AI & Data Science Learning Platform

Project Overview:

1.1. Purpose :

We are developing a specialized learning platform focused on providing exceptional education for AI and Data Science. This platform is designed for students and professionals who want to learn or improve their skills in these exciting fields. It will include various types of interactive learning materials, such as video lessons, audio guides, written content, and practical simulations, making learning both engaging and effective.

1.2. Platform Features and Objectives:

The AI and Data Science platform aims to provide a personalized and adaptive learning experience, helping each student progress at their own pace. Key features include:

- **Adaptive Learning Paths:** Custom learning pathways tailored to each student's goals and progress.
- **Progress Tracking:** Tools that allow students to track their progress and performance over time.
- **Interactive Elements:** Quizzes, simulations, and discussion forums to keep students engaged and deepen their understanding.
- **Content Management:** A user-friendly system that allows course creators to upload and organize content without needing technical skills.
- **Scalability and Accessibility:** The platform is designed to support a growing number of users and is optimized for accessibility, ensuring a seamless experience for all users, including those with disabilities.

1.3. Development Approach:

We are using the **Agile methodology** to build this platform.

Why Agile?

Agile is a flexible, step-by-step approach to development where the project is broken into parts called "sprints." Each sprint focuses on specific features, allowing quick adjustments, feedback, and response to changes. This is ideal for a learning platform that will need to adapt based on user feedback and evolving needs. Agile’s step-by-step process lets us test and improve accessibility (like screen-reader compatibility and keyboard navigation) during each sprint, ensuring the platform is inclusive for all.

2. Requirements Specification

2.1. Functional Requirements:

1. **User Registration and Login:** The platform should enable secure user registration and login, allowing users to create accounts using an email address and a password. This functionality should include error handling for invalid credentials and account lockout mechanisms after multiple failed login attempts.
2. **Role-Based Access Control:** The platform must implement role-based access control, allowing permissions and content access to vary based on user roles (e.g., student, educator, admin). Each role should have a customizable set of permissions, such as accessing courses, uploading content, or managing user accounts.
3. **Adaptive Learning Paths:** The platform should create personalized learning pathways for each student based on their goals, progress, and preferences. This includes dynamically adjusting content recommendations and suggesting modules to match each user's unique learning journey.
4. **Progress Tracking:** The platform should track students' progress by recording completed lessons, quizzes, and module scores. Both students and instructors should have access to detailed analytics on progress over time, displayed as visual graphs and reports.
5. **Content Management System (CMS):** Instructors and course creators should be able to use a CMS that allows them to easily upload, organize, and edit various types of educational content, including text, images, audio, video, and interactive simulations. This CMS should be intuitive and not require technical expertise.
6. **Interactive Elements:** The platform should support interactive learning elements, such as quizzes, simulations, and discussion forums, to keep students engaged. Quizzes should include multiple question types (e.g., multiple-choice, true/false) with automated grading and feedback.
7. **Course Content Updates:** Instructors should be able to update, edit, or remove existing content, including lessons and quizzes, ensuring that course materials remain relevant and up-to-date.
8. **Notifications and Reminders:** Users should receive timely notifications and reminders for upcoming deadlines, assignment due dates, or incomplete modules. Notifications should be customizable and delivered via in-app messages and, optionally, email.
9. **Database Design:** The platform should have a structured and secure database capable of managing and storing user data, course content, and progress tracking. It should support efficient queries and allow data storage and retrieval without performance issues.

10. **User Story Creation:** The platform should support the creation of user stories to capture needs for different roles, such as students and instructors. Each user story should specify user actions, desired outcomes, and any specific requirements unique to that role.
11. **Mobile Responsiveness:** The platform should be fully responsive, allowing users to access and navigate content easily on various devices (e.g., desktops, tablets, smartphones). The user interface should adapt to different screen sizes, ensuring an optimal experience across devices.
12. **Multimedia Support:** The platform should support multimedia content, including videos, audio clips, and interactive visualizations, to enhance the learning experience. Multimedia should load quickly, offer controls (e.g., play/pause, rewind), and be compatible with multiple browsers.
13. **Forum for Student Discussions:** Students should be able to participate in discussions and ask questions in a forum, enabling collaborative learning. The forum should support threaded discussions, tagging, and a "like" feature for responses.
14. **Performance Analytics for Instructors:** Instructors should have access to a dashboard with analytics tools that provide insights into student performance. This includes metrics such as average quiz scores, completion rates, and most challenging topics.
15. **Search Functionality:** The platform should include a search feature that allows users to search for specific courses, lessons, or keywords within the platform. The search results should display relevant content and filter options (e.g., by date or content type).
16. **Content Recommendations:** The platform should offer recommendations for additional courses or lessons based on a student's interests, learning path, and progress. Recommendations should appear on the dashboard, dynamically updating based on user behavior.
17. **Quiz and Assessment Module:** Quizzes and assessments should be integrated within each course, allowing students to test their knowledge after completing lessons. Quizzes should have automated grading, immediate feedback, and detailed explanations of correct answers.
18. **User Profile Management:** Users should be able to create and manage their profiles, updating their contact information, password, and learning preferences. Profiles should also display a summary of completed courses, scores, and other relevant information.
19. **Feedback Collection:** The platform should allow users to provide feedback on courses and the overall learning experience. Feedback forms should be available at the end of each course, and an option to provide additional feedback should be accessible on the platform.
20. **Admin Dashboard:** An admin dashboard should enable administrators to monitor platform usage, manage users, and oversee content uploads and course enrollments. The dashboard should display real-time data, including the number of active users, new registrations, and any flagged content.

21. **Logout Functionality:** The platform should allow users to securely log out from any device, ending their session. The logout feature should ensure that the user's session is closed entirely, preventing unauthorized access.
22. **Remember Me Option:** The platform should provide a "Remember Me" option on the login page. When selected, this feature will keep users logged in after closing the browser, with the ability to disable it in account settings for enhanced security.

2.2. Non-Functional Requirements:

1. **Scalability**: The platform should support a minimum of 10,000 concurrent users without a noticeable decrease in performance. This requires a scalable architecture that can handle growing user demands and adjust resources dynamically as needed.
2. **Accessibility Compliance**: The platform must comply with ADA standards, supporting screen readers, keyboard navigation, and other assistive technologies to ensure it is accessible to users with disabilities. Compliance should be verified with automated accessibility testing tools.
3. **System Availability**: The platform should maintain a minimum uptime of 99.9%, allowing users to access it reliably. Scheduled maintenance should be communicated to users, and unplanned downtime should be minimized through failover systems.
4. **Performance**: Page load times across the platform should not exceed 3 seconds for standard pages under normal load conditions. Critical pages, such as the login and course dashboards, should prioritize speed to avoid user frustration.
5. **Data Security**: All user data must be encrypted in transit using HTTPS and at rest using AES-256 encryption. Security protocols should meet industry standards to protect sensitive information and prevent unauthorized access.
6. **Cross-Browser Compatibility**: The platform must be fully compatible with major web browsers (Chrome, Firefox, Safari, Edge), maintaining consistent performance and design across these platforms without layout issues.
7. **Responsiveness**: The platform should be responsive on mobile devices, including iOS and Android, ensuring that all features are accessible and visually optimized for different screen sizes, from mobile phones to tablets.
8. **User Interface Consistency**: The platform's user interface (UI) should maintain a consistent design language, color scheme, and layout across all modules. This consistency helps users navigate easily and reduces learning curves for new features.
9. **Data Backup**: Daily data backups should be conducted to protect against accidental data loss or system failures. These backups should be securely stored offsite and retained for a minimum of 30 days.

10. **Load Handling**: The platform should handle high-traffic periods without degradation in performance. This includes maintaining page load speeds and response times during peak usage, especially during events like online quizzes or assessments.
11. **Error Recovery**: In case of a system crash or failure, the platform should have mechanisms to recover and resume normal operation within 5 minutes, minimizing disruption to users' learning experiences.
12. **Logging and Auditing**: The platform should log all user activities, including logins, content interactions, and profile updates, to support auditing and compliance. Logs should be stored securely and retained for at least 6 months.
13. **Localization**: The platform should support multiple languages, enabling users from different regions to navigate and interact in their preferred language. This includes translated content, localized date formats, and adaptable UI text.
14. **Resource Utilization**: CPU and memory usage should remain below 75% under standard operating conditions to ensure efficiency and prevent system slowdowns, even as user numbers and platform content grow.
15. **Data Consistency**: The platform must maintain data consistency across sessions and devices. For instance, progress tracking, quiz results, and content availability should be synchronized accurately in real time.
16. **User Feedback Processing**: The platform should collect and analyze user feedback monthly, prioritizing and addressing any reported issues to improve usability and enhance the user experience.
17. **Content Loading Time**: Multimedia content, such as videos, should load within 2 seconds on average, preventing long delays and buffering. This requirement helps keep users engaged and improves the perceived speed of the platform.
18. **Compliance with Data Protection Regulations**: The platform should adhere to GDPR or similar data protection laws, ensuring that user data handling meets regulatory standards. This includes clear policies on data storage, access, and user consent.
19. **Automated Testing**: The platform should undergo automated regression testing with each sprint to ensure new features do not introduce issues to existing functionality, reducing the risk of bugs in the production environment.
20. **Audit Trail**: All modifications to user data and course content should be traceable, creating a detailed audit trail. This includes tracking changes to courses, user roles, and permissions for accountability and compliance purposes.
21. **Usability Testing**: Usability testing should be conducted semi-annually to ensure the platform meets user needs and expectations. This testing should target an average task completion rate of 90% or higher to confirm ease of use.

22. **Data Retrieval Speed**: Data retrieval actions, such as loading user progress and analytics, should be completed within 2 seconds on average, ensuring quick access to critical information and enhancing the user experience.

3. Activities:

1- Requirements Gathering and Planning:

Description: Meet with stakeholders, to understand what the platform needs to accomplish.Clear requirements help guide all future sprints and make sure we stay aligned with FutureLearning's goals.

Duration: 1-2 weeks

Dependencies: -

2- Designing User Interface (UI) and User Experience (UX)

Description: The platform will be easy to navigate, accessible to all students, including those with disabilities, and will function smoothly across all devices.

Duration: 2-3 weeks

Dependencies: Requirements Gathering

3- Setting up Development Environment and Initial Architecture

Description: Set up the development environment and establish the technical architecture to ensure the platform can scale effectively and support multimedia content requirements.

Duration: 1 week

Dependencies: Requirements Gathering, initial UI/UX designs

4- Database Design and Setup

Description: Design the database to manage and store user data, course content, progress tracking, and analytics.

Duration: 1 week

Dependencies: Technical architecture

5- User Story Creation

Description: Develop user stories for different roles (students, instructors) and their needs.

Duration: 1 week

Dependencies: Initial Requirements Gathering.

6- Sprint Planning Session

Description: Organize meetings to select user stories for the next sprint.

Duration: 1 Week

Dependencies: User Story Creation.

7- Content Management Module (Sprint 1)

Description: Develop a module that allows course creators to upload and organize content (text, video, audio, interactive elements).

Duration: 2-3 weeks

Dependencies: Technical architecture

8- User Authentication and Authorization

Description: Set up secure login, registration, and role-based access (e.g., student, educator, admin) and logout.

Duration: 2 weeks

Dependencies: Database setup, content management

9- Progress Tracking and Analytics (Sprint 2)

Description: Implement a tracking system that records student progress and provides analytics for students and educators.

Duration: 2-3 weeks

Dependencies: User authentication

10- Personalized Learning Pathways (Sprint 3)

Description: Develop features that adapt learning pathways based on individual student progress, interests, and goals.

Duration: 2-3 weeks

Dependencies: Progress tracking

11- Interactive Features (Quizzes, Simulations, Discussion Forums) (Sprint 4)

Description: Build interactive elements like quizzes, forums, and simulations to enhance engagement and understanding.

Duration: 3-4 weeks

Dependencies: Content management, personalized pathways

12- Accessibility Testing and Optimization

Description: Conduct tests to ensure ADA compliance and make adjustments to enhance accessibility for users with disabilities.

Duration: 1-2 weeks

Dependencies: UI/UX, interactive features

13- Notifications and Reminders Module

Description: Add notifications for important events (assignment deadlines, upcoming quizzes, reminders to complete a module).

Duration: 1 week

Dependencies: Progress tracking, interactive features

14- Mobile Responsiveness and Cross-Platform Testing

Description: Ensure the platform works seamlessly on different devices, including phones, tablets, and desktops.

Duration: 1-2 weeks

Dependencies: UI/UX, interactive features

15- Security Measures and Data Protection:

Description: Implement data protection measures, secure sensitive information, and complete a security audit.

Duration: 1-2 weeks

Dependencies:All previous development tasks (this includes tasks such as the platform's core development, user interface design, content management, accessibility features, interactive tools, and any other functionality being built.)

16- Final Testing, Quality Assurance (QA), and Launch Preparation

Description: Conduct a thorough review to identify and fix bugs. Perform QA testing to ensure all features work seamlessly, followed by final launch preparations.

Duration: 2 weeks

Dependencies: Completion of all features.

4. TEST PLAN

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULTS
TC-001	Verify successful user registration with valid credentials.	1-Navigate to the platform URL. 2-Click on "Register." 3-Enter a valid email and password. 4-Submit the registration form.	**URL:** [PLATFORM URL] **Email:** {test email} **Password:** {test password}	Users should be registered and redirected to the login page.
TC-002	Verify login functionality with correct credentials.	1-Navigate to the platform URL. 2-Enter registered email and password. 3-Click "Login."	**Email:** {test email} **Password:** {test password}	Users should be registered successfully and redirected to the login page.
TC-003	Verify error handling for invalid login credentials.	Attempt login with incorrect email or password.	**Email:** {wrong email} **Password:** {wrong password}	System should display an error message for invalid credentials.

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULTS
TC-004	Verify account lockout mechanism after multiple failed login attempts.	1-Navigate to the platform URL. 2-Enter valid registered email and incorrect password. 3-Attempt to log in. Repeat steps 2-3 for the specified number of times to trigger lockout (e.g., 5 attempts). 4-Attempt to log in once more with the correct password.	**URL:** [PLATFORM URL] **Email:** {test email} **Incorrect Password:** {wrong password} **Correct Password:** {correct password} **Maximum Attempts Before Lockout:** {5}	1-After the specified number of failed attempts, the account should be locked, displaying an error message indicating account lockout. 2-Further login attempts, even with the correct password, should be denied with a lockout message until the lockout period expires or an admin unlocks the account.
TC-005	Verify access control based on user roles.	1-Log in as a student, educator, and admin. 2-Attempt to access role-specific features.	**Roles:** {Student, Educator, Admin}	1-Students access learning materials only. 2-Educators access content management. 3-Admins access user and content management.

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULT
TC-006	Verify personalized learning paths.	1-Register as a new student. 2-Enter preferences and goals. 3-Complete a module.	**Goal:** Beginner in Data Science.	System customizes a learning path and updates recommendations based on user progress.
TC-007	Verify progress tracking for completed lessons.	1-Log in as a student. Complete a lesson and quiz. 2-Check progress dashboard.	**Course:** *Introduction to Data Science.* **Lesson:** *Data Science Basics* **Quiz Score:** *80%*	Dashboard should show completed lessons, quiz scores, and progress.
TC-008	Verify instructor ability to upload content.	1-Log in as an instructor. 2-Upload text, video, and quiz content for a new lesson.	**Lesson Title:** *Introduction to AI*	Content should be uploaded and accessible in the course.

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULT
TC-009	Verify quiz functionality with multiple question types.	1-Log in as a student. 2-Attempt a quiz with multiple-choice, true/false, and short answer questions.	**Course:** Intro to ML **Lesson:** Supervised Learning VS Unsupervised Learning **Quiz Questions:** MCQs True/False	Quiz should grade automatically and provide feedback.
TC-010	Verify content update capability for instructors.	1-Log in as an instructor. 2-Edit existing course material.	**Course:** Fundamentals of DL **Lesson:** Neural Networks **Original Content:** Neural networks are inspired by the structure of the human brain. **Updated Content:** Neural networks are a set of algorithms, modeled loosely after the human brain, that are designed to recognize patterns.	Content should update and be immediately reflected for students.

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULT
TC-011	Verify reminder notifications for upcoming deadlines.	1-Log in as a student. 2-Set due dates for assignments .	**Course:** Advanced Data Analytics **Assignments:** Project Proposal Submission **Due Date:** Set a date 1 day from now **QUIZ:** WEEK 1 QUIZ **Due Date:** Set a date 2 days from now **Notification Settings:** Email reminders enabled	Notifications should be displayed in-app and sent via email if enabled.
TC-012	Verify secure storage of user data.	1-Register a new user and complete a lesson.	Completed Lesson: "Introduction to AI" Lesson 1: “Basics of Artificial Intelligence"	Data should be stored in a secure and accessible format.

		2-Check if data is securely stored and retrievable.	User Data Fields to Check: User details Progress tracking Security measures	

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULT
TC-013	Verify user story creation for role-specific requirements.	Create a user story for a student.	**Role:** Student **User Story:** **Title**: Student Learning Progress Tracking **User Action:** As a student, I want to view my progress after completing each lesson. **Desired Outcome:** The progress dashboard updates to show lessons completed and quiz scores immediately after each activity.	Create a user story for a student.

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULT
TC-014	Verify mobile responsiveness on various devices.	Access the platform on desktop, tablet, and smartphone.	**User Action:** As a student, I want to view the platform on desktop, tablet, and smartphone to ensure proper layout. **Desired Outcome:** The layout should adjust accordingly to each device's screen size, and all content should be accessible.	Layout should adapt to screen sizes, with content fully accessible
TC-015	Verify multimedia support for video and audio playback.	Access a video and audio lesson.	**User Action:** As a student, I want to access video and audio lessons with proper playback controls. **Desired Outcome:** The media content should load quickly with play, pause, and rewind controls working correctly.	Content should load quickly with play/pause/rewind controls.

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULT
TC-016	Verify student forum functionality.	1-Log in as a student. 2-Post, reply, and like in a discussion.	**User Action:** As a student, I want to post, reply, and like posts in the forum to engage with others. **Desired Outcome:** Posts should appear in the correct threads, and interactions such as replies and likes should be allowed.	Posts should appear in threads, and interactions should be allowed.
TC-017	Verify analytics dashboard for instructors.	1-Log in as an instructor. 2-View analytics for student performance.	**User Action:** As an instructor, I want to view performance analytics for my students. **Desired Outcome:** The dashboard should display data such as quiz scores, completion rates, and areas where students are struggling.	Dashboard should show quiz scores, completion rates, and difficult topics.

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULT
TC-018	Verify search feature within courses and lessons.	Search for specific courses and lessons by keywords.	**User Action:** As a student, I want to search for courses and lessons by keywords. **Desired Outcome:** Relevant courses and lessons should be displayed in the search results with filter options available.	Results should display relevant content with filter options.
TC-019	Verify personalized content recommendations.	1-Log in as a student. 2-View recommended lessons on the dashboard.	**User Action:** As a student, I want to see lessons recommended based on my progress and interests. **Desired Outcome:** The dashboard should recommend lessons that align with my learning history and preferences.	Recommendations should align with student progress and interests.

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULT
TC-020	Verify quiz integration with feedback on completion.	Attempt a quiz and submit answers.	**User Action:** As a student, I want to attempt quizzes, receive auto-grading feedback, and view correct answers. **Desired Outcome:** The quiz should be automatically graded, feedback should be provided, and the correct answers should be displayed after submission.	System should auto-grade, provide feedback, and display correct answers.
TC-021	Verify profile updates for personal information and preferences.	1-Log in as a student. 2-Update contact information and learning preferences.	**User Action:** As a student, I want to update my contact details and learning preferences. **Desired Outcome:** Changes made to my profile should save immediately and reflect on my profile.	Profile changes should save and reflect immediately.

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULT
TC-022	Verify feedback collection after completing a course.	Complete a course and access feedback form.	**User Action:** As a student, I want to fill out a feedback form after completing a course. **Desired Outcome:** A feedback form should be available, and submissions should be stored correctly.	Feedback form should be available and submissions stored.
TC-023	Verify admin dashboard for platform management.	1-Log in as admin. 2-Access usage statistics, user managemen t, and content oversight.	**User Action:** As an admin, I want to view user statistics, content performance, and user management options. **Desired Outcome:** The admin dashboard should display real-time data on user activity, registrations, and flagged content.	Dashboard should display real-time data on active users, registrations, and flagged content.

TEST CASE ID	OBJECTIVE	STEPS	TEST DATA	EXPECTED RESULT
TC-024	Verify secure logout functionality.	Log in as a user and log out.	**User Action:** As a student, I want to securely log out after completing my session. **Desired Outcome:** User session should end securely, and re-login should be required for access."	User session should end, and re-login should be required.
TC-025	Verify "Remember Me" option on login.	Select "Remember Me" during login.	**User Action:** As a student, I want to remain logged in after closing and reopening the platform unless I manually log out. **Desired Outcome:** Selecting 'Remember Me' should keep the user logged in across sessions.	User remains logged in across sessions unless manually logged out.

5. Project Plan

5.1. PERT CPM CHART

TABLE 2.1: ACTIVITY LIST FOR FUTURE LEARNING

Activity	Description	Duration	Dependencies
A	Requirements Gathering and Planning	1-2 weeks	—--
B	Designing User Interface (UI) and User Experience (UX)	2-3 weeks	A
C	Setting up Development Environment and Initial Architecture	1 week	A,B
D	Database Design and Setup	1 week	C
E	User Story Creation	1 week	A
F	Sprint Planning Session	1 week	E
G	Content Management Module (Sprint 1)	2-3 weeks	C
H	User Authentication and Authorization	2 weeks	D,G
I	Progress Tracking and Analytics (Sprint 2)	2-3 weeks	H
J	Personalized Learning Pathways (Sprint 3)	2-3 weeks	I
K	Interactive Features (Quizzes, Simulations, Discussion Forums) (Sprint 4)	3-4 weeks	G,J
L	Accessibility Testing and Optimization	1-2 weeks	B,K
M	Notifications and Reminders Module	1 weeks	I,K
N	Mobile Responsiveness and Cross-Platform Testing	1-2 weeks	B,K
O	Security Measures and Data Protection	1-2 weeks	All previous development tasks

Activity		ES	EF	LS	LF	Slack
P	Final Testing, Quality Assurance (QA), and Launch Preparation	2 weeks		O		

TABLE 2.2: THE PATH AND PATH LENGTH

PATH	LENGTH
A -> B -> C -> D -> H -> I -> J -> K -> L -> O -> P	2+3+1+1+2+3+3+4+2+2+2 = 25
A -> E -> F -> O -> P	2+1+1+2 +2 = 8
A -> B -> C -> G -> K -> L -> O -> P	2+3+1+3+4+2+2+2 = 19
A -> B -> C -> D -> H -> I -> M -> O -> P	2+3+1+1+2+3+1+2+2 = 17
A -> B -> C -> D -> H -> I -> N -> O -> P	2+3+1+1+2+3+2+2+2 = 18

Scheduling Individual Activities:

Calculating ES and EF (Forward Pass)

For each activity: EF = ES + Duration

Calculating LS and LF (Backward Pass)

For each activity:LS = LF - Duration

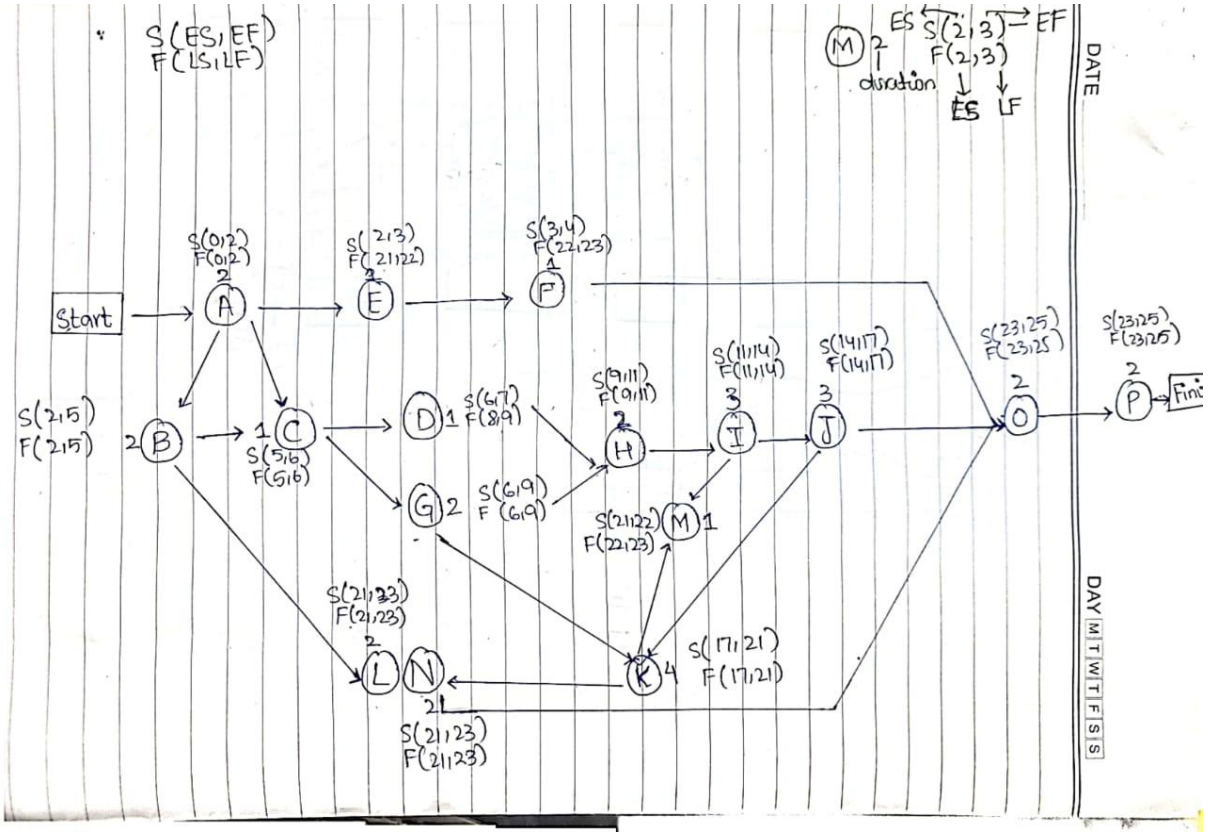
Slack Calculation

For each activity: Slack = LS - ES (or LF - EF)

Requirements Gathering and Planning	0	2	0	2	0
UI/UX Design	2	5	2	5	0
Setting up Development Environment and Initial Arch.	5	6	5	6	0
Database Design and Setup	6	7	8	9	2
User Story Creation	2	3	21	22	19
Sprint Planning Session	3	4	22	23	19
Content Management Module (Sprint 1)	6	9	6	9	0
User Authentication and Authorization	9	11	9	11	0
Progress Tracking and Analytics (Sprint 2)	11	14	11	14	0
Personalized Learning Pathways (Sprint 3)	14	17	14	17	0
Interactive Features (Quizzes, Simulations, Forums)	17	21	17	21	0
Accessibility Testing and Optimization	21	23	21	23	0
Notifications and Reminders Module	21	22	22	23	1

Mobile Responsiveness and Cross-Platform Testing	21	23	21	23	0
Security Measures and Data Protection	23	25	23	25	0
Final Testing, Quality Assurance (QA), and Launch	25	27	25	27	0

NETWORK DIAGRAM:



Critical Path:

The critical path is **A -> B -> C -> D -> H -> I -> J -> K -> L -> O -> P**, with a total duration of **25 weeks**.

6. System Design:

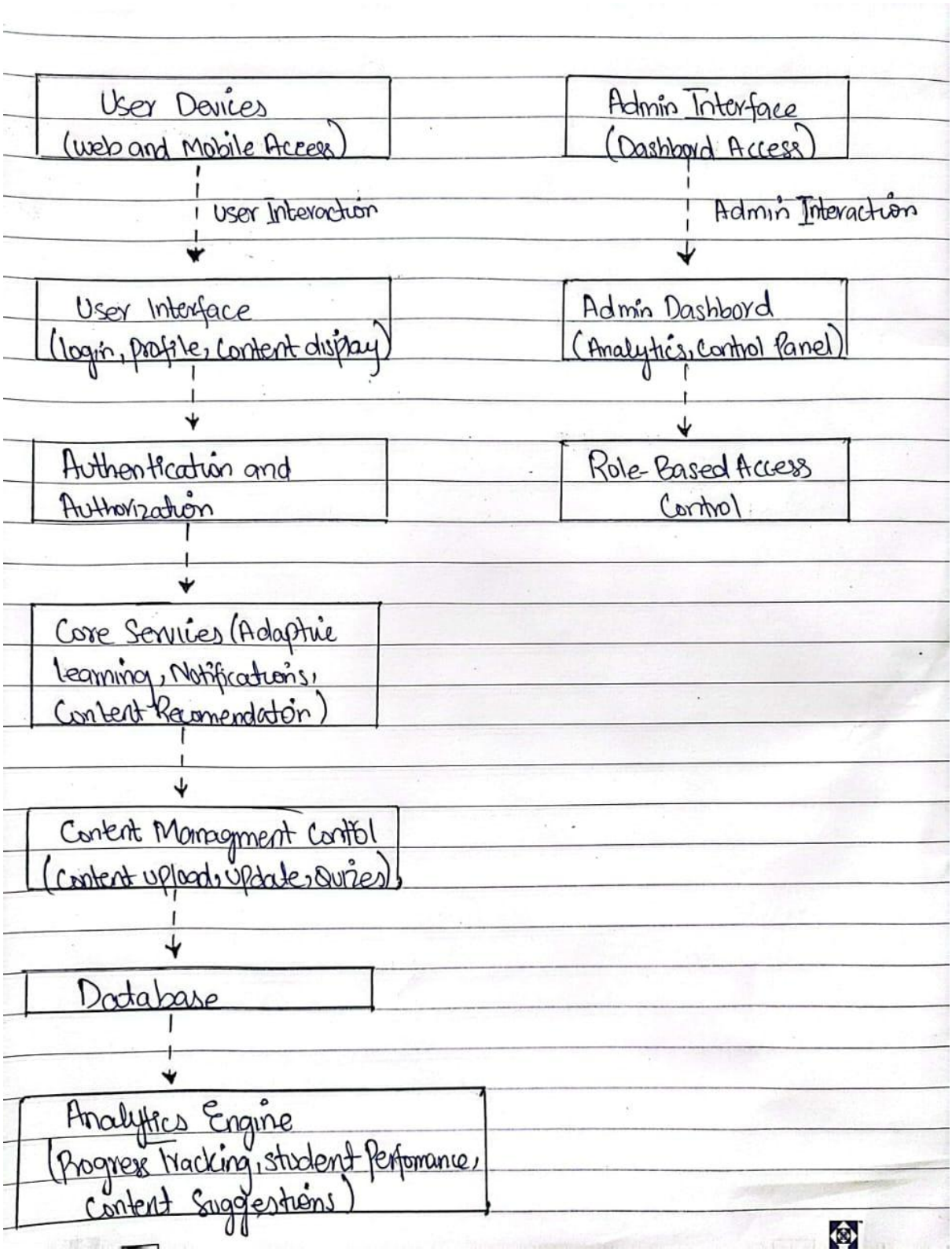
6.1. Architectural Diagram:

The architectural diagram represents the framework and flow of the FutureLearning platform, emphasizing how its core components interact to deliver a seamless and efficient user experience. Each layer in the architecture is designed to meet specific functional requirements while ensuring scalability, security, and user engagement. Breakdown of its purpose:

- User Interaction and Accessibility: The diagram highlights how users (students, educators, and administrators) access the platform through web and mobile devices. The User Interface and Admin Dashboard enable role-based functionalities tailored to their needs, such as accessing courses, managing content, and monitoring analytics.
- Authentication and Security: The Authentication & Authorization Layer ensures secure user registration and login, implementing features like role-based access control (RBAC) and account security mechanisms (e.g., account lockout). It segregates user permissions to protect sensitive data and functionality.
- Core Services: The central Core Services layer encompasses adaptive learning paths, content recommendations, and notifications. This ensures personalized and dynamic learning experiences for students based on their preferences, progress, and goals.
- Content Management and Updates: The Content Management System (CMS) provides instructors with tools to create, update, and manage multimedia content. It also supports interactive learning elements like quizzes and discussion forums to enhance student engagement.
- Database and Analytics: The Database stores structured data, including user profiles, course materials, and progress tracking, ensuring efficient data management. The Analytics Engine leverages this data to provide insights into student performance and content effectiveness, enabling instructors and admins to make informed decisions.

- System-wide Scalability and Responsiveness: The architecture is designed to ensure mobile responsiveness, multimedia compatibility, and real-time

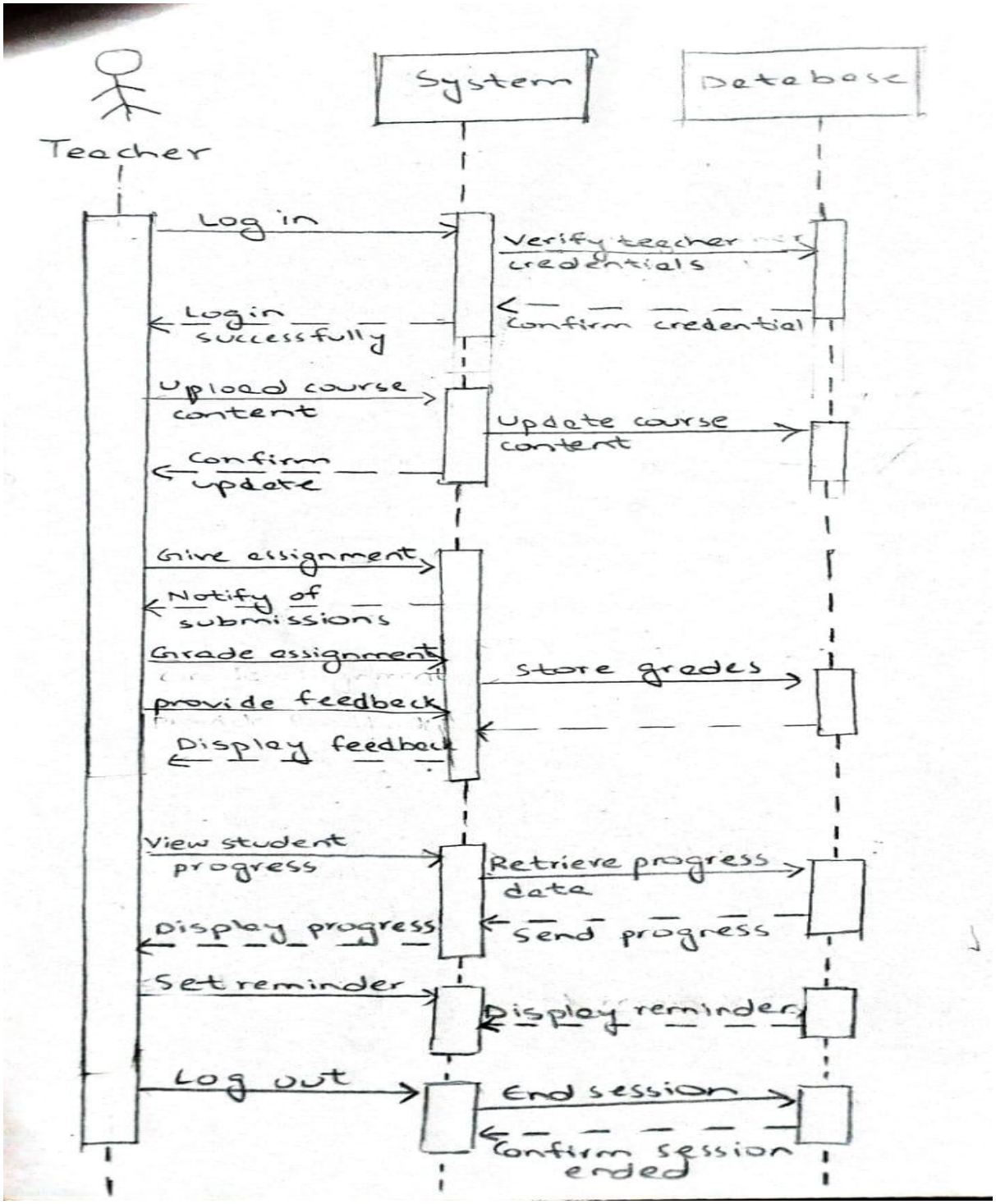
notifications. This supports the platform's goal of providing a user-friendly and adaptive learning environment.



7. SEQUENCE DIAGRAM:

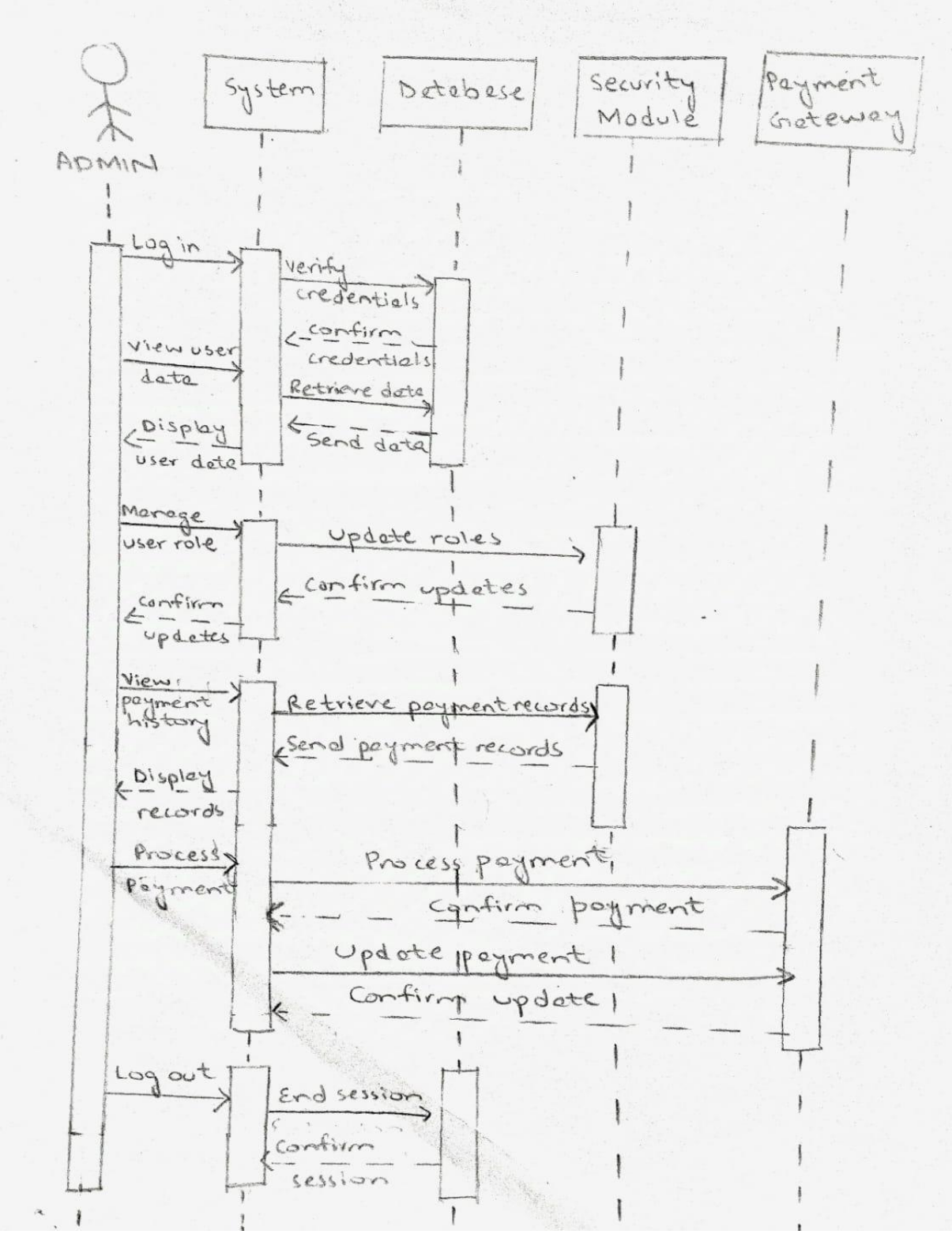
1.INTERACTION OF TEACHER WITH SYSTEM :

This sequence diagram illustrates the comprehensive interactions between a teacher and the learning management system, covering course creation, content management, student enrollment, lesson planning, grading, progress tracking, and notifications.



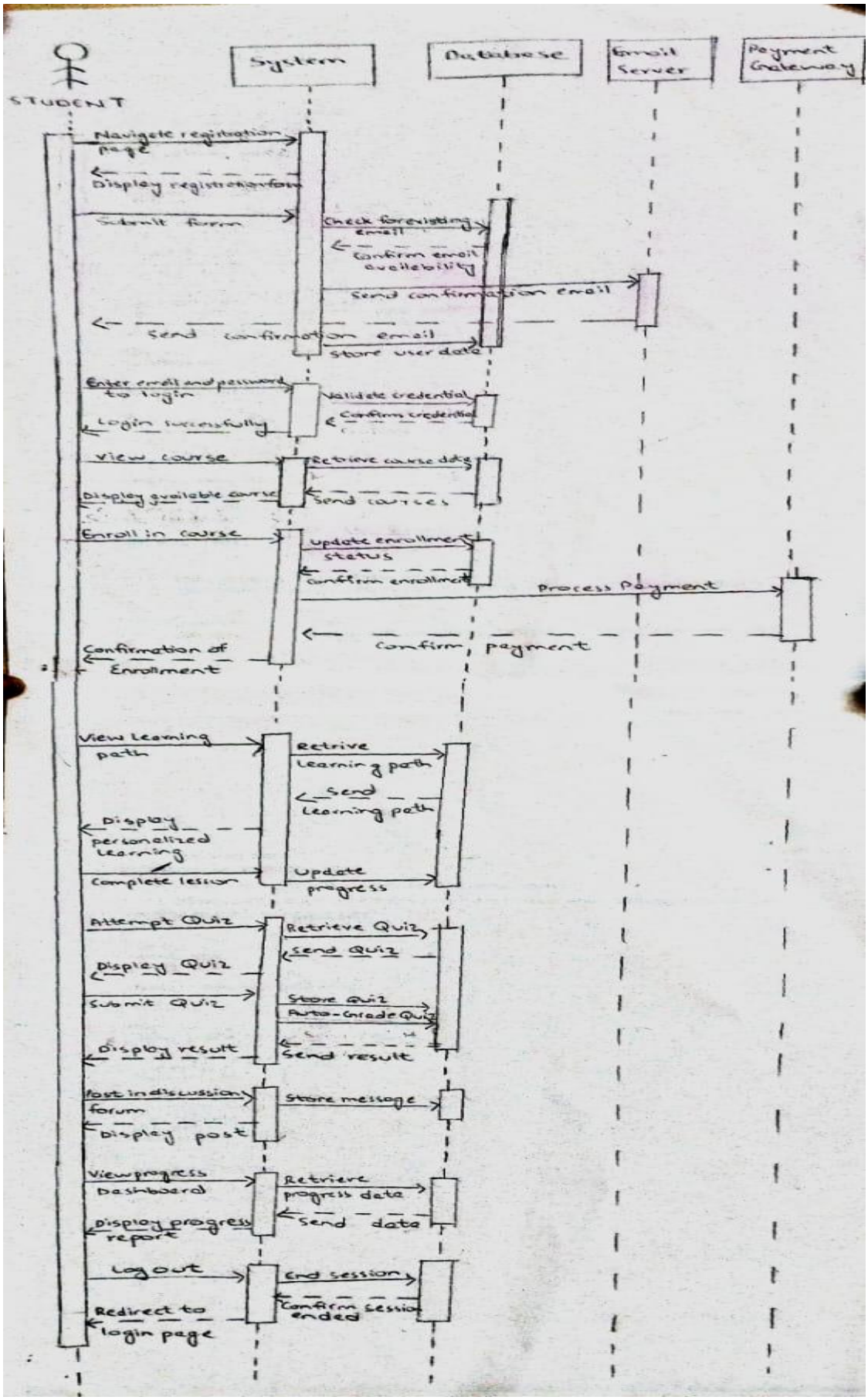
2.INTERACTION OF ADMIN WITH SYSTEM :

This sequence diagram illustrates the interactions between the Admin and the System, focusing on platform management, payment management, security, notifications, analytics, and review users data .



3.INTERACTION OF STUDENT WITH SYSTEM :

This sequence diagram illustrates the interactions between a student and the learning management system, covering registration, login, course enrollment, learning path, quiz and assessment, discussion forum, progress tracking, profile management, and logout.


STUDENT
System
Database
Email Server
Payment Gateway
Navigate registration page
Display registration form
Submit form
Check for existing email
Confirm email availability
Send confirmation email
Send confirmation email
Store user data
Enter email and password to login
Validate credential
Confirm credential
Login successfully
View course
Retrive course data
Display available course
Send courses
Enroll in course
Update enrollment status
Confirm enrollment
Process Payment
Confirm payment
Confirmation of Enrollment
View Learning path
Retrive Learning path
Send Learning path
Display personalized learning
Complete lesson
Update progress
Attempt Quiz
Retrieve Quiz
Send Quiz
Display Quiz
Submit Quiz
Store Quiz
Auto-Grade Quiz
Send result
Display result
Post in discussion forum
Store message
Display post
View progress Dashboard
Retrieve progress data
Send data
Display progress report
Log out
End session
Confirm session ended
Redirect to login page