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Smart Semester Tracking and Academic Management System for Educators

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Abstract: *The Semester Tracking App is a brilliant academic management tool designed specifically for schools and other educational institutions to organize classroom management and facilitate teacher-student communication. Made available for teacher use only, the app includes major features such as secure user authentication, advanced student profiling, class and assignment management, live messaging, resource sharing, and automated alerts. Teachers can use in-app and email reminders to keep students informed about schedules, submissions, and academic events. The app further provides for custom grading and feedback systems, thereby improving the scholastic experience. The three modules can be combined and consolidated in one comprehensive system through which the app enables easier monitoring by semesters, efficient communication, and effective management of learning processes.*

Keywords: Semester tracking, mobile application, student management system, academic scheduling, assignment tracking, feedback system, JWT authentication, educational technology, teacher dashboard, real-time notification, secure login, exam management, resource sharing, classroom communication

I. INTRODUCTION

With the fast-paced changing education sector, efficient digital tools are imperative to fill the communication gaps, monitor academic activities, and enhance student participation. Semester Tracking App serves this purpose by offering an inclusive platform to the teachers for tracking and coordinating semester-related operations. The application is developed using user authentication in order to only allow authorized academics to access and utilize its functions, thereby upholding data confi- dentiality and integrity. Student profiles with vital academic information like name, branch, roll number, and birthdate form the backbone of the app. Teachers can easily create, assign, and schedule class timetables, exam schedules, and assignment submissions. Built-in communication features like secure in-app messaging and announcement broadcasting help vital updates reach students in real-time. In addition, the app provides document upload support for sharing assignments, study material, and links of use. Push alerts and email notifications help ensure reminders regarding deadlines and incoming messages. Last but not least, the app has a grading and personalized feedback mechanism to enable educators to provide valuable insights into student performance. This article discusses the architectural design, characteristics, and possible influence of the Semester Tracking App on academic management and student-teacher communication in an online learning environment. The software centers around features like student record management, class and examination scheduling, assignment creation and assessment, delivery of feedback, push notifications in real-time, and messaging. Teachers are given full autonomy over semester planning and implementation, eliminating the reliance on paper-based records or fragmented multi-platform solutions. Security is also an important aspect with JWT (JSON Web Token) authentication being used to provide secure access and role-based authorization. This paper explores the Semester Tracking App's motivation, design process, system architecture, and development. It also explains how the app promotes productivity, better communication, and data integrity for academic settings. The suggested system is scalable, secure, and flexible, which makes it a realistic solution for educational institutions today seeking digital transformation.

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Motivation

In the constantly changing world of education, educators are frequently saddled with many tasks other than giving lectures. Handling student records, monitoring assignments, scheduling classes and exams, giving timely feedback, sending announce- ments, and keeping consistent communication with students can become daunting when done manually or through isolated systems. In most institutions, educators continue to use obsolete practices like paper registers, Excel spreadsheets, or ad-hoc communication channels like WhatsApp and emails. These practices are not only time-consuming but also error-prone, subject to communication breakdowns, and liable to loss of data. The driving force for the Semester Tracking App comes from the necessity to create an integrated digital tool that tackles these problems and makes academic management easier for instructors. The aim was to create a single, unified mobile platform that allows instructors to conduct all semester activities from one interface. Through the digitalization and automation of repetitive work, the app hopes to eliminate manual labor, ensure better accuracy in data, and have on-time execution of academic tasks.

II. LITERATURE SURVEY

A mobile application for managing student academic information by M. R. Islam, M. Rahman, and M. S. Rahman, International Journal of Computer Applications, vol. 182, no. 41, pp. 5–10, Feb. 2019. This paper presents the design and development of a mobile-based academic management system. It inspired several features in our project such as student record management, course scheduling, and user role-based access. The study shows the benefits of mobile apps in reducing teacher workload and improving data accessibility.

Secure mobile applications using token-based authentication by R. Kaur and M. Arora, International Journal of Computer Science Trends and Technology (IJCST), vol. 9, no. 1, pp. 34–38, 2021. This research highlights the use of JWT (JSON Web Token) for secure mobile authentication. It demonstrates how token-based access control ensures both security and flexibility, a key concern in our Semester Tracking App where role-based data access is implemented to protect academic records.

A study on scheduling and management of classroom activities using mobile app by S. K. Singh and R. S. Rana, International Journal of Innovative Research in Computer and Communication Engineering, vol. 7, no. 2, pp. 1032–1037, 2019. This paper explores mobile solutions to automate class and exam schedules. It reinforces the demand for customizable, intuitive interfaces and real-time updating systems, which have directly influenced the design choices of the scheduling module in our application.

Design and Implementation of a Smart Educational Mobile App for Teachers by M. T. H. Khan and M. M. Islam, International Journal of Computer Applications, vol. 175, no. 12, pp. 22–27, Oct. 2020. This paper presents a teacher-oriented mobile application focused on simplifying daily academic tasks such as tracking attendance, grading assignments, and posting announcements. The approach aligns closely with our project goals, particularly the emphasis on user-friendly design and centralized academic management.

Patterns of Enterprise Application Architecture by M. Fowler, Addison-Wesley, 2003. Although not a research article, this book is a key reference for designing maintainable, scalable application architectures. The concepts of layered architecture, data access patterns, and service encapsulation informed the backend and modular structure of the Semester Tracking App.

Mobile App Development for Student Record Management Using Cloud-Based Backend by A. Sharma and V. Gupta, International Journal of Advanced Research in Computer Science, vol. 11, no. 5, pp. 45–50, 2020. This study focuses on using cloud databases to manage academic records in real-time. It validates the effectiveness of Firebase and similar platforms in ensuring data integrity, scalability, and real-time synchronization—principles applied in our project for seamless performance across devices.

III. METHODOLOGY

Requirement analysis

The initial phase involved a thorough understanding of the academic workflow and pain points faced by faculty during semester planning and execution. Requirements were gathered through informal interviews with teachers and students.

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Key functionalities were identified, including secure login for teachers, student profile management, scheduling, assignment handling, communication tools, resource sharing, notifications, and grading.

System Architecture

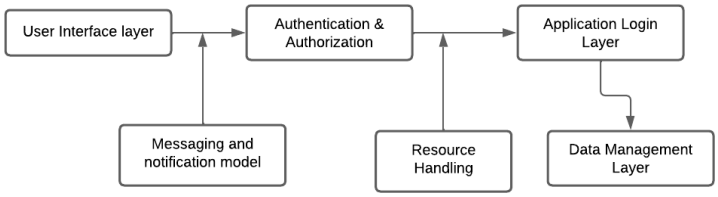

Fig. 1: Architecture

User Interface Layer : This layer is designed exclusively for teachers and acts as the interactive front end of the system. It includes all major screens and input forms required for managing students, scheduling lectures or exams, uploading assignments, providing grades and feedback, sending messages or announcements, and viewing notifications. It ensures user-friendly navigation and organizes core functionalities in a structured dashboard.

Authentication and Authorization Module : A crucial subcomponent of the architecture, this module ensures that only verified teachers can access the system. Upon successful login, a JSON Web Token (JWT) is issued and used to authorize all subsequent actions. This token is checked by the backend for every user request to confirm identity and permissions, maintaining secure and restricted access throughout the app.

Application Logic Layer :

Serving as the brain of the system, this layer contains the core business logic. It handles processes like verifying token validity, scheduling class sessions or exams, tracking assignment submissions, calculating grading statuses, managing deadlines, and preparing data for feedback delivery. It receives inputs from the user interface and determines what operations to perform and which data to fetch or store.

Messaging and Notification System :

This component supports real-time or scheduled communication between the teacher and students. It enables teachers to send one-on-one messages, group announcements, or class-wide updates. Notifications are generated automatically for new assignments, feedback, upcoming deadlines, or exam reminders. These notifications are pushed to the interface and also logged for future reference.

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Data Management Layer : This backend layer stores and retrieves all persistent academic data. It maintains structured collections of user credentials, student records, uploaded assignments, grades, feedback notes, messages, timetables, and notification logs. Data consistency, integrity, and security are prioritized here to ensure the system remains reliable and scalable as usage grows.

Access Control and Role Management : Though the current system is teacher-facing, this module is prepared to support role-based access control in case future expansion involves students or administrators. It defines what each user type can view, edit, or delete, and works closely with the JWT claims to enforce those restrictions dynamically.
Securing our system
Maintaining data security and proper access was a key consideration in the development of the Semester Tracking App. As the app deals with sensitive academic data—student profiles, assignments, messages, and feedback—it was necessary to have a strong authentication and authorization process in place. To meet these needs, the system uses JWT (JSON Web Token)-based authentication as its primary security feature.

Authentication Using JWT : The authentication mechanism is implemented in a way that only valid teachers can access and utilize the application. When a teacher logs in with proper credentials (email/username and password), the backend server authenticates the credentials through Firebase Authentication or a custom user authentication service. After successful login, the server creates a JWT token, which is then returned to the client (app). This token includes user information encoded like so: User ID or email, Token expiration time, Role (e.g., teacher), Extra claims (if needed). The JWT is safely stored on the client-side (usually in safe local storage or encrypted shared preferences). If the token is valid, the server processes the request; otherwise, the request is rejected with an appropriate error message (e.g., 401 Unauthorized).

Authorization Workflow : For every subsequent request from the frontend (e.g., loading student data, uploading assignments, posting announcements), the client includes the JWT in the Authorization header of the HTTP request.To enhance security, each JWT has a defined expiry time (e.g., 1 hour). Once the token expires, the user is required to log in again to obtain a new token. This minimizes the risk in case a token is compromised. Optionally, a refresh token mechanism can be implemented to allow re-authentication without asking for credentials repeatedly, improving user experience without compromising security. Since the application is intended for teacher access only, role-based access control is enforced using JWT claims. The server checks the user's role embedded in the token before granting access to protected resources or performing restricted operations (e.g., grading, uploading documents). All data transmitted between the client and server is encrypted using HTTPS to prevent man-in-the-middle (MITM) attacks. This ensures the confidentiality and integrity of the data in transit. Passwords are never stored in plain text. During account creation or login, passwords are:
Hashed using a secure hashing algorithm (e.g., bcrypt, SHA-256) Compared using a secure verification function

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IV. RESULTS

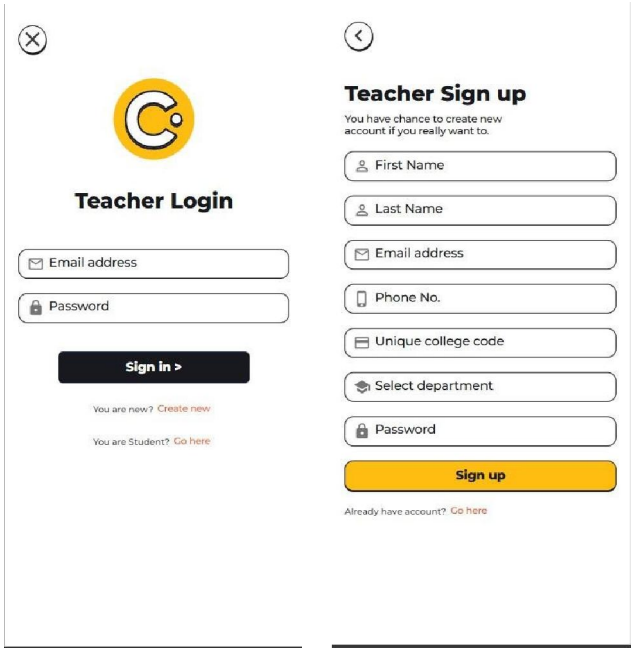

Fig. 2: Signin Page

Fig. 3: Signup Page

V. CONCLUSION

The Semester Tracking App is a well-organized and effective tool for instructors to track academic activities during the semester. With the integration of major features like student record maintenance, class and exam scheduling, assignment tracking, grading, communication, and notification into a single system, the app simplifies the academic process. The layer architecture provides safe access, modular development, and scalable performance. The utilization of authentication mechanisms like JWT increases data privacy and access control, rendering the system reliable for real-world educational use. All in all, the app plays a considerable role in mitigating manual workload, enhancing organization, and fostering timely communication between educators and students

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