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LEARNING MANAGEMENT SYSTEM

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ABSTRACT

A Learning Management System (LMS) is an online software that allows to manage learning content and engage students. The purpose of this project is to create a simple yet functional LMS that leverages HTML, CSS, JavaScript, Django, and SQLite. Teachers can upload and create lessons, and students will view and join the courses, track their progress. Furthermore, the LMS will also feature user authentication, interactive content rendering, and forums. This large project is a first effort to create a solid and scalable framework for e-Learning, with useful tools for an efficient and nice learning process.

1. INTRODUCTION

1.1 Introduction

Learning Management System(LMS) is a software application for managing the administration, documentation, tracking, reporting and delivery of educational courses or training programs. It serves as a central space for instructors to build, organize, distribute, offer assessments, and keep an eye on learners' progress. Use of an LMS provides a mechanism for learners to get to learning materials, online discussions, and class assignments and to monitor their own learning progress. It allows for monitoring of performance over time, and facilitates opportunities for collaboration and communication between teachers and students. In conclusion, an LMS makes learning process more friendly, flexible, scalable and efficient through content delivery. (Binhammad et al., 2024; Šimková & Štěpánek, 2013)

1.2 Problem Statement

There are many issues in the traditional education system, such as accessibility, flexibility, and potential for reaching large numbers of beta testers. Everyday current Learning Management Systems (LMS) are hampered by complexity, cost or accessibility woes, particularly for smaller educational establishments or individual teachers. The aims of this project was to implement a simple, easy to use LMS to take on these issues:

- Absence of a common solution to handle the courses, contents and students.
- Under the situation having the less frequency of exchange of information between students and faculty.
- Hard to see where students are.

The intention is to develop an open LMS that broadens the learning experience of students and teachers.

1.3 Existing System

Common LMS (e.g.,Moodle, Blackboard, Canvas) provides the following features:

- Course content management
- Student grading and report preparation
- Means to communicate (forum, message)
- Third party integration

There are many reasons but these two platforms are used in schools and are robust with good features.

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1.3.1 Disadvantages of Existing System

- Complex Interface And Learning Curve: These platforms have more of a learning curve for beginners as their interfaces can be quite complicated.
- Price: There are a lot of systems out there that are so expensive only for the licenses or subscriptions alone (they are often off the table as an option for smaller schools and individual educators).
- Restricted Customization: The majority of available LMS platforms will allow only limited level of customization, this lack of flexibility will not suit the personalized requirements of few organizations or a course.
- Internet access: Some platforms have performance and availability problems under low-bandwidth conditions.

1.4 Proposed System

The proposed Learning Management System (LMS) is a lightweight, web-based platform specifically designed to prioritize usability, affordability, and flexibility. In contrast to more complex or expensive systems, this LMS emphasizes simplicity while retaining essential educational functionalities. It is particularly suited for small institutions and educators with limited resources, effectively bridging the gap between functionality and accessibility.

1.4.1 Advantages of Proposed System

- User -Friendly interface
- Cost Effective
- Scalability
- Interactive Learning Environment
- Centralized Management

2. SYSTEM ANALYSIS

2.1 System Requirement Specification

2.1.1 Hardware Requirements

Specification	Requirement
Processor	1.5 GHz or higher (Intel Core i3 or equivalent)
RAM	2 GB or more
Storage	10 GB free disk space (for software and database)
Internet Connection	Stable connection for accessing the LMS platform (for online learning environments)

Table 1: Hardware Requirements

2.1.2 Software Requirements

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Component	Details
Operating System	Windows
Web Browser	Google Chrome, Mozilla Firefox, Safari (latest versions)
Database Management System (DBMS)	MySQL
Languages	HTML: For structuring the pages
	CSS: For styling and responsive design
	JavaScript: For client-side interactions and validations
	Django: High-level, open-source Python web framework
	SQLite: For database management and queries

Table 2: Software Requirements

2.2 Functional and Non-Functional Requirements

Define the functional requirements (e.g., user authentication, course management) and non-functional requirements (e.g., performance, security).

Functional Requirements

- **User Management Module:** The system is responsible for registering, logging, user role access such as student, teacher, and administrator; and user profile management.
- **Course Creation and Management:** Allows an instructor to create, edit, and maintain courses in a wide range of media formats, from text and video, to audio and presentation materials.
- **Content Delivery System:** Allows students to access course content in a wide range of formats and provides mechanisms to track these accesses.
- **Test Types:** Contains tests and reviews/assessments with multiple question formats and score/progress tracking.
- **Progress Monitor and Certificates:** Displays students' progress on a dashboard and, provides certificates along their progression.
- **Discussion Forum & Messaging:** Allows students and teachers to communicate through discussion forums and private messaging.

Non-Functional Requirements

- **Performance Optimization**
  Ensures fast load times and smooth performance even with high user traffic and large course materials.
- **Security Compliance**
  Implements encryption, secure login, and access control. Adheres to data privacy laws and protects user data.
- **Scalability**
  Designed to handle increasing users and course content without performance loss, allowing seamless scaling.
- **User-Friendly Interface**
  Provides a clean, intuitive interface with responsive design for access across desktops, tablets, and smartphones.

2.3 UML Diagrams

2.3.1 Use Case Diagram

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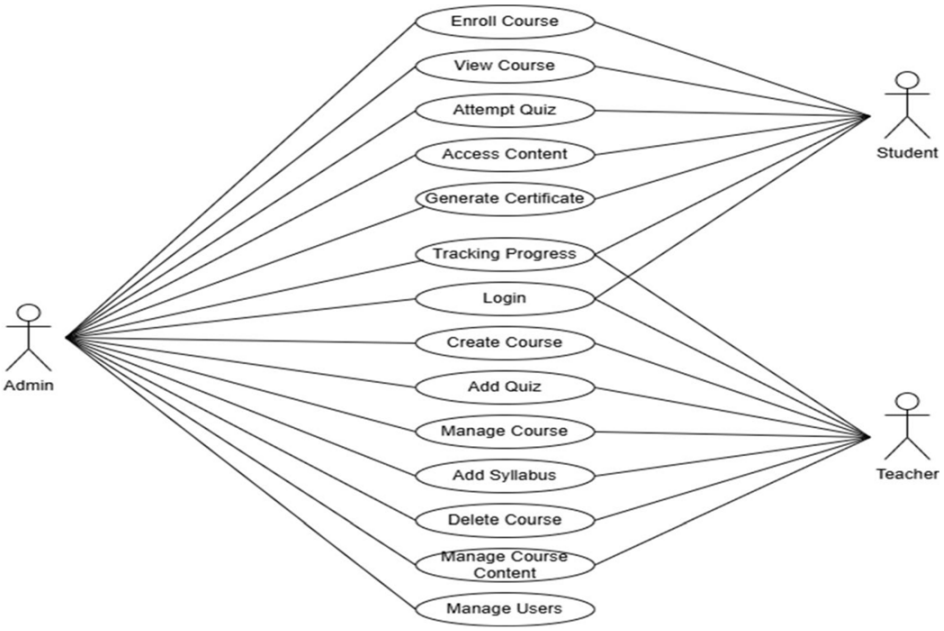

Fig 1: Use Case Diagram

2.3.2 ER Diagram

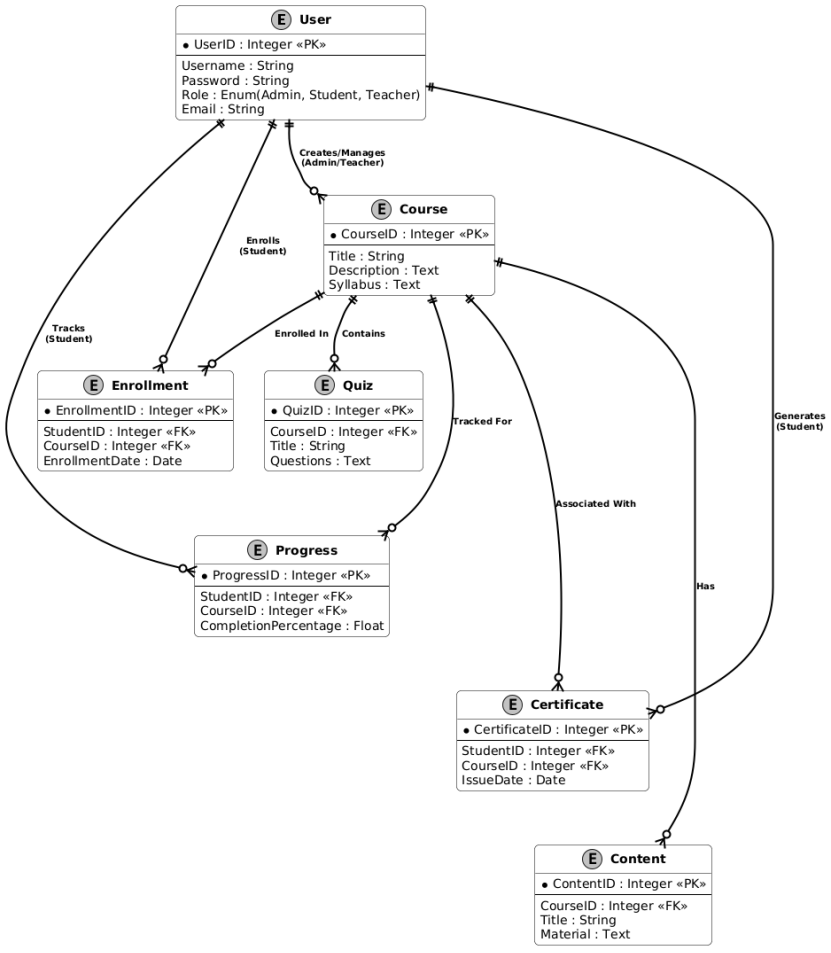

Fig 2: ER Diagram

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2.3.3 Class Diagram

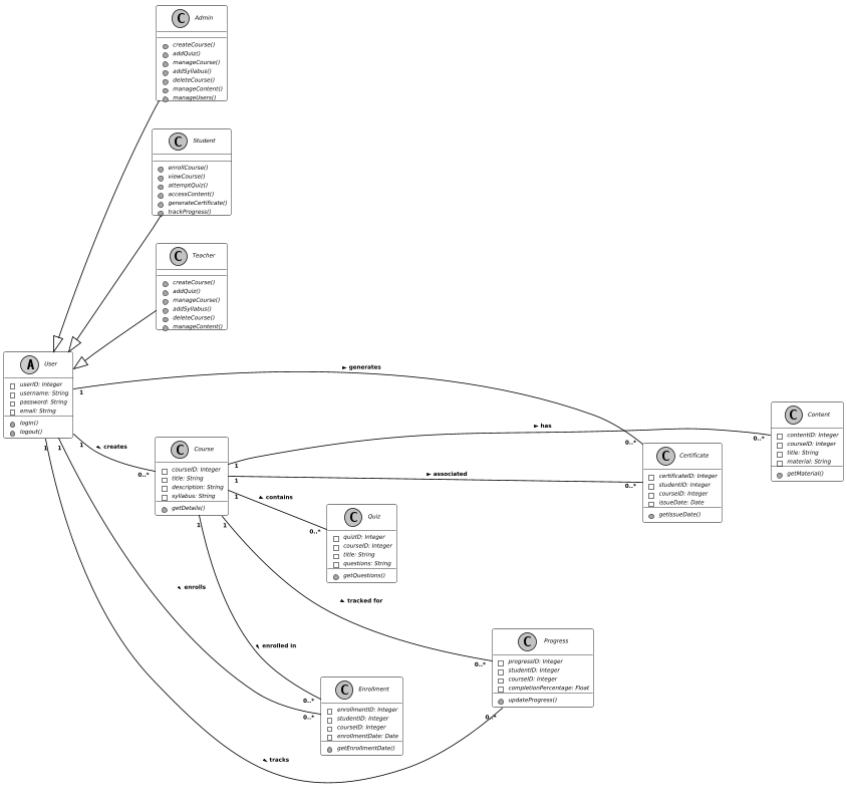

Fig 3: Class Diagram

3. SYSTEM DESIGN

3.1 System Architecture

It is the architecture of a system of IT application such the Learning Management System (here LMS) which is aiming to achieve effective and efficient learning so that the system or application is scalable, high performance and high security. Key components include:

1. User Interface-UI Layer(Frontend)

Users interact with the UI layer that could be a web or mobile browser. It provides learners and instructors access to course content, assignments, quizzes and communications tools to collaborate inside and outside of class. “However, the benefit of more user friendly experience is worth the tradeoff.

2. Application Layer (Backend)

The Application Layer is in charge of system inner processes:

- **Course Management:** Structure and administration of course content.
- **User Management:** This takes care of authentication, registering and role based access.
- **Content Delivery & Access Control:** Reduces the system’s data traffic by limiting access to course materials.
- **Assessment & Evaluation:** Organize the tests and marks.

3. Database Layer

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The Data Base Layer contains information that is collected and sent in the form of structured (student profile or grades) and unstructured data (courseware, multimedia). With relational databases such as MySQL or PostgreSQL you can achieve data consistency, scalability and performant operations.

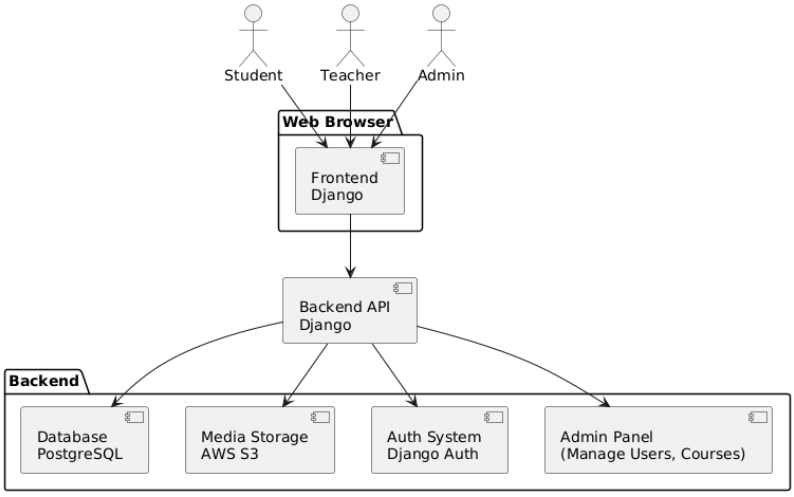

Fig 2: Database Layer

3.2 Interface Design

The LMS design emphasizes the ease of use of forms and readability of outputs for the students, instructors, and administrators. UserRegistrationAndLogin Account creation and secure sign-in with email and password validation and optional role selection. Course Registration enables students to search and register for courses; avoids redundant data, en and shows course information. Profile Management This feature will allow users to modify their info, update and add profile pictures with verification. Assignment Submission module that functions with sensible file types. Assessments and Quizzes are created by instructors and written by students with validation of answers and possible time limits. The Dashboard presents key activities through which students see up-to-date deadlines and grades, and teachers manage their courses and follow learners. Administrators can view data across the system, such as active courses and user reports. Course Info tab/ menu is laid out clearly. Assignment and Quiz Results offer feedback, grades, and performance summaries for both students and instructors.

4. TESTING

4.1 Test Cases

Test Case ID	Test Case Name	Test Steps	Expected Result	Actual Result	Status
TC1	Verify user login functionality	1. Go to the login page for the LMS. 2. Type in a working password and username. The 'Login' button should be clicked.	User should be sent to the dashboard once they have logged in.	True	Pass
TC2	Verify login with invalid credentials	1. Opening the LMS login page 2. Input a faulty username or password.	Error message: 'Invalid username or password.'	True	Pass

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		Click the "Login" button third.			
TC3	Verify password Recovery	1. Click the link 'Forgot Password'. 2. input registered email address. 3. Look for reset instructions in your email.	Password reset email received and user is able to reset the password.	True	Pass
TC4	Verify course enrolment for registered user	1. Log in as a registered user. 2. Browse available courses. 3. Select a course and click on 'Enroll.'	User should be enrolled in the course and it appears in the 'My Courses' section.	True	Pass
TC5	Verify course enrolment for non-registered user	1. Visit LMS without logging in. 2. Try to enroll in a course.	User prompted to log in or register before enrolling.	True	Pass
TC6	Verify content accessibility for enrolled users	1. Log in as an enrolled user. 2. Navigate to 'My Courses.' 3. Open a course and access materials (videos, PDFs, quizzes).	User can access all course materials.	True	Pass
TC7	Verify content access restrictions for non-enrolled users	1. Log in as a non-enrolled user. 2. Try to access materials of a course not enrolled in.	User cannot access the content and is prompted to enroll in the course.	True	Pass
TC8	Verify quiz attempts for enrolled students	1. Log in as an enrolled user. 2. Navigate to a course with a quiz. 3. Take and submit the quiz.	User should be able to attempt and submit the quiz.	True	Pass
TC9	Verify quiz results and feedback	1. Log in as an enrolled user. 2. Complete a quiz. 3. Check results and feedback.	User should see the quiz score and feedback.	True	Pass

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TC10	Verify quiz attempt limits	1. Log in as an enrolled user. 2. Attempt a quiz with a limit on attempts. 3. Try to retake the quiz beyond the allowed attempts.	The system prevents the user from retaking the quiz once the limit is reached.	True	Pass
TC11	Verify user profile update functionality	1. Register and log in. 2. Access profile settings. 3. Change profile details and save them.	Profile details are successfully updated.	True	Pass
TC12	Verify password change functionality	1. Log in under registered user. 2. Change Password by going to account settings. 3. Enter both a new and current password; save changes.	Password is successfully updated.	True	Pass
TC13	Verify course creation by an admin	1. Enter under administrator log-in. 2. Approach course management. 3. Create a new course with required details. 4. Save the course.	New course is successfully created and visible in the course catalog.	True	Pass
TC14	Verify user management by an admin	1. Log in as an admin. 2. Navigate to user management. 3. Search for a user and modify details. 4. Save changes.	User details are successfully modified.	True	Pass
TC15	Verify course start date notification	1. Log in as an enrolled user. 2. Enroll in a course with a scheduled start date. 3. Wait for start date and check for a notification.	User should receive a notification before the course starts.	True	Pass

6. Conclusion and Future Enhancement

Conclusion

The Learning Management System (LMS) provided in this mini-project shows how several web technologies can be put together to have a robust platform for managing online courses. However with solutions in embedded systems, cost of use, ease of use and availability is at the center while catering for smaller institutions and individual educators requiring a cost-effective, straightforward way to communicate with their students.

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Future Enhancement

As the implementation of the current project delivers a basic LMS with necessary functionalities: further improvement can be done in the future as such:

- **Mobile Application:** Building the mobile versions (Android/iOS) to help students, instructors access to the LMS easily as they move. Check It Out
- **Real-time Communication:** Incorporate live chats or video chatting for live interaction with students and teachers. Gamification: Incorporate elements of gamification: badges, leaderboards, and quizzes to further engage and motivate students. Advanced Reporting and Analytics - roll out advanced report and analytics for monitoring student attendance, performance, course engagement, and system-level activity.
- **Third-party Integration:** Bring in third-party tools such as Google Drive, Zoom, or Dropbox to share and work on content at the push of a button.
- **AI-Powered Features:** Deploy AI-centric recommendations such as the course recommendation, learning paths, and assessments as per the student's performance and behaviour.

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