

# AI-Powered Hostel Management System

**To Test this Web-application use these credentials:**

**1.Admin (pre-defined)**

[admin@hms.com](mailto:admin@hms.com)

password - admin123

**2.Staffs (can created using admin)**

[kumar@hms.com](mailto:kumar@hms.com) (Electrician)

password - kumar123

[jai@hms.com](mailto:jai@hms.com) (cleaner)

password – jai123

*other staff roles are also there it can created by admin.*

**3.Warden (can create using admin)**

[niyas@hms.com](mailto:niyas@hms.com)

password – niyas123

**4.Resident Tutor (can create using admin)**

[ayas@hms.com](mailto:ayas@hms.com)

password – ayas123

## **Introduction**

Welcome to the **Hostel Management System (HMS)** - A comprehensive solution for managing hostel operations including student bookings, room management, complaints, payments, and AI-powered assistance.

This system is designed to streamline hostel administration and provide students with a seamless experience for managing their accommodation, payments, and daily needs.

# System Architecture

## Frontend:

- **Framework:** React.js with Vite
- **Styling:** Tailwind CSS
- **State Management:** React Context API
- **Routing:** React Router DOM v6
- **Forms:** Formik + Yup validation
- **Icons:** Lucide React
- **AI Chat:** Integrated Gemini AI chatbot

## Backend:

- **Framework:** Node.js with Express.js
- **Database:** MongoDB with Mongoose ODM
- **Authentication:** JWT (JSON Web Tokens) + bcrypt
- **File Upload:** Multer + Cloudinary
- **Payment Integration:** Razorpay
- **AI Integration:** Google Gemini AI API
- **Email:** Nodemailer + Sendgrid

# Admin Capabilities

1. Full system access
2. Manage blocks, floors, and rooms
3. View all residents and occupancy
4. Manage staff and assign tasks
5. Create announcements
6. View financial reports
7. Handle complaints and maintenance
8. Access analytics dashboard

The screenshot shows the HMS Admin Portal dashboard. On the left is a dark sidebar with a navigation menu:

- Dashboard (selected)
- Rooms
- Residents
- Occupancy
- Staff
- Maintenance
- Announcements
- Billing
- Expenses
- Reports

The main content area has the following sections:

- Welcome back, Admin** (Monday, November 24, 2025)
- Dashboard Overview**: Welcome back, here's what's happening today.
  - Occupancy Rate: **0.6%** (1/164 Beds Filled)
  - Active Residents: **1** (Live Count)
  - Maintenance Desk: Manage Tickets
  - Total Revenue: **₹50,000** (Net Profit: ₹50,000)
- No Announcements**: Check back later for updates and notices.
- Room Availability Overview**: A chart showing room availability. The y-axis has categories "Occupied" and "Available". The x-axis ranges from 0 to 180. The "Available" bar spans from approximately 10 to 170.
- Quick Actions**:
  - Hostel Structure
  - Manage Staff
  - Billing Tools
  - Resident Directory

# Student Capabilities

1. Book hostel rooms
2. Make payments
3. Raise complaints
4. View mess menu
5. Check dues
6. Update profile
7. AI chatbot assistance

The screenshot shows the HMS Student Portal dashboard. At the top, it says "Welcome back, sabeer" and "Monday, November 24, 2025". On the left is a sidebar with a dark background and white text, showing navigation options: Dashboard (selected), Complaints, My Dues, Payment History, Services, and Profile. The main content area has a light gray background. At the top of this area, there's a teal-colored banner with the text "Welcome Home, sabeer! 🎉" and a subtitle "Your booking is confirmed! Manage your hostel experience from here." Below the banner is a section titled "Dashboard" with the subtitle "Your hostel overview and quick actions". It contains several cards: "Maintenance" (Raise complaints), "My Dues" (Pending payments), "Payment History" (Transaction records), "Services" (Additional services), and "Profile" (Manage account). At the bottom of the dashboard, there's a "Need Help?" section with a "Report Issue" button. A purple callout bubble from an AI chatbot named "Hey! I'm HostelBot AI" is visible on the right side, with the text "Got questions? Ask me anything about hostel services, dues, mess menu, or rules!". The bottom right corner of the screen has a blue circular icon with a white question mark.

# User Roles & Permissions

## 1. Admin/Warden

- Complete system control
- User management (CRUD operations)
- Property management (blocks, floors, rooms)
- Financial oversight
- Report generation
- Announcement creation
- Staff assignment

## 2. Resident Tutor (RT) / Warden

- Assigned to specific floors (only for RT's)
- Monitor student welfare
- Handle floor-specific queries
- View assigned students

## 3. Staff

- Receive maintenance assignments
- Update task status
- View assigned complaints
- Mark tasks as complete

## 4. Student

- Self-service portal
- Room booking and payment
- Complaint registration
- Service requests
- Profile management
- AI assistance

## Features Overview

### Property Management

- Structured as Blocks → Floors → Rooms
- Supports AC and Non-AC room types
- Multiple pricing plans
- Room capacity from 1 to 6 persons
- Seasonal and promotional discounts

### Payment System

- Razorpay payment gateway integration
- Automatic PDF invoice generation
- Complete payment history
- Tracking of pending dues
- Automated email reminders for payments

### Complaint Management

- Complaints categorized (Electrical, Plumbing, Furniture, Cleaning)
- Priority levels (Emergency, High, Medium, Low)
- Assign complaints to appropriate staff
- Track status: Pending → Assigned → In Progress → Resolved
- Option to upload images

### Announcements

- Notice board for posting announcements
- Priority marking (Urgent, High, Medium, Low)
- Target audience options (All, Students, Staff)
- Support for images in announcements
- Automatic hiding of expired notices

## **AI Chatbot (HostelBot)**

- 24/7 support
- Understands hostel-related queries
- Multi-language support
- Quick-action buttons for common questions
- Role-based suggestions

## **Example Queries**

- “What’s on the mess menu today?”
- “Show my pending dues”
- “What are the hostel rules?”
- “What are the gate timings?”
- “How do I raise a complaint?”

## **Services Management**

- Digital mess pass
- WiFi credential management
- Laundry service booking and tracking
- Support for additional customizable services

# AI Hostel Assistant - RAG Implementation

The AI Hostel Assistant is a RAG (Retrieval-Augmented Generation) powered chatbot that combines static knowledge (hostel rules & mess menu) with dynamic student data (room info, dues, complaints) to provide personalized assistance.

## RAG Components:

- 1. Retrieve:** Loads hostel rulebook and mess menu from `knowledgebase.txt`
- 2. Augment:** Fetches student's live data from MongoDB (room, dues, complaints)
- 3. Generate:** Uses Google Gemini AI to create contextual responses

## Features

### Smart Context Awareness

- Knows current day's mess menu
- Accesses student's room number and type
- Checks pending dues in real-time
- Lists active complaints

### Modern UI

- Floating chat button (bottom-right)
- Gradient purple/indigo theme
- Real-time typing indicators
- Quick question suggestions
- Smooth animations

### Intelligent Responses

- Answers using rulebook data
- Provides personalized information
- Suggests actions (e.g., "Use Complaints page")
- Friendly tone with emojis

## **Testing Workflow**

### **A. Admin Flow:**

1. Login with admin credentials
2. Navigate to Hostel Manager
3. Create a new block/property
4. Add floors and rooms
5. View occupancy dashboard
6. Create test announcement
7. Assign staff to complaints

### **B. Student Flow:**

1. Register new student account
2. Complete profile
3. Browse available rooms
4. Book a room and make payment
5. Raise a test complaint
6. Chat with AI bot
7. View payment history

### **C. Payment Testing:**

Use Razorpay test mode

Test card: 2305 3242 5784 8228

CVV: Any 3 digits

Expiry: Any future date

## **Additional Features**

### **Analytics & Reports**

- Occupancy trends
- Revenue analysis
- Complaint statistics
- Student demographics
- Payment reports

### **Notification System**

- Real-time updates
- Email notifications
- In-app alerts
- Payment reminders

### **Responsive Design**

- Mobile-first approach
- Tablet optimization
- Desktop enhancement
- Cross-browser compatibility

### **Security Features**

- JWT authentication
- Password encryption
- Role-based access control
- Input validation
- XSS protection
- CORS configuration

## **Support & Contact**

For any queries or issues:

- **Documentation:** This file
- **AI Assistant:** Use HostelBot for instant help
- **Email Support:** [sabeeranwermeeran@gmail.com](mailto:sabeeranwermeeran@gmail.com)

Thank you for testing the Hostel Management System!