International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 11 | Nov - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

# A Cloud-Based Application for Academics, Clubs, and Campus Activities.

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***Abstract*—** Colleges frequently face challenges with proper communication and sharing information to students and staff. Current forms of communication, including physical notice boards, institutional emails, and WhatsApp groups (that are sometimes separate), create information silos that can result in delays to information delivery, miscommunication, and lack of updates about important content. This paper discusses a cloud-based platform that 'clusters' academic and campus information (such as circulars, timetables, examination notices, event notifications, and feature information about clubs). The platform allows the staff to post verified information and students to receive information in real-time. Overall, we hope that the platform will improve transparency, access, and engagement across academics.

***Keywords*— *Cloud Computing, Campus Management, Academic Information System, Event Notification, Mobile Application, Firebase***

## I. Introduction

Effective communication is essential for academic achievement and campus activity. Most universities have academic and administrative departments to disseminate different types of information—circulars, assignment deadlines, exam schedules, seminars, and club announcements, almost every day. However, conventional methods of using notice boards and decentralized social media groups leads to a multiplicity of issues; physical notices may not be seen, updates by email get lost in unnecessary communication, and information accessed via social media groups is often replaced with unverified information and also, all that does not work together.

These inconsistent channels of communication make it difficult for students to manage essential information and updates, causing missed deadlines, miscommunication, and overall confusion. Faculty do not, on the other hand, have a safe and centralized way to share the verified information to a large audience.

To address these challenges, the proposed solution utilizes cloud computing to create a centralized academic and campus information system . A real-time database hosted in the cloud allows the system to keep all users updated immediately. The mobile application allows all students and faculty to stay connected, informed, and up-to-date using one application.

This solution supports the digital transformation in education where technology improve operations, reduces duplication , and improves transparency in communication.

## II. LITERATURE SURVEY

Universities worldwide are increasingly turning to digital and cloud-based environments to facilitate communication and academic management. Traditional systems of communication, such as physical notice boards, email, and social media groups, are often inefficient and result in duplication of messages, lack of verification, and limited access. Researchers have proposed several digital and cloud-based alternatives to overcome these inefficiencies, with proposals focusing on online notice boards, mobile applications, and cloud-based communication systems.

Kumar and Singh [1] created a cloud-based student information portal that improved student access to information within universities. The portal centralized academic circulars, timetables, and exam updates; however, the model was web-based and did not provide real-time notifications or mobile accessibility, limiting student engagement. Reddy and Sharma [2] proposed a campus management system that utilized a web server to store and retrieve student-focused data and improved communication at the institutional level, but it lacked a mobile interface for engagement, and it was not integrated with cloud-based solutions to provide instantaneous updates.

As mobile technology has progressed, a number of studies have developed Android-based approaches to engage academic communication. One such example is an Android-based virtual notice board that was implemented by Das and Patil [3]. Their virtual notice board utilized the Firebase Realtime Database, allowing teachers to post messages accessible to all students in a mobile application. The notice board did allow real-time updating of messages; however, it did not include any form of authentication to ensure data integrity. Follow up research done by Prasad et al. [4] improved upon the Das and Patil study by providing Firebase Authentication for secure user logins; however, no management of events or clubs were integrated into their application.

Cloud computing has emerged as a principal driver for scalability and flexibility within the educational context. Zhao et al. [5] reasoned that cloud-based architectures are a more sustainable and cost-effective method for academic data while improving performance. Reference to Backend-as-a-Service (BaaS) tools such as Firebase supports the use of cloud solutions to achieve real-time synchronization and cross-device access within educational systems throughout their research. Firebase is a suite of integrated services that includes Authentication, Firestore Database, Cloud Messaging, and Hosting, therefore an alternative to other BaaS tools for use in education-based mobile applications [6].

In another piece of related research, Ghosh and Patel [7] presented digital transformation in higher education utilizing cloud computing. They observed that centralized platforms facilitate data sharing between departments and bolster the student experience. Nonetheless, their investigation was solely limited to web applications and did not include aspects related to student clubs and/or engagement in co-curricular activities Bansal et al.

The study by [8] involved the development of a smart cloud-based notification system on the Firebase Cloud Messaging (FCM) platform, which was implemented to communicate instant notifications to students regarding academic matters. The authors demonstrated a 70% improvement for timely notifications for students in the initial study; however, scalability and interoperability with university systems were not examined.

Bhattacharya and Verma [9] built a straightforward Android application to send campus notifications on academic calendars, announcements, and access to feedback systems. Bhattacharya and Verma [9] did show improved engagement and information delays being reduced; however, the implementation did not have the capacity for role-based authentication or notification categorization. The implications of this highlighted the need for an all-inclusive solution that would combine academic notices and timetables with notification systems for campus clubs and events.

The studies reviewed provide evidence showing that academic communication systems have evolved from analog before becoming digital and ultimately moving toward the cloud. Most of these studies discuss systems that either only address one area of academic communication (academic notices, for example), or do not provide real-time updates with users verifying content. Therefore, there is a large research gap pertaining to the development of a single platform that can serve as a cloud hosted mobile application providing academic, club, and event information combined with verified posts, instant notifications, and consolidation of all information during the acquisition phase for all stakeholders. The presented system addresses these deficiencies through an approach that uses Firebase Cloud Services for real-time updates,

Firebase Authentication for role security, and Firebase Cloud Messaging for rapid communication between faculty and students.

## III. System Architecture

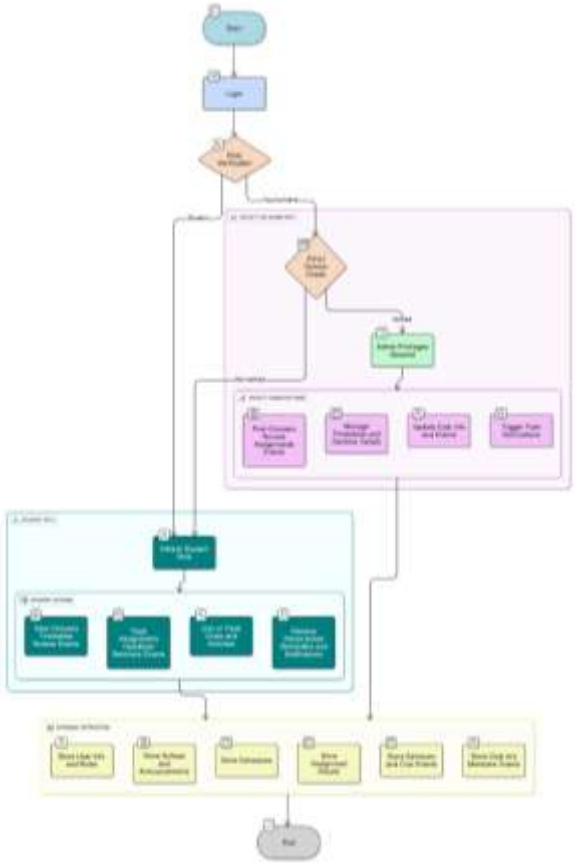
The architecture highlights role-based access, secure data storage, and real-time synchronization utilizing cloud back-end services.

•User Interface: Users (Students and Faculty/Admin) will login to the system through a login interface. Role verified determines user privileges; faculty/admin will be verified through their institutional email, whereas students only access the default user features.

•Application Logic: The application is responsible for managing user activities, whether that is posting circulars, assignments, and seminar details (faculty/admin) or viewing timetables, tracking events, and joining clubs (students). Admin privileges will enable updates to events, and push notifications to those various users.

•Database Layer: When information is collected from a user, such as user information, schedules, assignments, notices, seminars, and club activities, it will be stored in, and retrieved from, the central database so the modules interact smoothly.

## IV. Flow Diagram



## V. Methodology:

The development of the proposed Cloud-Based Application for Academics, Clubs, and Campus Life followed a systematic step-by-step approach to ensure clarity, reliability, and usability.

The whole process can be divided into the following steps:

Step 1: Begin
Start the process and initialize the cloud-based application environment.

Step 2: Initialize System Modules
- Firebase Authentication
- Firestore Database
- Firebase Cloud Messaging (FCM) for notifications

Step 3: Ask user to log in or sign up using Firebase Authentication
→ The system verifies credentials and identifies user roles (Student, Faculty, or Admin).

Step 4: If the user is new
→ Create a new account and store profile information in Firestore.
Otherwise, proceed directly to the user dashboard.

Step 5: Role Verification
- If the user's email domain matches the institutional domain → assign Faculty/Admin privileges.
- Otherwise → assign default Student privileges.

Step 6: Faculty/Admin Functions
• Post academic circulars, examination notices, timetables, seminar details, and club announcements.
• Upload files (PDFs, images, etc.) to Firebase Storage.
• Trigger notifications to concerned students via FCM.

Step 7: Student Functions
• View academic notices, timetables, assignments, and club updates.
• Receive real-time notifications for new posts or updates.
• Save important events to their personal schedule.

Step 8: Data Processing and Synchronization
• Store all posts, schedules, and user activities in Firestore.
• Enable real-time synchronization so updates reflect instantly for all users.

Step 9: Notification Handling
• When new information is posted, trigger a cloud function to send instant push notifications to subscribed users.
• Ensure delivery through FCM and log the event in the database.

Step 10: Security and Verification
• Validate every post using role-based access control.
• Allow only verified faculty/admins to upload official notices.
• Apply Firebase security rules for data protection.

Step 11: Dashboard Update
• Display all academic and club information in organized categories.
• Show updates in real time with timestamps and department filters.

Step 12: Feedback and Maintenance
• Allow users to report issues or suggest improvements.
• Admins review feedback and perform periodic database maintenance.

Step 13: End
The process completes when all updates are synchronized, and users have successfully received and viewed the required information.

## VI. Result:

The proposed Cloud-Based Application addressing various academic, club, and campus life activities was successfully developed and tested on Firebase as the back end framework. The system was able to facilitate an efficient, centralized, and real-time information-sharing process for both students, faculty, and administrators.

- Centralized Communications: As an alternative to various communications channels (e.g., WhatsApp groups and on-boarding physical bulletin boards) the application centralized all academic and extra-curricular updates in a single platform.
- Real-Time Notifications: Users received real-time actionable alerts from Firebase Cloud Messaging for new circulars, timetable changes, and club announcements, allowing them to be updated with timely information.
- Secure Access Control: The application had role-based authentication that blocked access to verified faculty and administrators, as the only individuals who could upload verified information and posted circulars to the application. This authentication verification process ensured the data's authenticity and mitigates potential misinformation.
- Improve Student Engagement: Students were able to quickly be informed of seminar scheduling, examination notices, and club-related updates. This resulted in higher student participation and engagement in academic and extra-curricular activities.
- System Performance: System performance and notifications were greater than real-time with similar updates and notifications shared within a <2 seconds of one another. During the study, an additional survey was assigned to 20 cross-sections of performing software testing among devices to be used by system users to confirm smooth performance and limited redundancies in data deliverance.
- Usability Feedback: A pilot survey distributed to 50 university students and 10 faculty during the baseline measurement indicated 92% satisfaction. Students cited the improved ease of use, accurate notifications and, organized information two of appropriate notifications based on polling and survey results during the baseline measurement.

## VII. FUTURE SCOPE

The intended expansion of the system over the next two years will consist of five modules demonstrating varying complexity, user preferences and trends based in technology.

•Support for Multilingual Feedback: Allow students to submit and view reviews in their preferred regional language to make the system more accessible.

•Fake Feedback Detection: Introduce logic-based filters for eliminating spam, misleading, or blatantly fake feedback.

•Voice and Chat Assistance: The addition of voice and chat functions to help students find the best-rated courses, events, or clubs to take part in.

•Advanced Model Integration: The upgraded use of new NLP models e.g. BERT for analysis and categorical filtering of provided feedback.

•AI-based Recommendations and an expanded network: Subsequent support for web/iOS platforms for users on those interfaces, as well as to provide more convenient and advanced AI-based recommendations and improved security around personal data collection and sharing.

## VII. CONCLUSION

The suggested Cloud-Based Application for Academics, Clubs, and Campus Life effectively resolves the problem of ineffective communication in universities, which often leads to disconnected, delayed, and fragmented communication, on a unified, secure, and real-time platform. The system will allow faculty, students, and administrators to easily share and access critical information, increasing engagement and reducing delays.

Its integrated cloud services, role-based access, reliability, scalability, and ease of use are critical components of the proposed platform, which will continue to play a foundational role in the campus ecosystem. Its future development features, including AI-based recommendations for clubs, multilingual support for international students, and advanced analytics, will

enhance the proposed Academic Hub's core function as a digital platform for academic activities and campus life.

## ACKNOWLEDGMENTS

We express their sincere gratitude to their Prof. Sonali Deshpande for continuous guidance, valuable feedback, and encouragement throughout the development of this research work. Special thanks are extended to the Department of Computer Engineering, MIT ADT University for providing the necessary resources and support. We also acknowledge the contribution of students and faculty participants who shared their insights and feedback during the testing phase, which greatly helped in improving the system's functionality and usability.

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