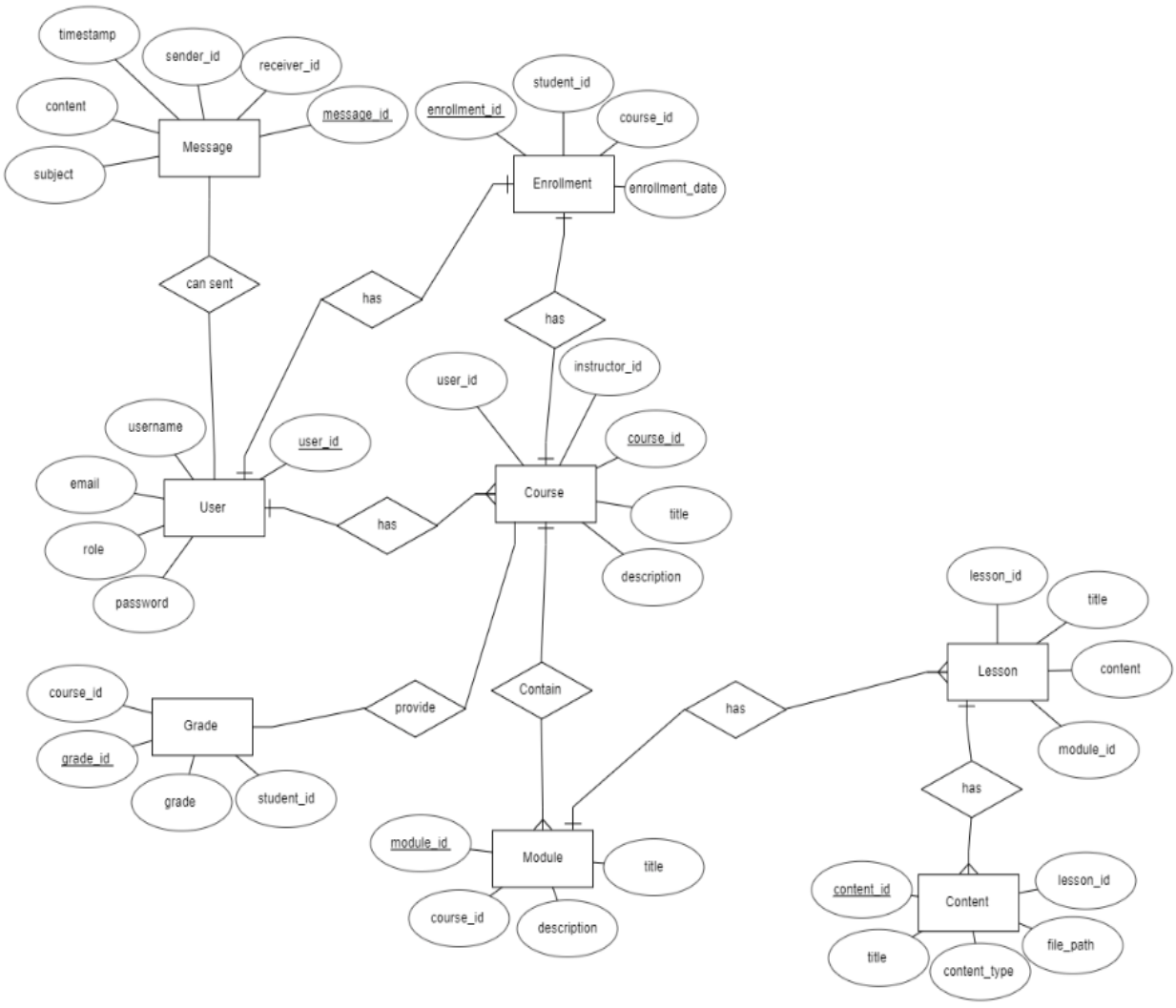


Fig. ER Diagram for Shiksha-setu

3.2 Use Case Diagram:

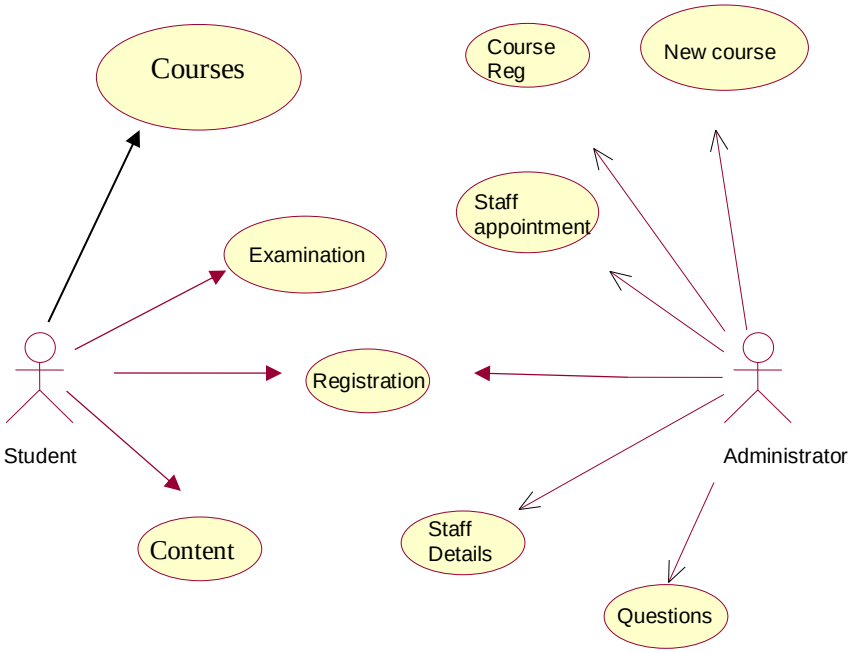
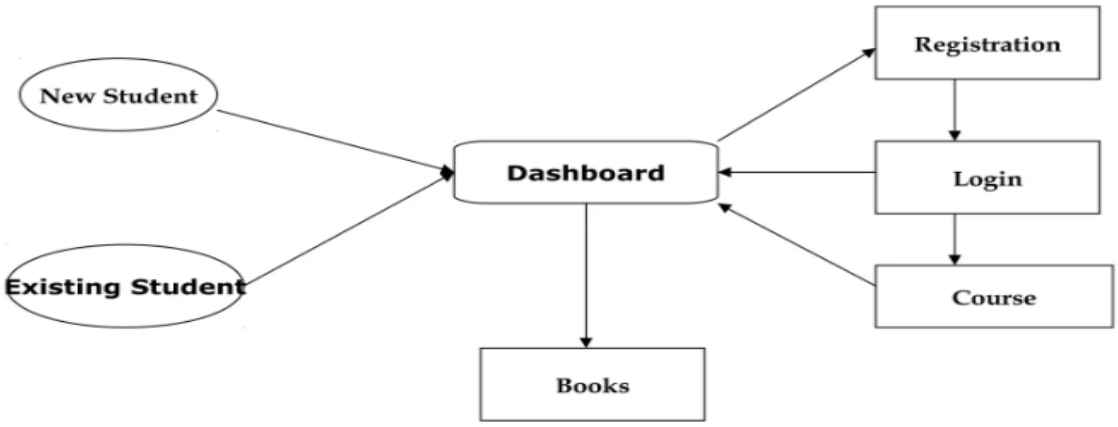
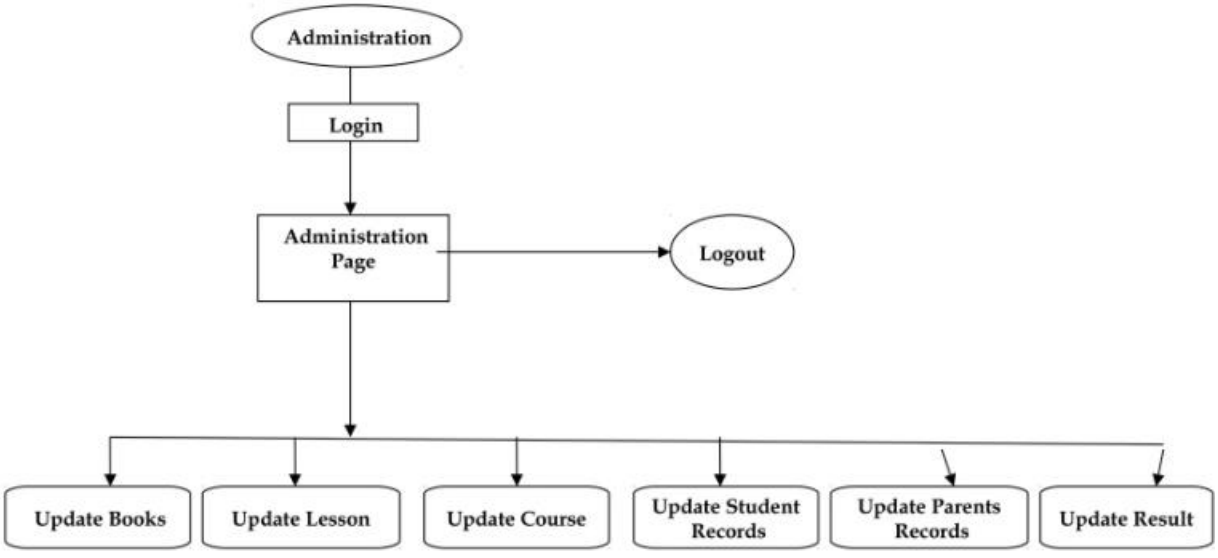


Fig. Use Case Diagram for Shiksha-Setu

3.3 Data Flow Diagram:



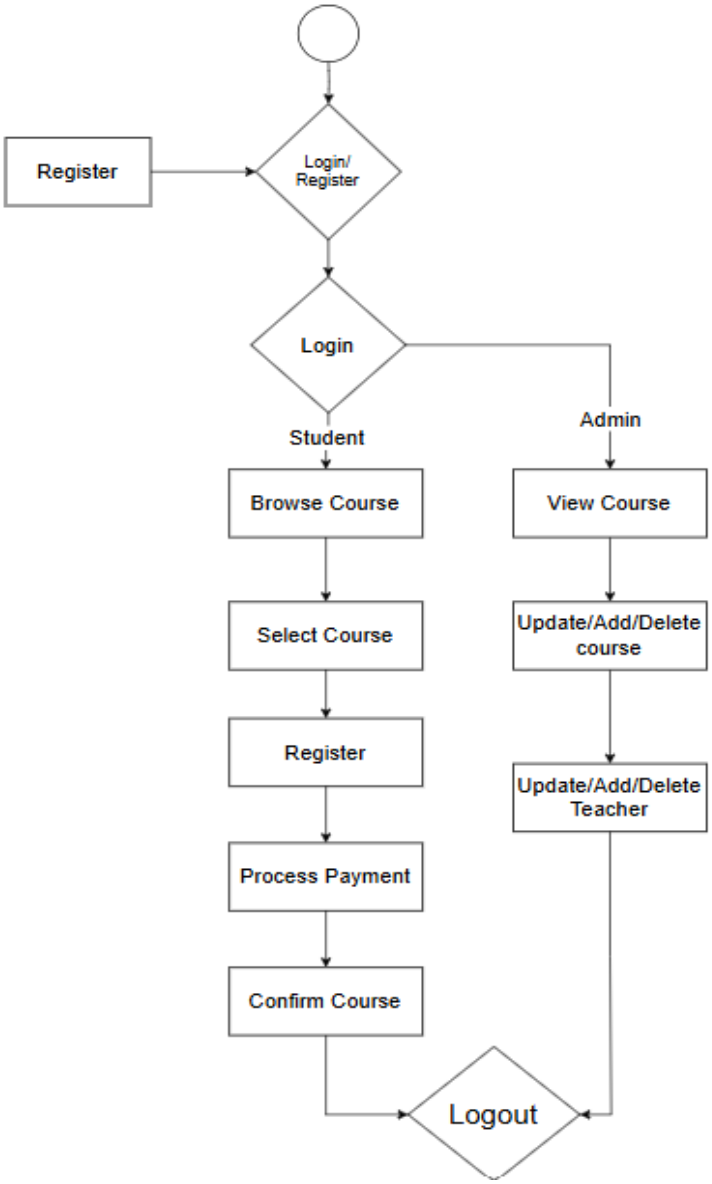
DFD Level 0:



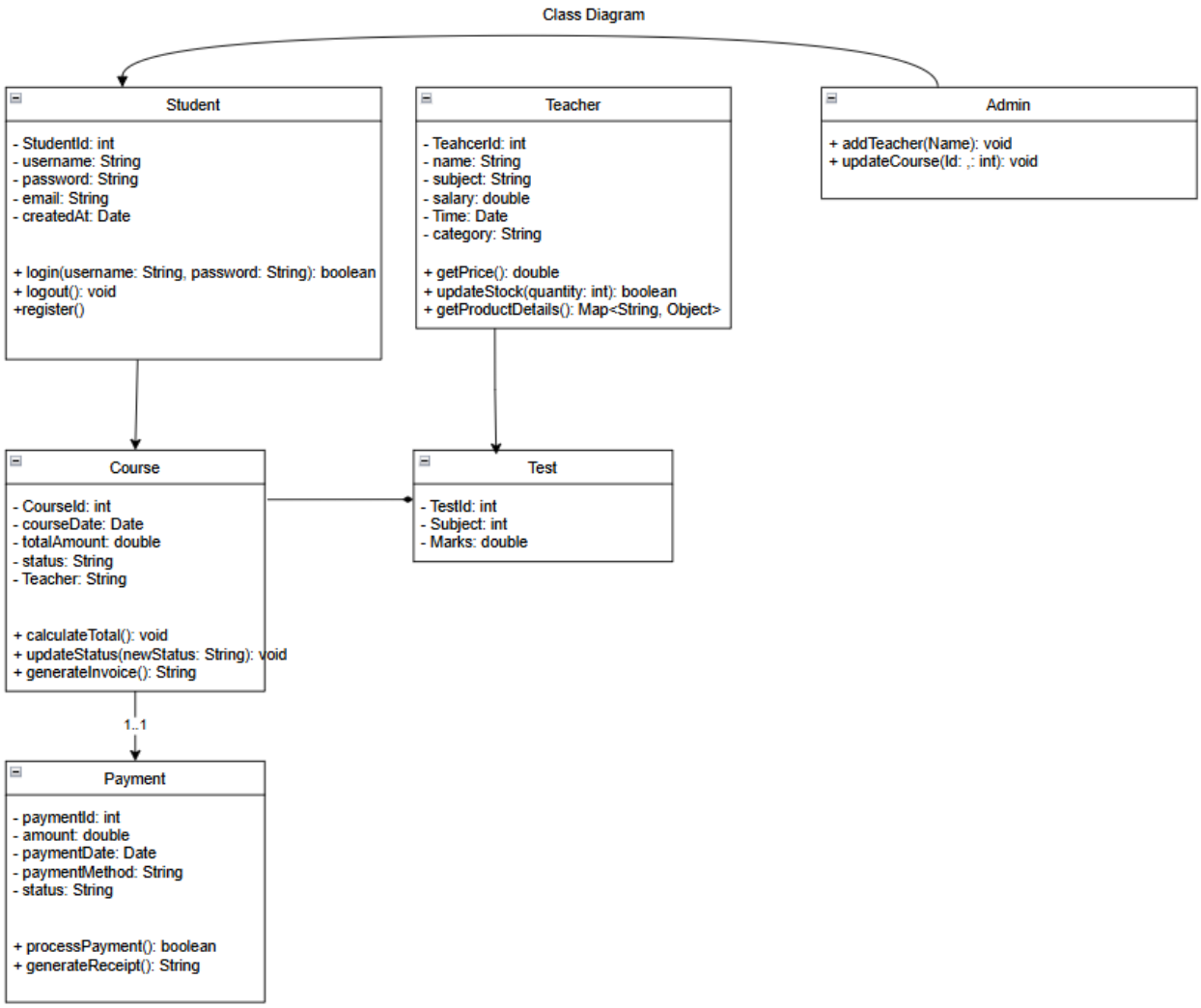
DFD level 1:

3.4 Activity Diagram:

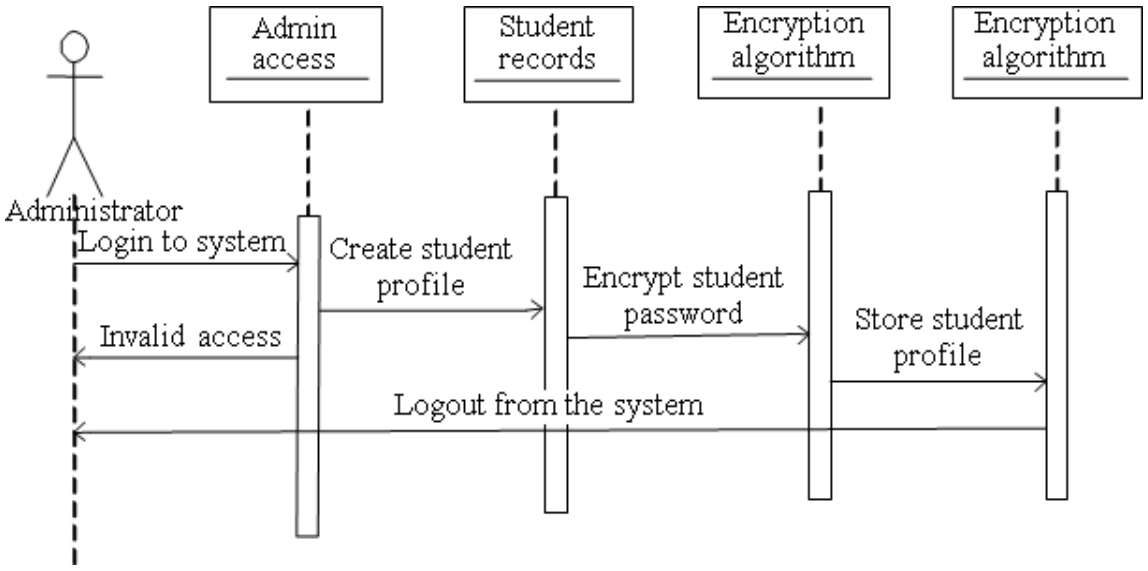
1. Login Activity Diagram:

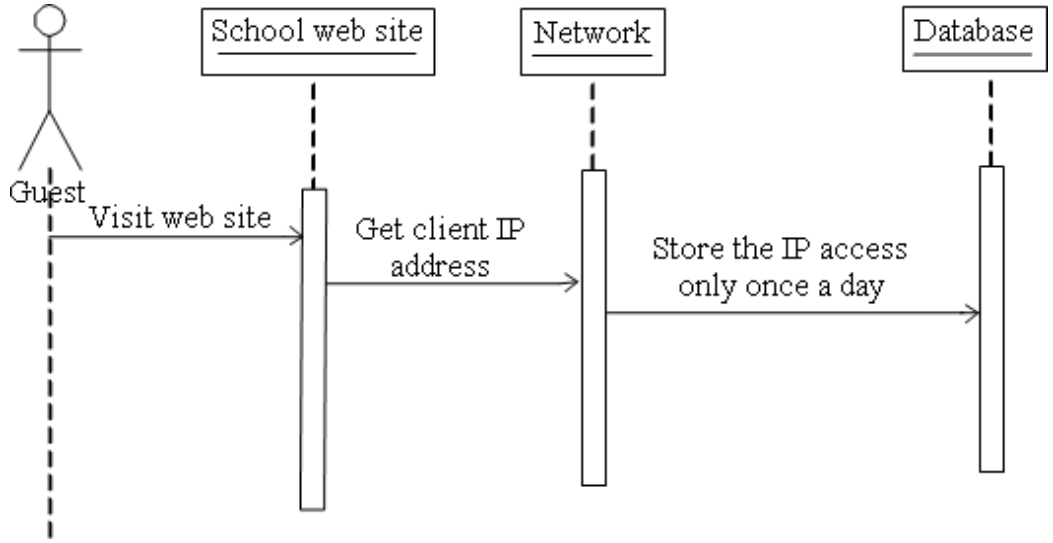


3.5 Class Diagram:

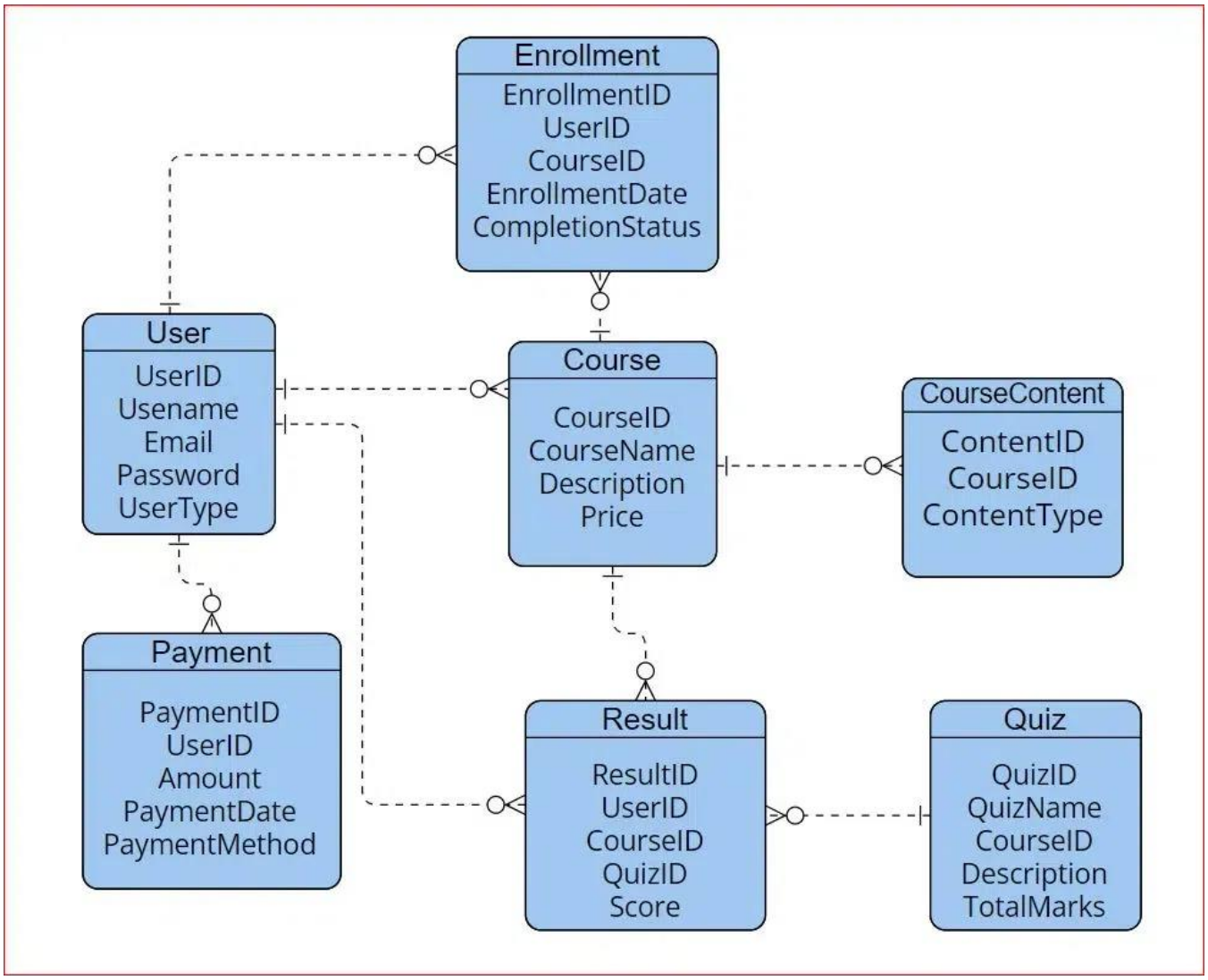


3.6 Sequence Diagram





4. DATABASE DESIGN



4.1 Design:

SNAPSHOTS

4.2 Tables:

The following table structures depict the database design.

```
mysql> desc courses;
+-------------+--------------+------+-----+---------+----------------+
| Field       | Type         | Null | Key | Default | Extra          |
+-------------+--------------+------+-----+---------+----------------+
| id          | bigint       | NO   | PRI | NULL    | auto_increment |
| category    | varchar(255) | NO   |     | NULL    |                |
| created_at  | datetime(6)  | YES  |     | NULL    |                |
| created_by  | varchar(255) | NO   |     | NULL    |                |
| description | varchar(160) | NO   |     | NULL    |                |
| public_id   | varchar(255) | YES  |     | NULL    |                |
| secure_url  | varchar(255) | YES  |     | NULL    |                |
| title       | varchar(60)  | NO   |     | NULL    |                |
| updated_at  | datetime(6)  | YES  |     | NULL    |                |
+-------------+--------------+------+-----+---------+----------------+
9 rows in set (0.01 sec)
```

Table 1: Courses

```
mysql> desc users;
+--------------+--------------+------+-----+---------+----------------+
| Field        | Type         | Null | Key | Default | Extra          |
+--------------+--------------+------+-----+---------+----------------+
| id           | bigint       | NO   | PRI | NULL    | auto_increment |
| created_at   | datetime(6)  | YES  |     | NULL    |                |
| email        | varchar(255) | NO   | UNI | NULL    |                |
| full_name    | varchar(255) | NO   |     | NULL    |                |
| password     | varchar(255) | NO   |     | NULL    |                |
| role         | varchar(255) | NO   |     | NULL    |                |
| subscription | varchar(255) | NO   |     | NULL    |                |
| updated_at   | datetime(6)  | YES  |     | NULL    |                |
| avatar_id    | bigint       | YES  | MUL | NULL    |                |
+--------------+--------------+------+-----+---------+----------------+
9 rows in set (0.00 sec)
```

Table 2: Users

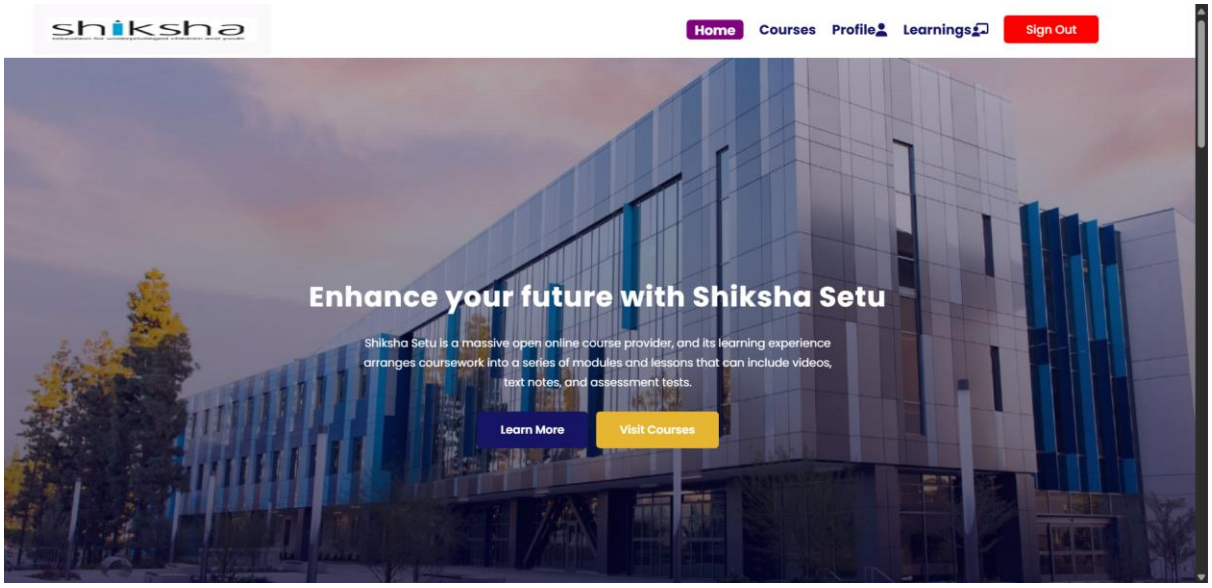
```
mysql> use shikshasetu;
Database changed
mysql> show tables;
+-----------------------+
| Tables_in_shikshasetu |
+-----------------------+
| avatars               |
| courses               |
| lectures              |
| users                 |
+-----------------------+
4 rows in set (0.05 sec)

mysql> desc avatars;
+------------+--------------+------+-----+---------+----------------+
| Field      | Type         | Null | Key | Default | Extra          |
+------------+--------------+------+-----+---------+----------------+
| id         | bigint       | NO   | PRI | NULL    | auto_increment |
| public_id  | varchar(255) | NO   |     | NULL    |                |
| secure_url | varchar(255) | NO   |     | NULL    |                |
+------------+--------------+------+-----+---------+----------------+
3 rows in set (0.02 sec)
```

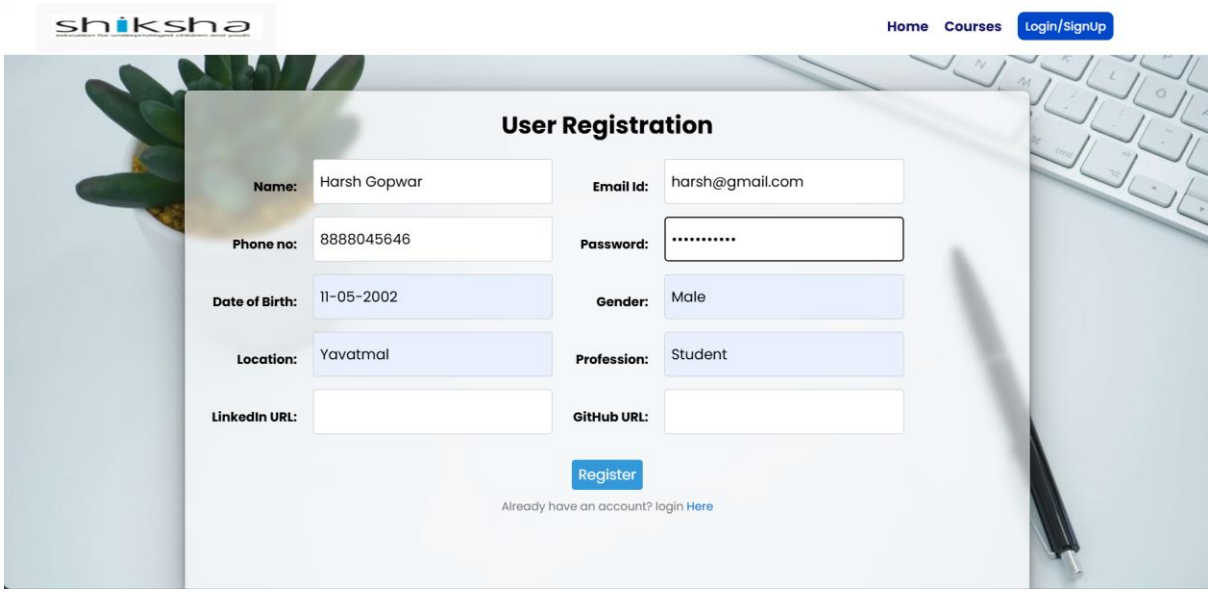
Table 3: Shiksha setu Tables

```
mysql> desc lectures;
+-------------+--------------+------+-----+---------+----------------+
| Field       | Type         | Null | Key | Default | Extra          |
+-------------+--------------+------+-----+---------+----------------+
| id          | bigint       | NO   | PRI | NULL    | auto_increment |
| description | varchar(255) | NO   |     | NULL    |                |
| public_id   | varchar(255) | YES  |     | NULL    |                |
| secure_url  | varchar(255) | YES  |     | NULL    |                |
| title       | varchar(255) | NO   |     | NULL    |                |
| course_id   | bigint       | YES  | MUL | NULL    |                |
+-------------+--------------+------+-----+---------+----------------+
6 rows in set (0.00 sec)
```

Table 4: Lectures

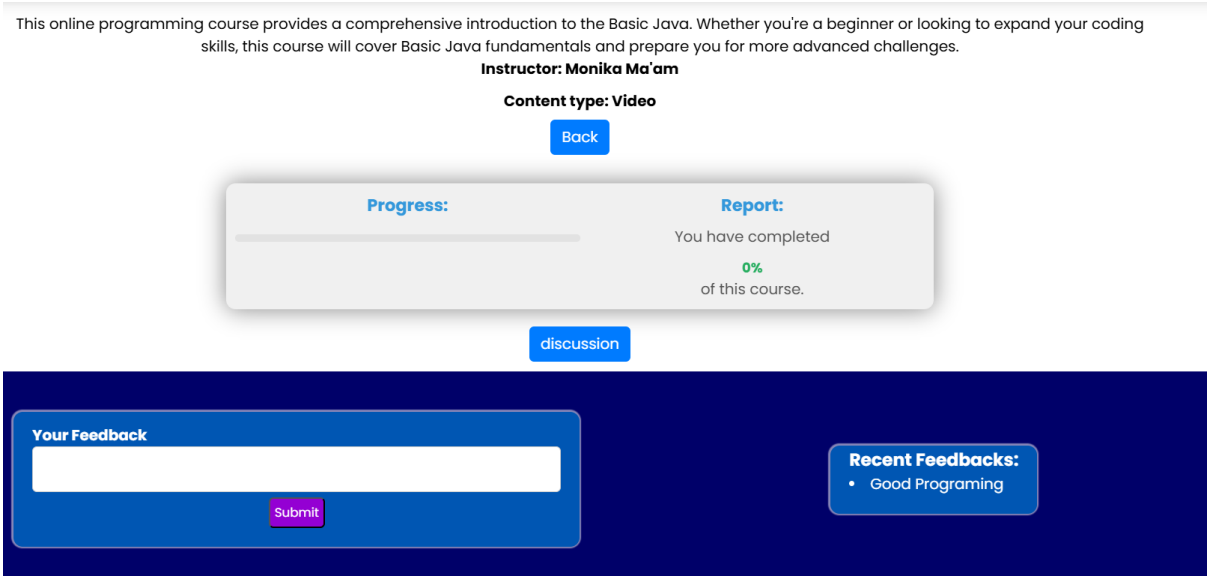


Home Page

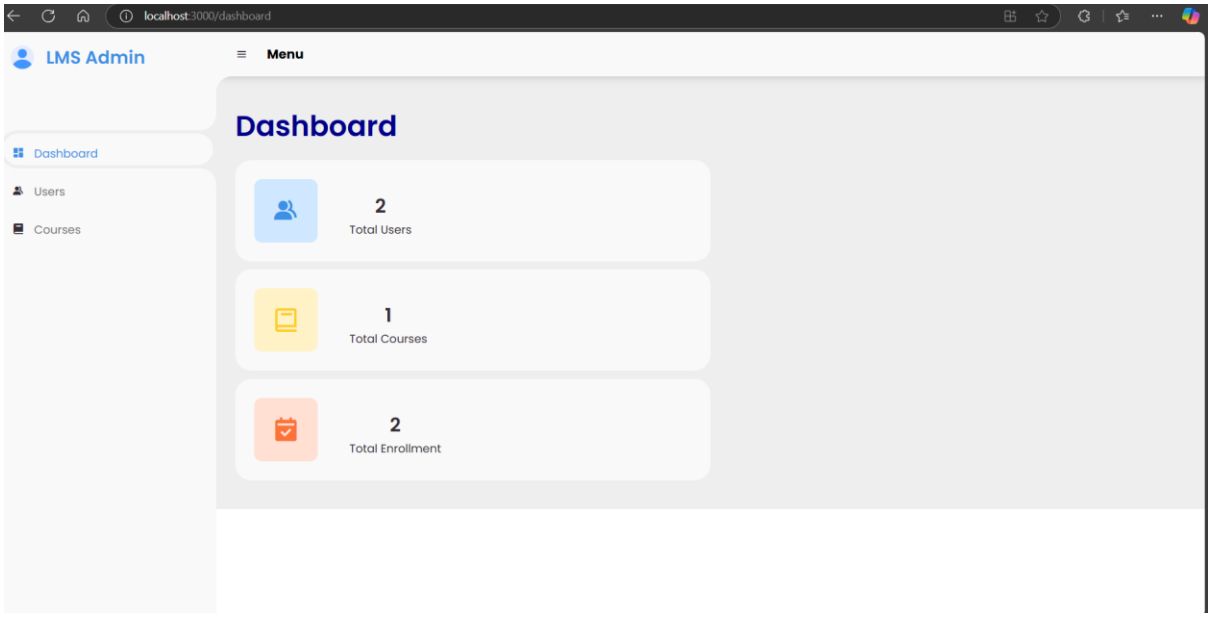


Registration Page

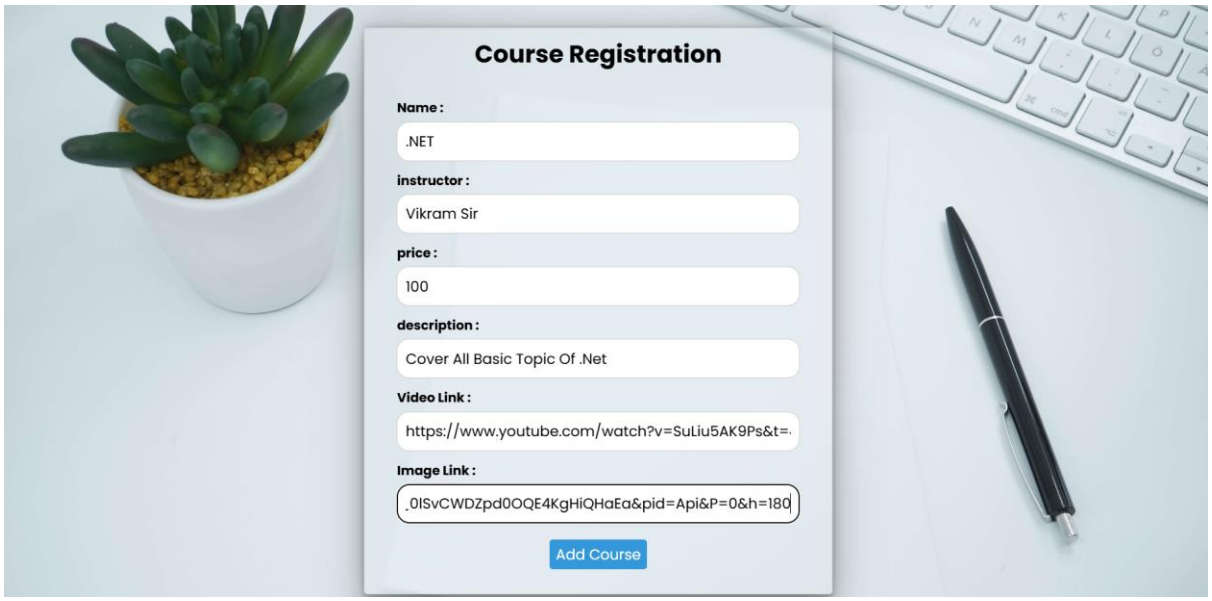
After Registration



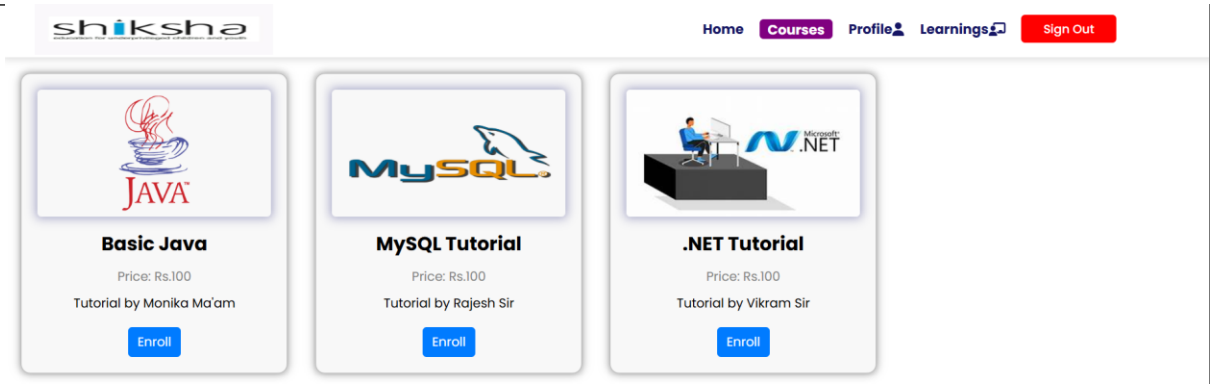
Progress Tracking



Admin Dashboard



Admin can add course



List of Course

Student Registration Page

5. CONCLUSION

In conclusion, the "SHIKSHA-SETU" project successfully demonstrates the integration of modern technologies such as Java and Spring Boot to create an efficient and scalable e-learning platform. Through the development process, key features including user authentication, course management, and interactive learning modules were implemented to provide a seamless educational experience. The project not only showcases technical proficiency but also underscores the potential of leveraging robust frameworks to address educational challenges in today's digital age. Future enhancements could focus on expanding content diversity, enhancing user engagement features, and optimizing performance to further enrich the learning experience.

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