| | **Marwadi University** <br> **Faculty of Engineering and Technology** <br> **Department of Information and Communication Technology** | |
|---|---|---|
| **Subject: Capstone Project** | **System Design and Architecture Section** | |
| **Project : - Galaxy Hostel** | **Date: 25-09-2025** | **Enrolment No: 92310133001** |

## Introduction

- Galaxy Hostel Website is purely based for the hostel students as well as for the wardens and admins so that they can not only know how many users are there but also get the details they want easily. The main reason behind making this project is very clear. Being hostel students ourselves, we know about the timings, rules, and regulations of the hostel, but some new students are not aware of them. Because of that, the idea of creating this project came up.
- I also noticed that the warden of Galaxy Hostel usually comes to each floor and every room to take attendance using pen and paper. While this method is fine, technology has evolved, and that is the main reason behind creating this site. With this website, admins can not only manage data but also keep track of student complaints and attendance online, along with the gate pass system.

## Modular Design

- The Galaxy Hostel Website is designed using a three-tier modular architecture to ensure scalability, maintainability, and smooth interaction between different stakeholders (students, wardens, and admins). Each module is independent yet interconnected, ensuring that updates or modifications can be done without affecting the entire system.

**1. Frontend Module (User Interface):**
- Provides hostel students, wardens, and admins with an interactive web platform.
- Handles student registration, login, attendance view, gate pass requests, complaint submissions, and hostel rules display.
- Offers responsive design for accessibility across devices (desktop, tablet, and mobile).

**2. Backend Module (Application Logic):**
- Implements the core business logic of the system, including attendance tracking, gate pass approval workflows, and complaint management.
- Ensures secure authentication and authorization for students, wardens, and admins.
- Provides APIs for smooth communication between frontend and database.
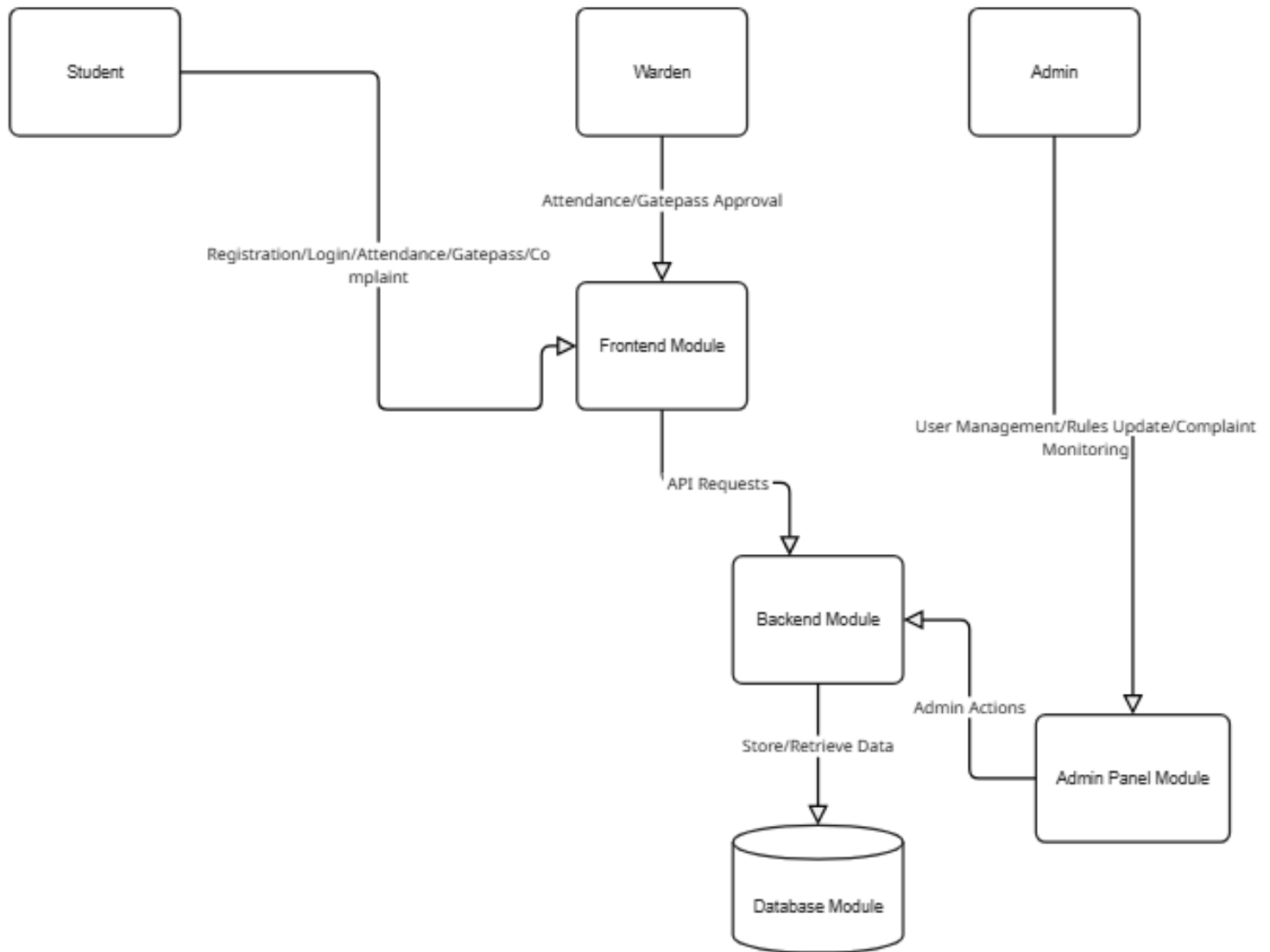- Handles notifications and data validation before storage.

**3. Database Module (Data Storage):**
- Stores student profiles, attendance records, gate pass requests, complaint logs, hostel rules, and admin data.
- Maintains data integrity and security with relational structures.
- Optimized for fast data retrieval to support real-time queries (e.g., attendance lookup by warden).
- Ensures backup and recovery mechanisms for reliability.

**4. Admin Module (Management Panel):**
- Allows admin to monitor hostel activities, verify student records, and view system statistics.
- Provides dashboards for managing attendance, gate passes, complaints, and hostel notices.
- Enables admin to add or update hostel rules and regulations.
- Supports role-based access control to ensure only authorized personnel can manage sensitive data.

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## Technology Stack

### ➕ Frontend

- ❖ **Next.js (with TypeScript)**:
  - Provides a server-side rendered React framework for fast, SEO-friendly web pages.
  - Supports TypeScript for type safety, reducing runtime errors and improving code maintainability.
  - Enables SPA-like behavior with fast page navigation and dynamic rendering.
- ❖ **Tailwind CSS**:
  - Utility-first CSS framework for consistent, responsive, and easily customizable UI.
  - Reduces the need for writing custom CSS and ensures rapid UI development.
- ❖ **HTML & CSS**:
  - Standard web technologies used for semantic markup and additional styling flexibility.
- ❖ **Framer Motion / Optional Animations**:
  - Used for smooth transitions, micro-interactions, and enhanced user experience.

### ➕ Backend / Serverless

- ❖ **Firebase (Authentication, Firestore, Functions, Hosting)**:
  - **Authentication**: Secure login with email/password, social login, and role-based access.
  - **Firestore Database**: Cloud-hosted NoSQL database for storing student profiles, attendance logs, gate passes, complaints, and admin data.
  - **Cloud Functions**: Serverless functions to handle business logic, API requests, and notifications.
  - **Hosting**: Fast deployment with SSL support and global CDN.
- ❖ **Justification**:
  - Firebase eliminates the need to manage traditional backend servers, reduces development time, and ensures scalable, real-time data synchronization across users.

- **Authentication**
  - ❖ **Firebase Authentication**:
    - • Handles secure login, registration, and role-based access for students, wardens, and admins.
    - • Supports passwordless login and integration with Google/other OAuth providers.
  - ❖ **Justification**:
    - • Reduces complexity of managing authentication, enhances security, and integrates seamlessly with Firestore.

- **Database**
  - ❖ **Firestore (NoSQL)**:
    - • Real-time, cloud-hosted database.
    - • Stores structured and semi-structured data, including attendance, gate pass requests, complaints, and notifications.
  - ❖ **Justification**:
    - • Provides real-time updates, scales automatically with users, and reduces backend management overhead.

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## Conclusion

➢ The Galaxy Hostel Website directly solves the real challenges faced by students, wardens, and admins in day-to-day hostel management. By digitizing attendance, gate passes, and complaints, the system reduces manual work, saves time, and increases efficiency. It is technically feasible, cost-effective, and scalable for future needs.