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Design and Implementation of an Integrated Hostel Management System with Role-Based Access for Students and Wardens

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ABSTRACT

Purpose: Traditional hostel management relies heavily on manual processes, such as paper-based gate passes, handwritten maintenance requests, and limited communication channels. These approaches are inefficient, error-prone, and fail to address modern requirements like emergency medical support and real-time feedback. The purpose of this study is to design and implement an integrated role-based hostel management system that streamlines routine hostel operations while enhancing communication, transparency, and student safety.

Methods: The system is developed using a three-tier architecture with a web-based front end (HTML, CSS, JavaScript), a PHP-based backend hosted on XAMPP, and a MySQL database for secure data storage. Modules were designed for students (gate pass requests, food menu and reviews, maintenance requests, medical leave applications, and emergency messaging) and wardens (approvals, menu updates, student record management, and emergency response). Use case analysis and an entity-relationship (ER) model were used to define system interactions and database design.

Findings: The implementation demonstrates that the proposed system reduces delays, minimizes manual errors, and provides real-time communication between students and wardens. Features like digital gate passes with history logs improve accountability, while maintenance and medical request modules ensure timely responses to student needs. The centralized database improves data accuracy and makes it easier for wardens to manage hostel records efficiently.

Implications: This system highlights how digitization can improve hostel administration by increasing efficiency, transparency, and responsiveness. It also creates a safer environment for students by integrating emergency messaging and medical support features. The proposed approach can be adapted by educational institutions to modernize hostel management and improve student welfare.

Originality: Unlike earlier hostel management systems that focused mainly on room allocation and fee collection, this system integrates a wider range of essential services into a single role-based platform. Its novelty lies in combining academic, administrative, and welfare features, such as emergency medical support and feedback mechanisms, within one unified system.

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1. Introduction

Hostels form an essential part of educational institutions, offering residential facilities and support to students. Traditionally, critical administrative tasks such as room allocation, attendance tracking, fee collection, and complaint management were carried out manually. These processes relied on paper registers, gate passes, or spreadsheets to maintain handwritten student records. While simple, such methods are inefficient and prone to errors, leading to issues like delays, biased room allocations, and poor communication between wardens and students. With the continuous rise in student populations, manual approaches have become increasingly ineffective, emphasizing the need for digitized solutions (Akolo, 2015; Ayanlowo *et al.*, 2014; Narkhede *et al.*, 2022).

Although several hostel management systems have been developed to minimize manual processing, their scope has remained limited. Earlier systems were unable to fully meet the requirements of modern hostel operations. To overcome these challenges, many researchers have proposed digital hostel management systems as replacements for traditional

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record-keeping methods. Ako (2021) designed a centralized system incorporating modules for booking, payments, and administrative processes. These studies highlighted that digital solutions reduce human errors, improve efficiency, and offer secure, user-friendly interfaces. Building upon this foundation, Diyaolu *et al.* (2024) and Eweoya *et al.* (2025) integrated advanced web-based features such as online payments, feedback mechanisms, and real-time reporting for wardens. Collectively, these advancements have significantly enhanced transparency, accountability, and operational effectiveness.

Most conventional hostel management systems primarily address room allocation and fee management. However, essential features such as medical leave applications, emergency response mechanisms, and transparent communication remain underdeveloped. Manual or semi-automated workflows often result in inconsistencies between paper-based and digital records (Ako, 2021; Bamgude *et al.*, 2022; Chaudhri & Kevat, 2021). Moreover, the absence of intelligent analytics and predictive tools limits the ability of hostel authorities to make proactive decisions. This highlights the need for a more reliable, role-based hostel management system. A digital hostel management solution ensures transparency and efficiency while meeting the needs of students, wardens, and administrators (Ternikar *et al.*, 2024). Centralized access to data further enables authorities to make informed decisions regarding resource utilization, maintenance, and student welfare. Recent research has even explored the development of aggregated hostel management systems for broader institutional applications (Kumar & Singh, 2019).

To address the shortcomings of existing hostel management approaches, this research proposes the development of an integrated hostel management system. The primary objective is to design and implement a role-based solution that consolidates all essential student services within a single platform. The system enhances student engagement through feedback mechanisms while ensuring data accuracy by maintaining a centralized database of student and hostel records (Ako, 2021). In addition, it reduces administrative workload and streamlines hostel operations. Ultimately, the proposed solution aims to improve both operational efficiency and the overall quality of student life (Yadav *et al.*, 2016). This paper details the design and implementation of the integrated system, including a review of related work, the methodology and system architecture, and the development of key modules.

2. Literature Review

A hostel management system implemented and designed a hostel management system focusing on complaint management, digitizing room allocation, and record keeping. This system helps reduce manual work and improves basic administrative tasks. However, it does not support structured interaction between wardens and students or emergency workflows, which represents a major gap in safety handling and coordination (Goel *et al.*, 2020).

Chaudhri and Kevat (2021) designed a digital hostel system known as eHostel, which allows students to use mobile devices for advanced features like fee management. It also includes basic functionalities such as room allocation and complaint registration. While the system improved accessibility, it was limited by a lack of support for role-based workflows and low scalability. The absence of a real-time communication system and emergency alerts further limit its effectiveness in urgent situations.

The AI-enhanced hostel management system developed by Kadyan *et al.* (2025) includes chatbot support for simple query handling and automated hostel booking. The system represents a modern direction, but it still does not include standard role-based authorization or any formal usability evaluation. The authors emphasized that reliable notifications and mobile usability are important for better adoption by students. However, without emergency-response and role-based workflow features, the system remains incomplete for handling real hostel scenarios.

A survey of hostel management systems (Ternikar *et al.*, 2024) reviewed existing hostel software and identified common gaps, including the lack of emergency modules, absence of real-time communication, weak scalability, and poor user interfaces. The survey reinforced the need for user-centered design, multi-role workflow support, and systematic evaluation. It highlights that most systems fail to support safety-related reporting or urgent decision-making, which are necessary requirements in modern hostels.

Wafula (2021) developed an online hostel booking system for Uganda Christian University using PHP and MySQL, replacing manual booking processes. However, this system failed to capture detailed user feedback and was not useful for maintaining historical records or past data. These limitations indicate that the system lacks real-time updates, reducing its overall usefulness.

Sandhu *et al.* (1996) proposed an RBAC (role-based access control) model for educational platforms. Their research shows that RBAC improves workflow separation, data protection, and security. Nevertheless, most hostel systems still rely on simple login mechanisms without role-based permissions. Since hostel operations involve administrators, wardens, and students, the absence of RBAC is a major operational gap, limiting structured decision-making and safety.

To address usability challenges in educational applications, Tileng *et al.* (2023) developed student

mobile applications and evaluated them using the SUS (System Usability Scale). Their research demonstrated that usability testing strongly affects student adoption. Most hostel management systems do not conduct user testing or usability evaluations, which can cause poor acceptance and difficulties during real-world use. This represents a significant gap in existing hostel management platforms.

Eweoya (2025) implemented a web-based hostel management system using modern web technologies and structured database design. This system improved transparency, room allocation processes, and data accuracy. However, the study also observed gaps in security controls and mobile optimization. These limitations reflect a broader pattern found across many existing hostel management systems.

Table 1: Overview of Methodologies, Benefits, and Limitations of Selected Hostel Management Systems

Paper / Ref No.	Methodology / Technology Used	Advantages	Limitations
Goel *et al.* (2020)	Web-based hostel management system with allocation modules and digital records	Reduces manual work and improves basic administrative tasks	Cannot provide real-time notifications, has no mobile interface, and lacks role-based access
Chaudhri & Kevat (2021)	Mobile-supported digital hostel system known as eHostel with features like room allocation, fee management, and complaints	Better accessibility and supports core hostel functionality	Weak scalability, no role-based workflows, and poor student–warden communication
Kadyan *et al.* (2025)	AI-based enhanced web system with automated booking and chatbot	Provides simple chatbot query handling and automated booking system	Lacks RBAC, no usability evaluation, and mobile usability is still weak
Ternikar *et al.* (2024)	Review of existing hostel software (multiple technologies)	Identifies common trends and highlights modern feature expectations	Absence of real-time communication, emergency modules, user-centered design, and scalability
Wafula (2021)	Uses PHP and MySQL for hostel booking system developed for Uganda Christian University	Automates booking, making it simpler than the manual process	Cannot store detailed feedback, has poor historical records, and lacks user-friendly extended features
Sandhu *et al.* (1996)	Role-Based Access Control model for educational systems	Improves security, data protection, and workflow separation	Most hostel systems still do not use RBAC; simple login systems remain common
Tileng *et al.* (2023)	Mobile student app evaluated using the System Usability Scale (SUS)	Shows importance of usability testing for better adoption	Most hostel systems do not conduct formal evaluation or usability testing
Eweoya (2025)	Developed web-based hostel management system using modern structured database and web stack	Improves transparency, room allocation, and data accuracy	Lacks mobile optimization, real-time communication, and strong security controls

In summary, existing hostel systems still lack integrated, proper medical emergency features, a centralized communication structure, and role-based workflows. Many solutions provide only basic digital functions, and they lack user-centered evaluation or real-time coordination. This creates gaps which highlight the need for a more responsive, unified, and secure system.

3. Methodology

We propose a centralized, role-based web platform designed for both students and wardens. The system incorporates a secure role-based login architecture to ensure that users access only the features relevant to their responsibilities. For students, the platform offers a dedicated homepage linked to multiple modules, including digital gate pass requests (Akolo, 2015), review submission, and access to the daily food menu, similar to the approach presented in Wafula's work (Wafula, 2021). The system also maintains historical records, enabling students to track past requests and activities. Additional features include access to warden contact details with a built-in messaging interface for direct communication (Bello, 2023), as well as modules for lodging maintenance requests when repairs are required (Ayanlowo *et al.*, 2014). To address health-related needs, a medical leave module allows students to request assistance for emergencies such as ambulance services or doctor consultations (Akolo, 2015).

Conversely, the warden's homepage consolidates all administrative and supervisory functions, such as allowing wardens to manage student records and update them if needed (Ako, 2021). We have provided separate modules so wardens can easily manage the approval and rejection of gate passes. Wardens can update the food menu as well as modify contact details so that students receive updated notices (Bello, 2023). Wardens can view maintenance requests and medical leaves, verify the conditions, and decide whether to accept or reject the request. Wardens can inform university doctors and ambulances if necessary (Akolo, 2015).

The proposed system integrates various features in a single platform, improves communication, and enhances student safety. It also significantly reduces administrative workload. Figure 1 shows the block diagram of the front and backend relationship between the user and the database.

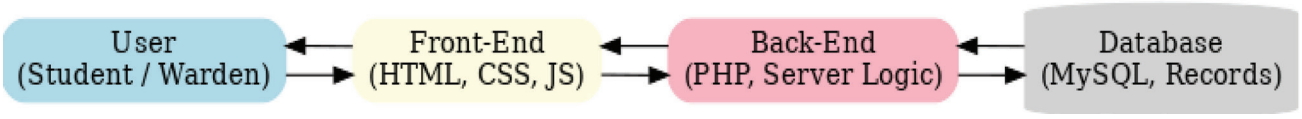


Figure 1: Block Diagram of the Front and Back End Relationship

The first part of hostel management methodology is System Analysis. Traditional hostel management depends on manual processes. It involves paper-based gate passes and maintenance requests, which are inefficient (Braimah & Duduyemi, 2016). Key requirements of the proposed solution include role-based login, digital gate pass with history, food menu, and many more. All of this is stored in a centralized database for secure record management (Ako, 2021; Goel *et al.*, 2020). The administrator (warden) plays a very important role, so it should support various services such as approvals, record updates, and emergency response (Akolo, 2015).

3.1. System Design

The system follows a three-tier architecture. The front end is a combination of HTML, CSS, and JS for user interaction. The backend uses PHP for logic and processing. A MySQL database is used to store student and hostel records (Ako, 2021). Role-based access ensures students and administrators access the data in a consistent manner (Sandhu *et al.* 2016). Students manage gate passes, reviews, maintenance, and medical leave, whereas the warden handles approvals, menu updates, and emergency support (Ling & Mahdin, 2022). Our three-tier architecture aligns with earlier Ghana-based hostel management solutions (Yadav *et al.*, 2016).

3.2. System Architecture

The proposed Hostel Management System is designed on a three-tier client–server architecture as shown in Figure 2. It provides data scalability and secure data handling (Akolo, 2015). The first tier presents the user interface for both students and wardens, with fingerprint-based verification (Rajkumar & Sivagama Sundari, 2018).

The middle tier serves as the backend where logic is executed. Using PHP and hosted on an XAMPP server, this layer processes all user requests, manages authorizations, and validates data. The data generated from users is stored in the MySQL database. It acts as a central repository for all records such as students' profiles and other relevant data (Ako, 2021). Therefore, user inputs from the front end are processed by the backend and stored in the database in the form of tables such as gate pass table, contact table, message table, and so on (Goel *et al.*, 2020).

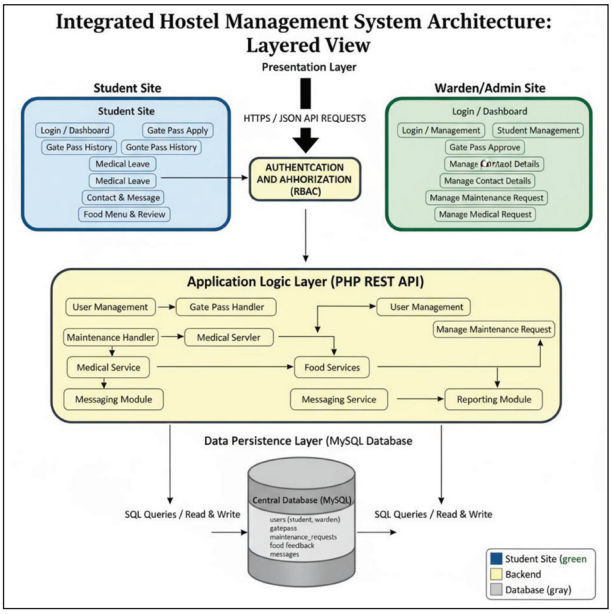


Figure 2: System Architecture of Hostel Management System

Figure 2 shows the layered architecture of the Integrated Hostel Management System. The student site and warden site send secured HTTPS/JSON requests to the backend, where role-based authentication controls access. The PHP backend handles core modules such as gate pass processing, medical and

maintenance services, messaging, and food menu management. All operations read and write data to a central MySQL database that stores user records, requests, and system logs.

3.3. Entity–Relationship (ER) Model

The Entity–Relationship (ER) diagram illustrates the data models of the Hostel Management System. It introduces all significant entities, attributes, and relationships among them. The key table is USER, which stores student profiles. It contains personal details, contact information, and a securely hashed password. There are several modules that are connected to their entities in one-to-many relationships.

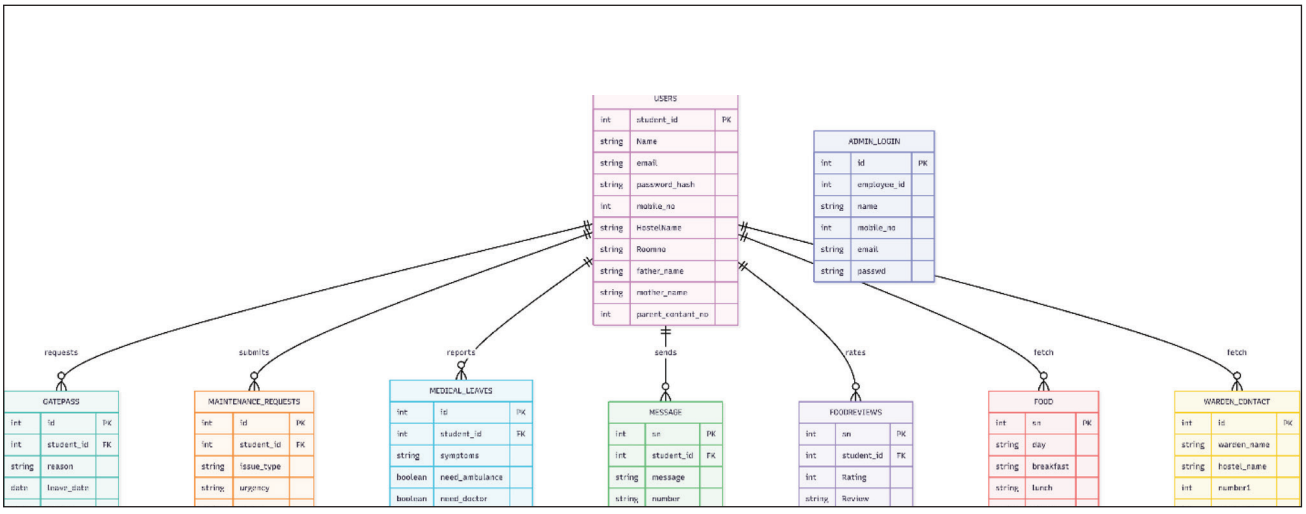


Figure 3: Entity Relationship Diagram of the Proposed Hostel Management System

- **GATEPASS**, in which students have an option to request a gate pass with reason, date, and status.
- **MAINTENANCE_REQUEST**, a table that stores issues regarding maintenance provided by students, together with urgency and status.
- **MEDICAL_LEAVE**, where medical leave requests, symptoms, emergency status, and approval status are recorded.
- **MESSAGE**, which represents the messages that are being sent by the students, including the message content and contact numbers.
- **FOODREVIEWS**, through which students post a rating and review of the hostel food services.

Besides these, there are other system-related entities such as FOOD and WARDEN_CONTACT, where the daily food menu and contact details are stored, respectively, which can be accessed by students. The authentication of an admin or a warden is performed in a separate table called ADMIN_LOGIN. It holds contact details as well as employee credentials. In general, the ER model clearly demonstrates the interaction of students with different modules. It guarantees referential integrity and smooth access for both students and wardens within the system's stored data.

Table 2: API Endpoints in Hostel Management System

Method	Endpoint	Input	Output	Description
POST	/api/login	username, password	status, role, user_id	User authentication
POST	/api/gatepass/apply	student_id, reason, out_date	gatepass_id, status	Submit gate pass request
GET	/api/gatepass/history	student_id	JSON list	Retrieve gate pass history
POST	/api/maintenance/submit	student_id, issue, urgency	request_id, status	Submit maintenance request
POST	/api/medical/apply	student_id, symptoms, options	medical_id, status	Submit medical leave request
GET	/api/food/menu	—	JSON menu object	Retrieve food menu
POST	/api/food/feedback	student_id, rating, comments	status	Submit food feedback
POST	/api/message/send	sender_id, receiver_id, message	status	Send emergency message

The backend exposes a small set of REST-style API endpoints that support the core functionality of the system. The login verifies user credentials using secure authentication and returns the appropriate access level. The gate pass submission allows students to create new requests. Together, all these APIs form the communication bridge between the user interface and the server. Each request is stored in the database and is identified by a unique ID. Meanwhile, the history endpoint provides students with convenient access to their submissions. It helps to remove manual dependencies and improve transparency. Overall, these APIs help to bridge the gap between the user interface and the server.

3.4. Description of Modules

The proposed Hostel Management System is based on admin and student login accounts. Both accounts are associated with different modules in their respective dashboards.

Figure 4 illustrates the modules of the hostel management system. Students and faculty access their respective sites. The admin dashboard has various services like managing users, gate pass approval, updating the food menu, and much more, whereas students have limited access, such as gate pass application, viewing history, food menu, medical leave, and so on. The flow ends after the user completes their respective dashboard operations.

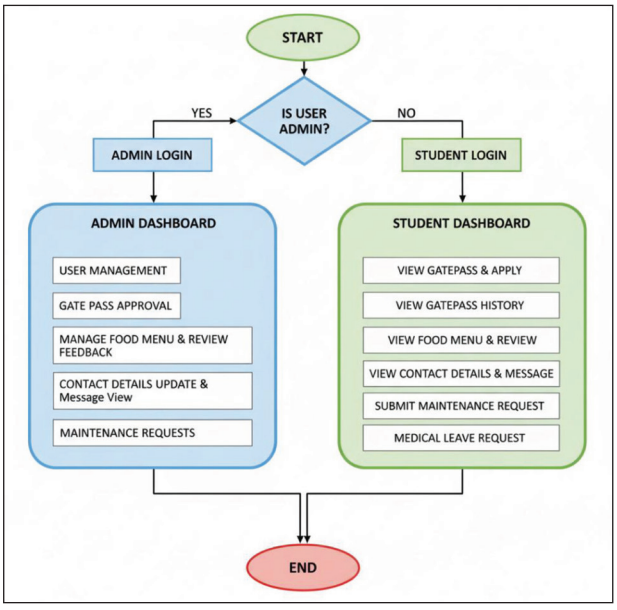


Figure 4: Modules of Hostel Management System

- **Login Page for Signing In**

The system provides login pages for students and wardens. Students can log in using their credentials to access hostel services. Wardens have a dedicated panel to oversee and manage student-related requests and records.

- **Gate Pass Approval Panel/Module**

Students can easily apply for digital gate passes and view their request history to track approval status. Wardens receive these requests and have the authority to approve or reject them as per the rules and regulations set by the university.

- **Food Menu and Reviews**

Students can easily view the latest food menu, which may change according to the session. Students can also submit reviews or lodge complaints regarding food quality. Wardens can update menu items, monitor student feedback, and have the authority to remove reviews if found inappropriate.

- **Emergency Messaging and Contact Details**

The system provides a directory of emergency contact details for wardens. In case of an emergency, students can directly send messages to the warden. Wardens receive these messages in real time and can update contact information to ensure students always access the correct details.

- **Maintenance Request Modules**

Students can submit maintenance requests easily. They must fill in a form and provide details about issues such as electrical faults, plumbing problems, or damaged furniture. Wardens receive these requests, inspect the reports, and approve or reject them based on verification.

- **Medical Request Modules**

Students who need medical support can submit medical requests through the platform. They may request consultation with the university doctor or apply for ambulance services. Wardens are notified immediately of such requests and can take prompt action to ensure timely medical assistance.

- **Use Case Analysis**

There are mainly two actors in this hostel management system: students and wardens. Students use the system to simplify their day-to-day activities. They can log in with their ID and password and then request a gate pass, view history, check the new food menu, submit reviews or complaints about food, file maintenance requests if there are any problems in the room, and submit medical leave or request a doctor/ambulance if necessary (Ade-Ikuesan, 2018; Ako, 2021). Conversely, wardens also have their own login, where they can see all student requests. They can accept or reject gate passes, modify the food menu, check and delete inappropriate reviews, verify maintenance requests, and respond to medical requests quickly so that students benefit on time (Jain, 2016). Both wardens and students have defined roles in the system, which has been

developed to serve the interests of both parties (Adagunodo *et al.*, 2013; Akolo, 2015).

- **Technology Stack**

An Integrated Development Environment (IDE) refers to the software that helps organize various programming languages and consolidate them. The IDE used to build this system is Visual Studio Code, which acts as a powerful and easy-to-use cross-platform editor. It has features like split editing, multi-section support, dark mode, and syntax highlighting. These features help developers work efficiently with different programming languages. The system supports HTML, PHP, MySQL, and many other programming languages (Diyaolu *et al.*, 2024; Eweoya, 2025; Yadav *et al.*, 2016). The use of PHP and MySQL is consistent with prior works such as Yadav *et al.* (2016).

For implementation of the proposed system, programming languages used include HTML, CSS, JavaScript, PHP, and MySQL.

- **Deployment Environment**

The system was first built and tested using the XAMPP package, which includes Apache, PHP, and MySQL in a single setup. This environment is easy to configure and is commonly used in academic projects, allowing fast development, testing, and debugging during the initial phase. For actual deployment, the system is better suited to a proper server environment such as a LAMP stack (Linux, Apache, MySQL, PHP). These platforms offer better performance and stability while handling real users. This production server should also run SSL/TLS to ensure all data exchanged between the user and server remains secure. If required, the system can be deployed through Docker containers, which helps maintain a consistent environment and makes scaling easier.

- **Ethics Statement**

No participants were involved in this study, and no actual personal data or information was collected during the development and testing of the system. All testing was performed using dummy records prepared specifically for demonstration purposes. Thus, there was no need for institutional review board (IRB) approval.

- **Security and Privacy Implementation**

Security was treated as a key requirement throughout the development of the Hostel Management System. The system uses HTTPS to ensure that all data is transmitted in encrypted form between the user and server. All important data, such as passwords, are stored using encryption (bcrypt hashing), which prevents exposure even if the data is compromised. SQL injection, a major risk, is mitigated using parameterized SQL queries. Access to system features is controlled through role-based access, ensuring that students and wardens can only view or modify data according to their roles. Server-side input validation is used to filter unsafe data and prevent malicious requests. The system has implemented automatic session timeouts, logging out users if they are inactive, to prevent unauthorized access. Sensitive information, such as medical records and phone numbers, is stored using special hashing functions. To prevent data loss from system failure, the system automatically backs up data every 24 hours.

- **Empirical Evaluation**

To evaluate the performance of the proposed hostel management system, a small pilot test was carried out with 20 students and 4 wardens. Participants were requested to complete typical hostel tasks such as requesting a gate pass, filing a maintenance request, checking the food menu, and requesting medical leave. All activities were carried out using both the traditional manual system and the newly developed digital system. The time taken to complete tasks, error rates, and task success rates were recorded. A brief usability questionnaire based on the System Usability Scale (SUS) was also completed by the participants.

- **Evaluation Metrics**

The evaluation focused on the following metrics:

  - **Task Success Rate:** Percentage of participants who used the portal without assistance.
  - **Completion Time:** Average time taken to complete tasks.
  - **Error Rate:** Mistakes made during task completion.
  - **User Satisfaction:** Perceived usability on a scale of 0–100.
  - **Qualitative Feedback:** Open-ended responses on ease of use and system clarity.

- **Quantitative Results**

Table 3: Comparison of the Performance of the Manual Workflow with the Proposed System

Metric	Manual System	Proposed System	Improvement
Avg. Gate Pass Processing Time	5.0 min	1.2 min	76% faster
Avg. Maintenance Request Time	4.2 min	1.4 min	67% faster
Error Rate	12%	2%	83% reduction
Task Success Rate	82%	96%	+14% improvement
User Satisfaction (SUS)	61/100	85/100	+39% increase

- **Qualitative Results**

Participants reported that the digital system was:
Easier to navigate

- Faster than manual processing
- Less confusing
- More transparent

Wardens also emphasized that online approvals and real-time updates minimized paperwork and enhanced the responsiveness of gate pass requests, maintenance requests, and medical requests.

- **Summary**

The pilot evaluation demonstrates that the proposed system has a significant impact on operational efficiency, error reduction, and overall user satisfaction. These results show that the integrated web-based solution provides substantial benefits compared to manual hostel management processes.

- **Ethics Statement**

This study included a small pilot evaluation involving volunteer participation from students and wardens. All participants were informed about the purpose of the research and demonstration. Consent was obtained from all participants prior to their involvement. To maintain privacy, no personal information was collected during the evaluation. Formal Institutional Review Board (IRB) approval was not required under the institution's guidelines.

4. Results and Discussion

The implementation of the proposed Hostel Management System was successfully carried out. As shown in Figures 5 and 6, students and wardens can log in to their dashboards and access modules after signing in.

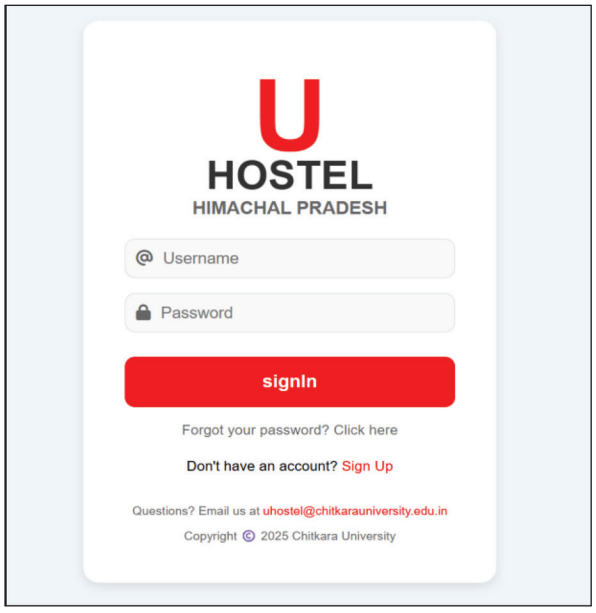


Figure 5: Student Login

Figure 7 shows the dashboard where students have key access for all modules like gate pass, food menu, maintenance complaints and so on. There is clear separation of role-based modules.

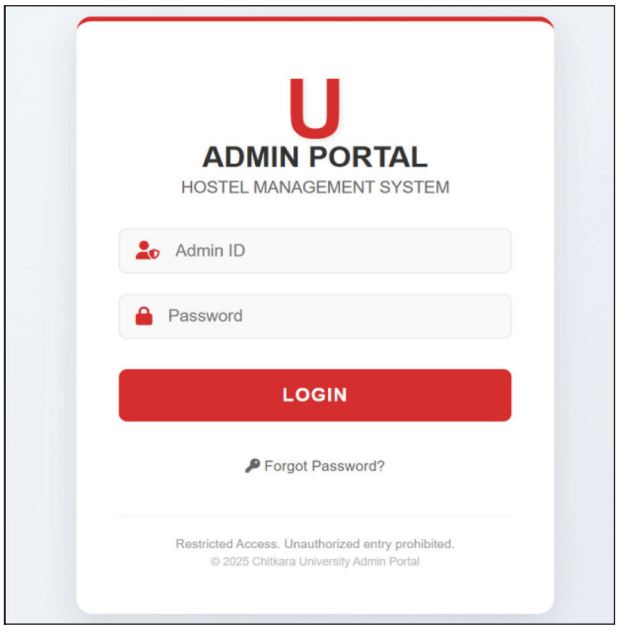


Figure 6: Admin Login

Figures 8 and 9 show the gate pass module where students can submit gate pass applications and view the history of their previously applied.

Figure 10 shows student forms to apply for the maintenance request. It also allows students to report the issues and indicates the level of urgency. Figure 11 presents the medical leave form where students can apply for medical assistance such as doctor or ambulance if needed.

Figure 12 illustrates the warden dashboard, which provides an overview of student records and enables updates to their details when required. The dashboard also displays pending or unread requests, allowing the warden to address them promptly.

Figure 13 shows the food menu update module. Wardens can modify the menu according to the schedule. Once updated, the changes are immediately reflected on the student interface to ensure real-time access to the latest information.

Figure 14 illustrates the gate pass approval module, which allows the warden to review student requests and accept or reject gate passes based on hostel and university policies.

The outcomes of the Hostel Management System can be evaluated in terms of efficiency, security, and communication. Students can now apply for services instantly through their

dashboards, reducing delays and minimizing paperwork. The introduction of digital records reduces the risk of data manipulation or loss; for example, every gate pass request is logged in the database, making it easier to track records. The system enhances communication between students and wardens through modules such as emergency messaging and contact modules. Students can directly reach wardens via the platform, ensuring faster responses during emergencies. At the same time, wardens can broadcast updated food menus, contact details, and important announcements.

Overall, the evaluation highlights that the proposed solution not only digitizes students' lives but also ensures transparency and responsiveness compared to traditional manual methods.

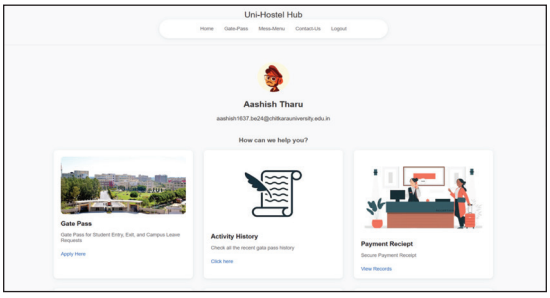


Figure 7: Student Dashboard

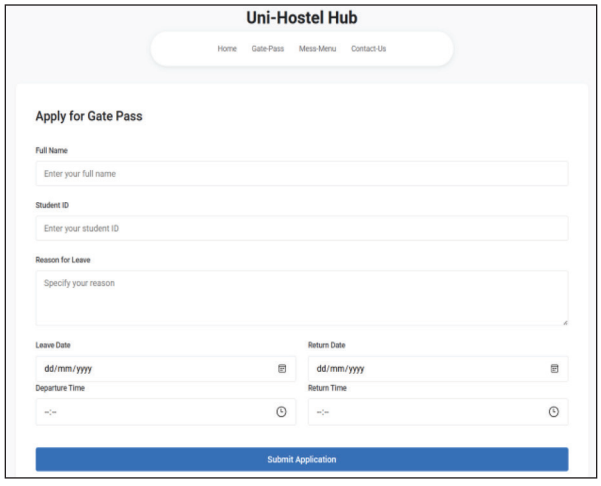


Figure 8: Gate Pass Apply Module

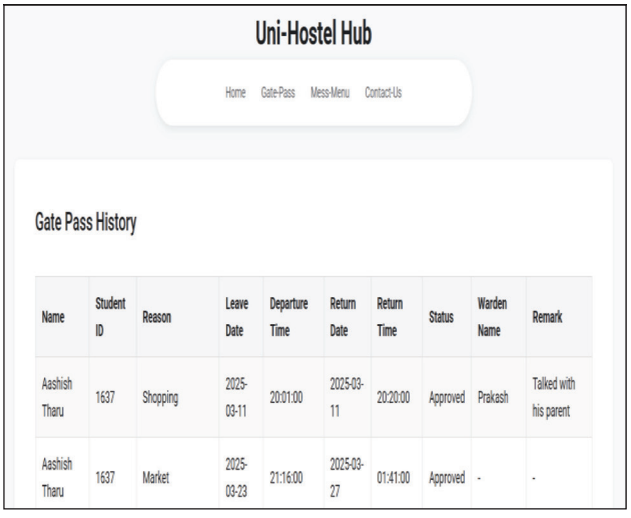


Figure 9: Gate Pass History

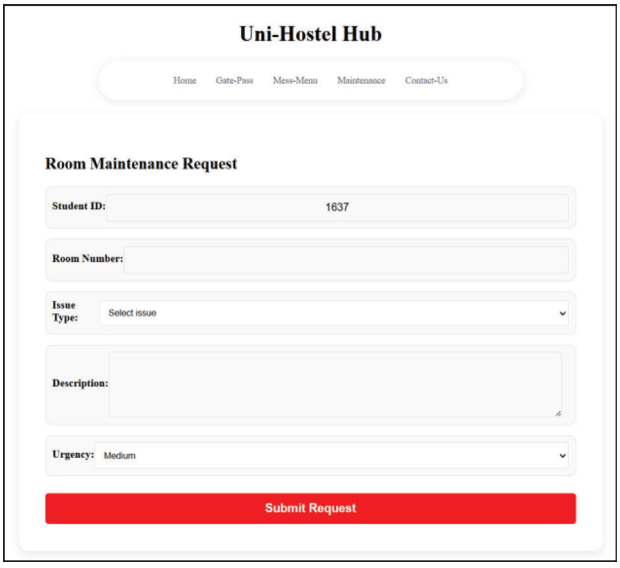


Figure 10: Maintenance Request Module

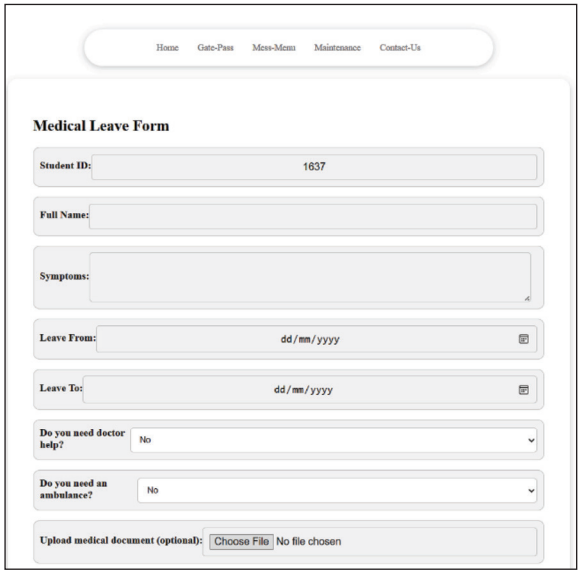


Figure 11: Medical Leave Module

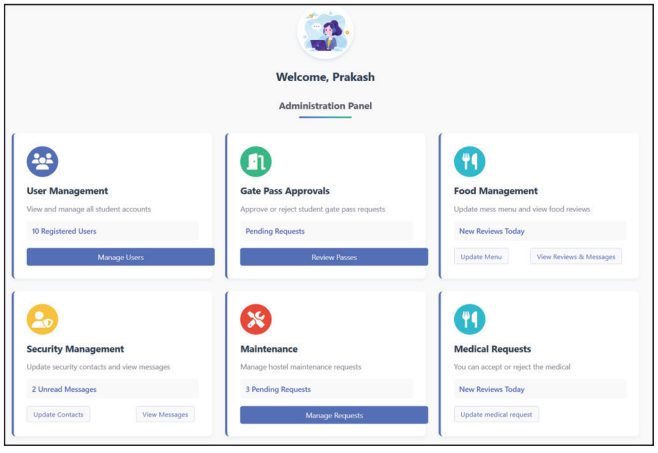


Figure 12: Warden Dashboard for various Administrative Tasks

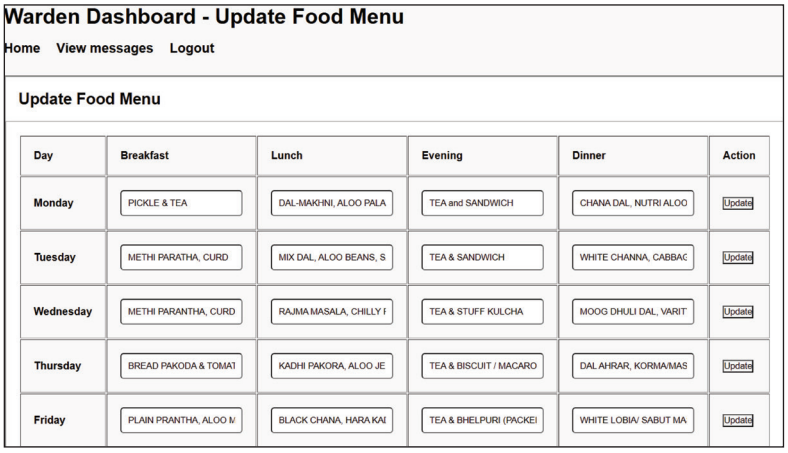


Figure 13: Warden Dashboard for Updating Food Menu for a Week

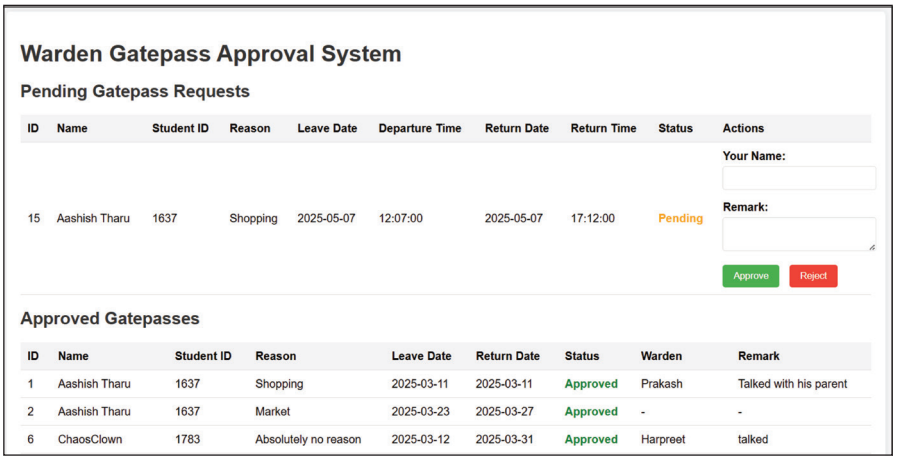


Figure 14: Gate Pass Approval

5. Conclusion

The Hostel Management System is a user-friendly, web-based platform designed to streamline hostel services within academic institutions such as colleges and universities. The proposed system digitalizes key processes associated with hostel residency, including gate pass requests, medical leave applications, emergency messaging, and direct communication. By replacing manual methods, it addresses several challenges inherent in traditional hostel management while improving efficiency, transparency, and accuracy. The system is cost-effective, stable, and easy to use, offering a scalable and adaptable solution for hostel administration. Ultimately, it contributes to better resource management and an enhanced living experience for students.

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Authorship Contribution

The primary development and implementation of the system were carried out by the first author, who also led the design, analysis, and documentation of the work. The co-authors contributed through supervision, feedback, revisions, and approval of the final manuscript. All authors reviewed and approved the final version of the paper submission.

Ethical Approval

This research did not involve human participants, live deployment, or the collection of identifiable information. Therefore, approval from an Institutional Review Board (IRB) or ethics committee was not required. All system testing was performed in a controlled development environment using simulated data to ensure privacy and confidentiality.

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Declaration

The authors declare that this work is original and has not been submitted elsewhere for publication. All data, methodologies, and system components have been developed and reported in adherence to academic standards. All referenced materials have been duly cited, and the authors accept full responsibility for the integrity and accuracy of the findings presented.

Conflict of Interest

The authors certify that they have no affiliations, financial interests, or personal relationships that could have appeared to influence the work reported in this paper.

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