Academic Platform

A Professional Report Summary

Introduction

Brief Overview

This project presents a comprehensive and scalable **Academic Platform** tailored for modern university environments. Designed to streamline both teaching and learning processes, it integrates key functionalities such as course management, assessments, and secure user profiling. Drawing inspiration from established systems like Moodle, this platform introduces an intuitive interface and supports role-based access for students and instructors alike.

Among its primary features are the ability to manage quizzes, assignments, practical work submissions, and collaborative tools, all within a unified interface. Users are empowered to securely view and update their profiles, ensuring data privacy and personalization.

Security and data integrity are ensured through hashed password authentication and a role-verification mechanism based on a pre-approved matricule list. At its core, the system is backed by a relational database, enabling efficient storage and retrieval of academic records, user profiles, and course content.

The result is a functional, extensible, and user-focused academic environment that promotes engagement, consistency, and streamlined workflows between all educational stakeholders.

Outline of the Report

This report provides a detailed overview of the development process, design considerations, and technical solutions implemented. It is structured as follows:

- **Analysis and Specifications:** Defines the core functional and non-functional requirements, complemented by a comprehensive Use Case Diagram that models system interactions and user flows.
- **Software Design:** Explores the overall software architecture through a Package Diagram and supporting UML models including Class, Sequence, and State Machine diagrams. This section emphasizes system modularity and scalability.
- **Implementation:** Documents the chosen technology stack, including programming languages, backend frameworks, libraries, and APIs. It also highlights implementation strategies and development best practices.
- **User Guide:** Offers an illustrated walkthrough of the platform's features with annotated screenshots to ensure ease of adoption for end users, focusing on usability and accessibility.
- **Conclusion and Perspectives:** Summarizes the project outcomes, discusses encountered limitations, and proposes future directions to enhance platform functionality, scalability, and user satisfaction.

Analysis and Specifications

Functional Requirements

Role	**Action**	**Description**
Student	Register	Create an account using valid university credentials.
Student	Login	Authenticate using matricule and password.
Student	View	Access available courses, quizzes, exercises, and practical works.
Student	Submit	Submit completed quizzes and practical works.
Student	Search	Search by course, quiz, exercise, or practical work.
Student	Profile View/Edit	View and modify personal profile information.
Student	Logout	Safely exit the platform.
Teacher	Register	Sign up using verified institutional credentials.
Teacher	Login	Access teaching dashboard via login.
Teacher	Manage Courses	Add, edit, or delete course materials.
Teacher	Manage Exercises	Add, edit, or delete exercises.
Teacher	Manage Quizzes	Add, edit, or delete quizzes.
Teacher	Manage Practical Works	Add practical works and view student submissions.
Teacher	Profile View/Edit	View and update personal profile.
Teacher	Logout	Securely log out of the system.

Table 1: Functional Requirements by User Role

Use Case Diagram:

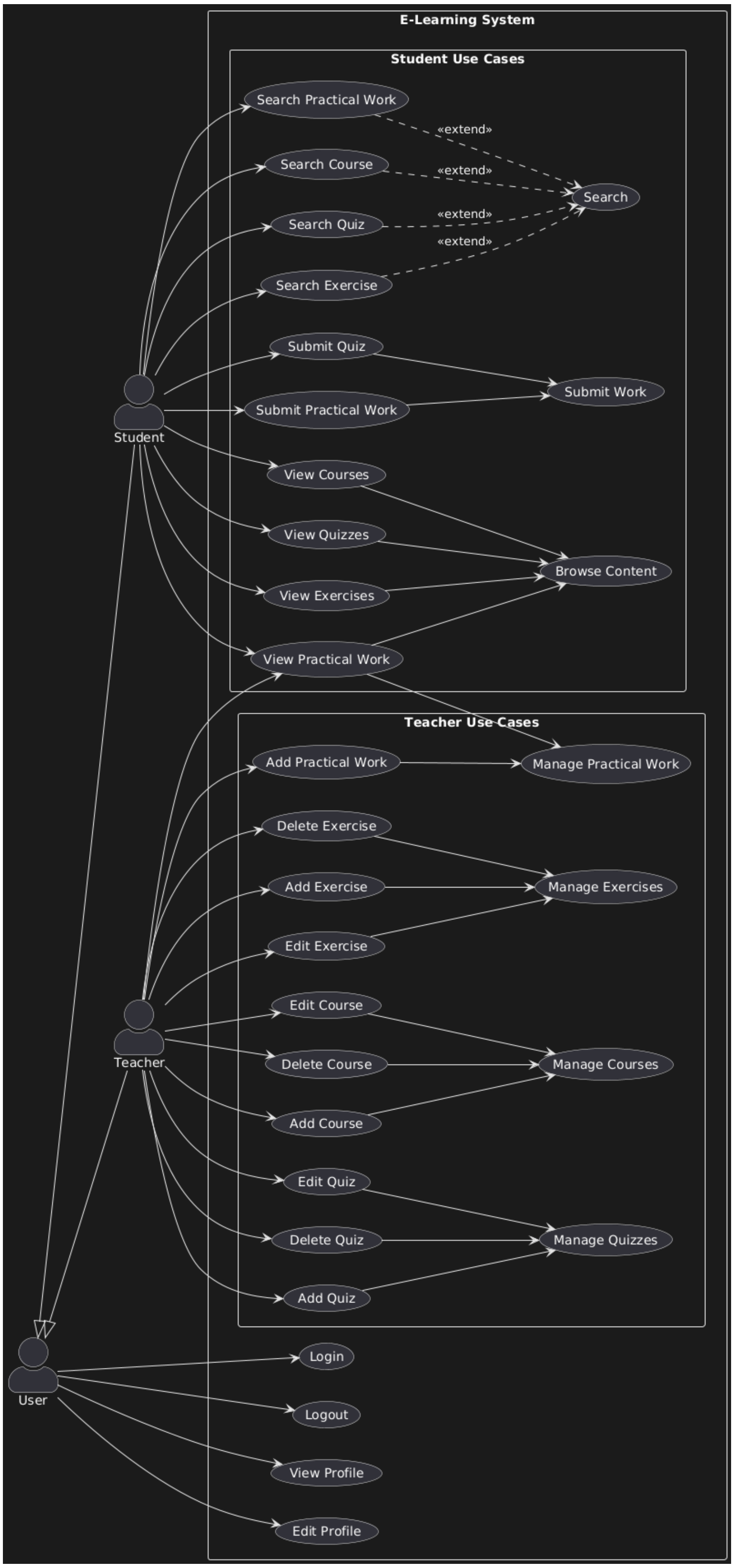


Figure 1: PlantUML use case Diagram

Non-Functional Requirements

In addition to the core functionalities, the Academic Platform adheres to several non-functional requirements that ensure its performance, reliability, and user satisfaction. These requirements define how the system operates rather than what it does.

Performance

The platform is optimized to support multiple concurrent users (teachers and students) with no noticeable lag or delay. Database operations, including content loading and submission handling, are optimized for quick execution (under 2 seconds in normal conditions).

Security

All user passwords are securely hashed using a strong hashing algorithm before being stored. Authentication and authorization mechanisms are implemented to restrict access to valid users only. Role-based access ensures that users can only perform actions specific to their permissions (e.g., students cannot add content). The system uses parameterized SQL queries (PreparedStatements) to protect against SQL injection attacks.

Usability

The user interface is designed to be intuitive and user-friendly, supporting smooth navigation and interaction. Features are logically categorized (e.g., learning content, profile management, submissions), enhancing the overall user experience.

Maintainability

The code is modular and follows a clean structure, using layered architecture (models, services, utilities). Java naming conventions and consistent formatting practices are followed for better readability and collaboration. Exception handling and logging are in place for easier debugging and future maintenance.

Scalability

The database schema is normalized and extensible, allowing easy addition of new features (e.g., new user roles or content types). The application structure allows scaling both horizontally (adding more instances) and vertically (enhancing features).

Reliability

The platform is designed for stability and consistency, ensuring that user data is not lost or corrupted. Input validation and exception management contribute to predictable and stable system behavior.

Portability

Developed in Java, the application can be deployed on any environment that supports a Java Runtime Environment (JRE). The system does not rely on platform-specific features, enhancing its adaptability across different operating systems.

Data Integrity

Registration is restricted to users listed in a pre-validated database (ValidID), ensuring authorized access. All user actions are validated and verified against system constraints to preserve data consistency.

Accessibility

The interface design follows accessibility best practices, including readable fonts, clear layout structures, and keyboard navigability.

Logging and Debugging

System actions such as login attempts, registration, and database operations are logged for monitoring and debugging. Error messages are descriptive and help guide users in resolving issues where applicable.

Backup and Recovery

The system uses a persistent relational database backend that can be periodically exported and backed up. Recovery mechanisms can be established through standard database restoration practices.

Software Design

This section illustrates the global architecture and dynamic behavior of the system using standard UML diagrams. It includes the Package Diagram for high-level structure, and Class, Sequence, and State Machine Diagrams for detailed component interactions.

Global Architecture: Package Diagram

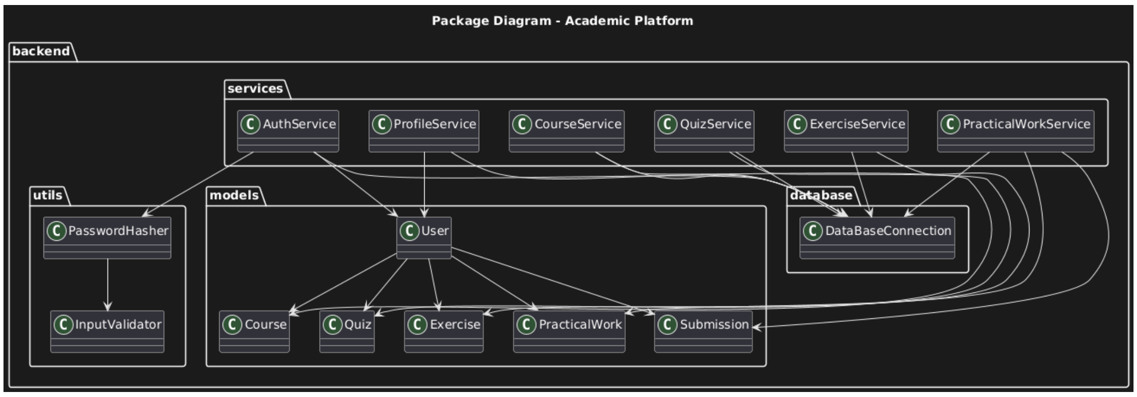
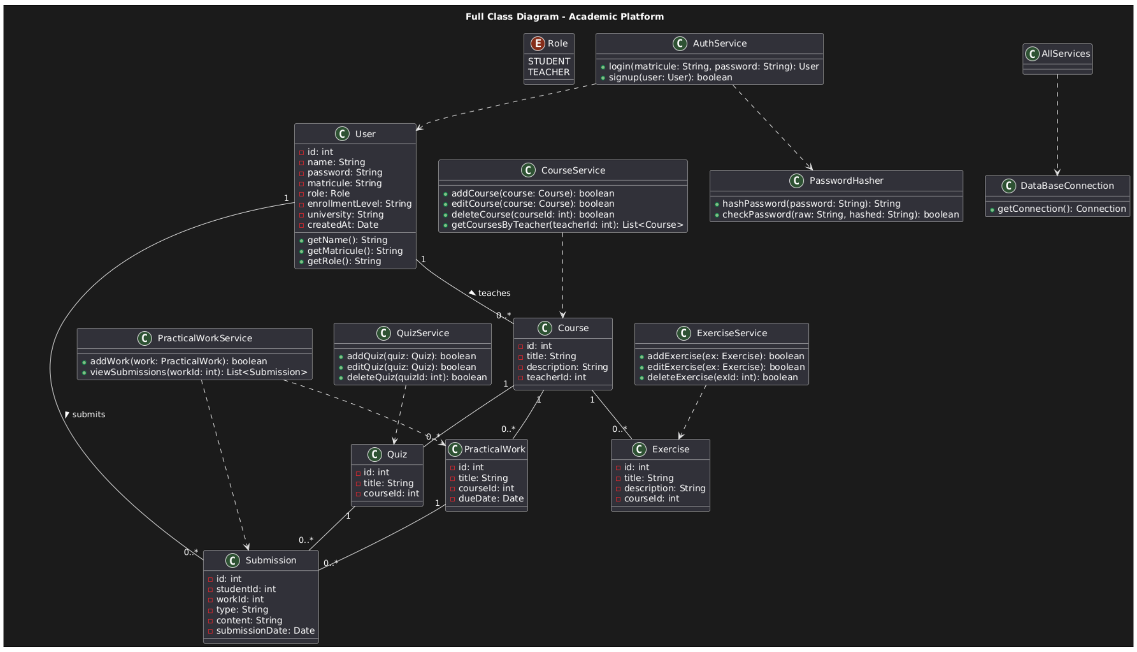


Figure 2: Global Software Architecture – Package Diagram



Full Class Diagram - Academic Platform
Role
STUDENT
TEACHER
AuthService
login(matricule: String, password: String): User
signup(user: User): boolean
AllServices
User
id: int
name: String
password: String
matricule: String
role: Role
enrollmentLevel: String
university: String
createdAt: Date
getName(): String
getMatricule(): String
getRole(): String
CourseService
addCourse(course: Course): boolean
editCourse(course: Course): boolean
deleteCourse(courseId: int): boolean
getCoursesByTeacher(teacherId: int): List<Course>
PasswordHasher
hashPassword(password: String): String
checkPassword(raw: String, hashed: String): boolean
DataBaseConnection
getConnection(): Connection
teaches
submits
PracticalWorkService
addWork(work: PracticalWork): boolean
viewSubmissions(workId: int): List<Submission>
QuizService
addQuiz(quiz: Quiz): boolean
editQuiz(quiz: Quiz): boolean
deleteQuiz(quizId: int): boolean
Course
id: int
title: String
description: String
teacherId: int
ExerciseService
addExercise(ex: Exercise): boolean
editExercise(ex: Exercise): boolean
deleteExercise(exId: int): boolean
Quiz
id: int
title: String
courseId: int
PracticalWork
id: int
title: String
courseId: int
dueDate: Date
Exercise
id: int
title: String
description: String
courseId: int
Submission
id: int
studentId: int
workId: int
type: String
content: String
submissionDate: Date
1
0..*

Figure 3: UML Class Diagram

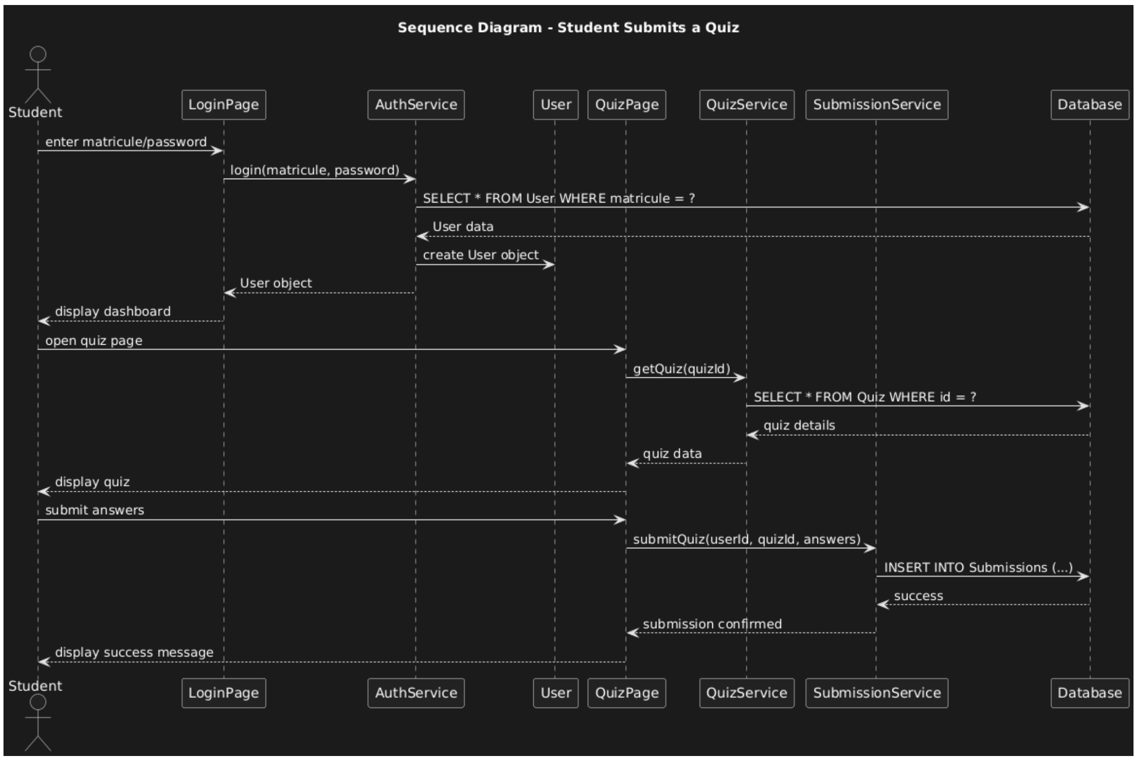


Figure 4: UML Sequence Diagram

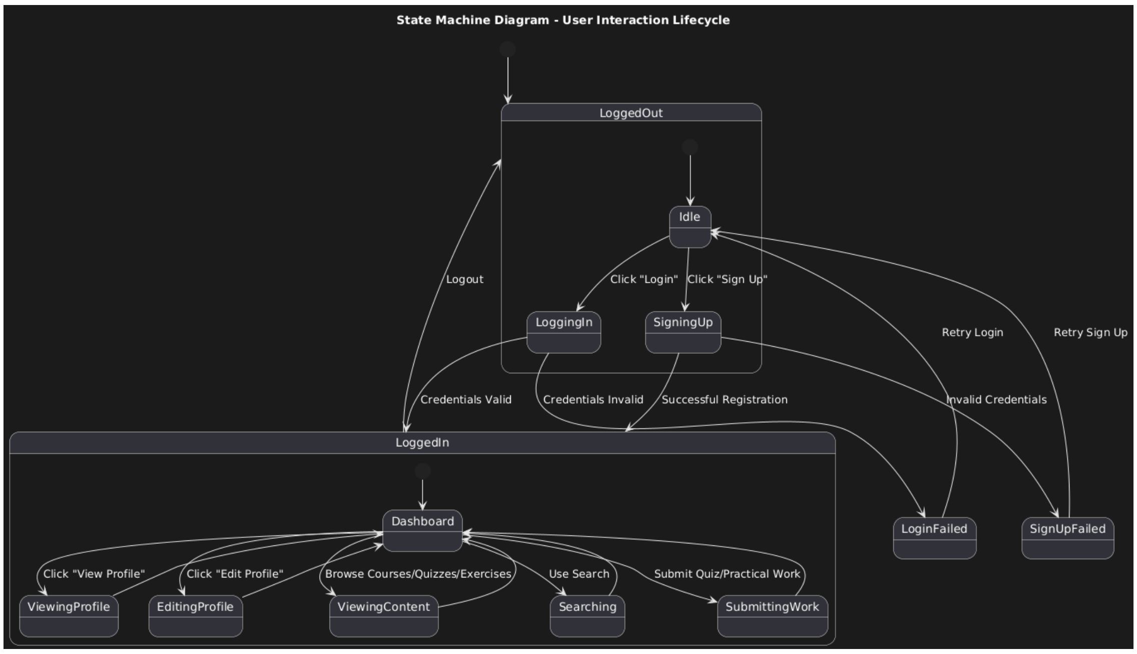


Figure 5: UML State Machine Diagram

5. Implementation

Technologies Used

The development of the Academic Platform was carried out using a combination of modern technologies and tools, ensuring modularity, scalability, and maintainability. Below is a summary of the technologies employed across different layers of the application:

Layer	**Technology / Tool**	**Description**
Frontend	JavaFX (FXML)	Used for building the graphical user interface. FXML provided a clean separation between design and logic.
Frontend	SceneBuilder	Assisted in designing and previewing the JavaFX interface visually.
Backend	Java (JDK 17+)	Core programming language used for logic implementation.
Backend	JDBC	Used to connect and interact with the relational database (SQL).
Backend	Custom Authentication Service	Developed for handling login, signup, and password hashing using BCrypt.
Models	POJOs	Represented key entities such as User, Course, Quiz, Exercise, and Practical Work.
Utilities	PasswordHasher Utility (BCrypt)	Ensured secure password storage and verification.
Database	MySQL / SQLite	Relational database used to store users, roles, courses, quizzes, etc.
Version Control	Git	Used for source code management and collaboration.
Build Tool	Maven / Manual Compilation	Managed project structure and dependencies (optional depending on setup).

Table 2: Summary of Technologies Used in the Academic Platform

Architecture Highlights

The system adopts an MVC-like structure:

- **Model:** Java classes representing application data.
- **View:** FXML files rendered by JavaFX.
- **Controller:** Service classes such as `AuthService`, `UserService`, etc.

Secure Authentication: Passwords are hashed before storage, and user roles are verified against a valid matricule list.

Modular Codebase: Structured using packages such as `models`, `services`, `utils`, and `database` to ensure a clean separation of concerns.