

# Hostel Management QR Code Attendance System

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**Abstract:** Traditional hostel attendance systems mainly depend on manual registers for recording student entry and exit details. These methods are time-consuming, error-prone, difficult to maintain, and do not provide real-time information about student movement. Manual attendance records may also be manipulated, misplaced, or damaged, which affects hostel security and administrative efficiency. To overcome these limitations, this paper presents a Hostel Management QR Code Attendance System designed to automate student IN and OUT attendance using QR code technology.

The proposed system allows students to scan a QR code placed at the hostel entrance and select their movement status as IN or OUT. The system automatically records student details, date, time, and attendance status in a centralized database. An admin dashboard enables hostel authorities to monitor student movement, view attendance logs, manage student records, and generate reports. The system is cost-effective because it does not require expensive hardware such as RFID readers or biometric devices. It improves accuracy, reduces manual workload, supports real-time monitoring, and enhances hostel security. The system is suitable for colleges, universities, private hostels, and residential institutions.

**Keywords:** QR Code, Hostel Management System, Digital Attendance, Real-Time Monitoring, Student Entry-Exit Tracking, Admin Dashboard, Database Management

## I. Introduction

Attendance and movement tracking play an important role in hostel administration. Hostel authorities need to maintain accurate records of students entering and leaving hostel premises for safety, discipline, and administrative purposes. In many institutions, this process is still performed manually using physical registers. Students write their name, room number, time, and signature whenever they enter or exit the hostel.

Although manual registers are simple to use, they are inefficient for modern hostel management. They require continuous manual supervision, consume time, and are prone to errors such as incorrect entries, missing details, and unreadable handwriting. Moreover, manual registers do not provide real-time information about whether a student is currently inside or outside the hostel.

The increasing use of smartphones and digital systems has created opportunities to automate such administrative activities. QR code technology provides a simple, affordable, and efficient way to record attendance digitally. A QR code can be scanned using a smartphone or web-enabled device, and the scanned data can be processed by a backend system to mark attendance.

The proposed Hostel Management QR Code Attendance System is designed to replace manual hostel attendance registers with a digital attendance platform. A unique QR code is placed at the hostel entrance or exit point. Students scan the QR code and select their status as IN or OUT. The system stores the attendance record with date and time in a database. Hostel authorities can view these records through an admin dashboard.

This system improves hostel monitoring, reduces paperwork, increases accuracy, and supports quick report generation. It is especially useful for educational institutions that require a low-cost and reliable hostel attendance solution.

## 1.1 Problem Statement

Traditional hostel attendance systems face several problems:

- Manual entries are time-consuming and error-prone.
- Hostel authorities cannot monitor student movement in real time.
- Physical registers may be lost, damaged, or manipulated.
- Searching previous records from registers is difficult.
- Report generation requires manual checking of records.
- Proxy or false entries may occur in manual registers.
- Hostel security is limited due to lack of automated tracking.

Therefore, there is a need for a digital system that can automate hostel entry-exit attendance, store records securely, and provide real-time access to hostel authorities.

## 1.2 Objectives

The main objective of this project is to design and develop a QR code-based digital attendance system for hostel management.

The specific objectives are:

- To automate student entry and exit attendance in hostels.
- To provide QR code-based attendance marking.
- To reduce manual paperwork and administrative workload.
- To record attendance with accurate date and time.
- To provide real-time monitoring for hostel authorities.
- To maintain student records in a structured database.
- To generate daily, weekly, monthly, and student-wise reports.
- To improve hostel security and student accountability.
- To provide a cost-effective alternative to RFID and biometric systems.

## 1.3 Scope

The proposed system is designed for hostel environments where student movement must be monitored regularly. The scope of the system includes:

- Student registration and login.
- QR code scanning for attendance.
- IN and OUT status selection.
- Automatic date and time recording.
- Centralized attendance database.
- Admin dashboard for monitoring.
- Student record management.
- Attendance log viewing.
- Report generation.

The current system mainly focuses on student entry and exit tracking. Advanced features such as GPS verification, face recognition, dynamic QR codes, parent alerts, and cloud-based analytics can be added in future versions.

## 1.4 Limitations

The proposed system has some limitations:

- Internet connectivity is required for real-time database updates.

- Static QR codes may be shared if proper validation is not implemented.
- Students require a smartphone or camera-enabled device.
- Location verification is not included in the basic version.
- Face recognition and biometric verification are considered future enhancements.

## II. Literature Review

### 2.1 Manual Attendance Systems

Manual attendance systems are commonly used in hostels because they are simple and inexpensive. In this method, students write their name, room number, time, and signature in a register. Hostel staff later verify and maintain the records.

However, manual systems have many limitations. They are slow, require physical storage, and are difficult to search. Manual records can also contain mistakes or incomplete information. In large hostels, maintaining registers becomes inefficient and unreliable.

### 2.2 RFID-Based Attendance Systems

Radio Frequency Identification, or RFID, is used in many institutions for attendance automation. Each student is given an RFID card, and attendance is marked when the card is scanned by a reader.

RFID systems are faster than manual systems and can store records digitally. However, they require RFID cards and reader devices. Cards may be lost, damaged, or shared among students. The hardware cost also makes RFID less suitable for institutions with limited budgets.

### 2.3 Biometric Attendance Systems

Biometric systems use unique physical characteristics such as fingerprints, face recognition, or iris patterns for attendance. These systems provide better identity verification and reduce proxy attendance.

However, biometric systems require dedicated hardware and maintenance. Fingerprint devices may face issues due to dust, injury, or hygiene concerns. Face recognition systems may be affected by lighting conditions. These systems can also raise privacy concerns and increase implementation cost.

### 2.4 Mobile and Cloud-Based Attendance Systems

Mobile and cloud-based attendance systems allow users to mark attendance through mobile applications. These systems provide remote access, centralized storage, and real-time synchronization.

However, mobile-based attendance systems must include proper authentication and validation to avoid misuse. Without location verification or secure access control, students may mark attendance from unauthorized locations.

## 2.5 QR Code-Based Attendance Systems

QR code-based attendance systems provide a simple and low-cost solution for attendance automation. A QR code can store or link to attendance-related data. Students can scan the code using a smartphone, and the system can automatically record attendance.

In hostel management, QR codes can be placed at entry and exit points. Students scan the code and select their IN or OUT status. The system stores the record in the database and allows hostel authorities to monitor student movement.

QR code systems are suitable for hostels because they require minimal hardware, are easy to use, and can be integrated with web or mobile applications.

Several researchers have proposed QR code-based attendance systems to reduce manual work, improve attendance accuracy, and provide faster record management in educational institutions [14]–[16].

## 2.6 Research Gap

Existing attendance systems have several gaps when applied to hostel management:

- Many systems are designed for classrooms or offices, not hostel entry-exit tracking.
- Manual systems do not provide real-time monitoring.
- RFID and biometric systems require additional hardware.
- Report generation is difficult in manual systems.
- Some systems do not include proper authentication.
- Existing systems may not combine student records, attendance logs, and admin monitoring in one platform.
- Searching and retrieving old records is difficult in physical registers.

The proposed system addresses these gaps by providing a QR code-based hostel attendance system with student authentication, IN/OUT tracking, database storage, admin monitoring, and report generation.

## III. System Analysis and Design

### 3.1 System Architecture

The proposed system follows a three-tier architecture consisting of:

1. Presentation Layer
2. Application Layer
3. Database Layer

The presentation layer includes the student interface and admin dashboard. The application layer handles authentication, QR code validation, attendance processing, and report generation. The database layer stores student details, admin records, QR code data, and attendance logs.

The basic system flow is:

Student Login → QR Code Scan → IN/OUT Selection → Backend Validation → Database Storage → Admin Dashboard Update



**Fig. 1: Proposed System Architecture**

The layered and modular design follows standard software engineering practices for maintainability and scalability [1], [2].

### 3.2 User Roles and Modules

The system mainly includes two user roles:

#### 1. Student

Students can:

- Register or log in.
- Scan the hostel QR code.
- Select IN or OUT status.
- Submit attendance.
- View attendance confirmation.

#### 2. Admin

Admins can:

- Log in securely.

- Manage student records.
- View attendance logs.
- Search attendance history.
- Monitor student movement.
- Generate reports.

### 3.3 System Modules

The system is divided into the following modules:

#### 3.3.1 Student Module

This module allows students to register, log in, scan the QR code, and mark IN/OUT attendance.

Functions include:

- Student registration
- Student login
- QR code scanning
- IN/OUT status selection
- Attendance confirmation

#### 3.3.2 Admin Module

This module allows hostel authorities to manage and monitor attendance records.

Functions include:

- Admin login
- Student record management
- Attendance log viewing
- Search and filter options
- Report generation

#### 3.3.3 QR Code Module

This module manages QR code generation, scanning, and validation.

Functions include:

- QR code generation
- QR data storage
- QR code validation
- Invalid QR rejection

#### 3.3.4 Attendance Module

This module processes student movement records.

Functions include:

- Date and time recording
- IN/OUT status storage
- Duplicate entry prevention
- Attendance history maintenance

#### 3.3.5 Database Module

This module stores all important system data.

Functions include:

- Store student details
- Store admin records
- Store attendance logs
- Retrieve reports

#### 3.3.6 Report Module

This module helps admins generate useful attendance reports.

Reports include:

- Daily attendance report
- Student-wise report
- Room-wise report
- Monthly report
- Late entry report
- Outside hostel student list

### 3.4 QR Code Attendance Process

The QR code attendance process includes the following steps:

- Student opens the application or web interface.
- Student logs in using valid credentials.
- Student scans the QR code placed at the hostel entrance.
- The system validates the QR code.
- Student selects IN or OUT status.
- The backend verifies the student and attendance request.
- The attendance record is stored in the database.
- Confirmation is displayed to the student.
- Admin dashboard is updated with the latest record.

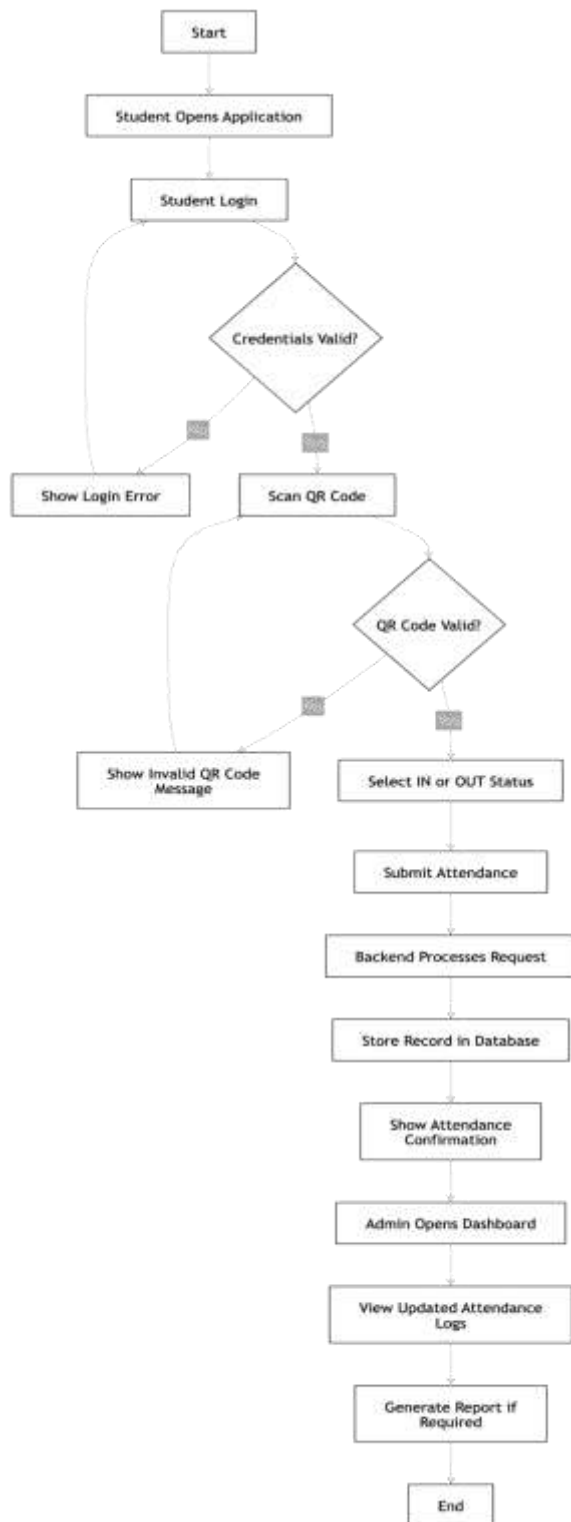


Fig. 2: QR Code Attendance Workflow

- student\_id
- name
- email
- password
- room\_no
- department
- contact\_no
- status

#### Admin Table

- admin\_id
- username
- password
- role

#### Attendance Table

- attendance\_id
- student\_id
- date
- time
- status
- qr\_id

#### QR Code Table

- qr\_id
- qr\_data
- generated\_date
- expiry\_time
- status

#### Report Table

- report\_id
- report\_type
- generated\_by
- generated\_date

The relationship between tables ensures proper data management. One student can have many attendance records, and one QR code can be linked with many attendance entries.

The use of tables, keys, and relationships follows standard database design principles [3].

### 3.5 Database Design

The database is an important part of the system. It stores student details, admin details, QR code data, attendance records, and reports.

The main tables are:

#### Student Table

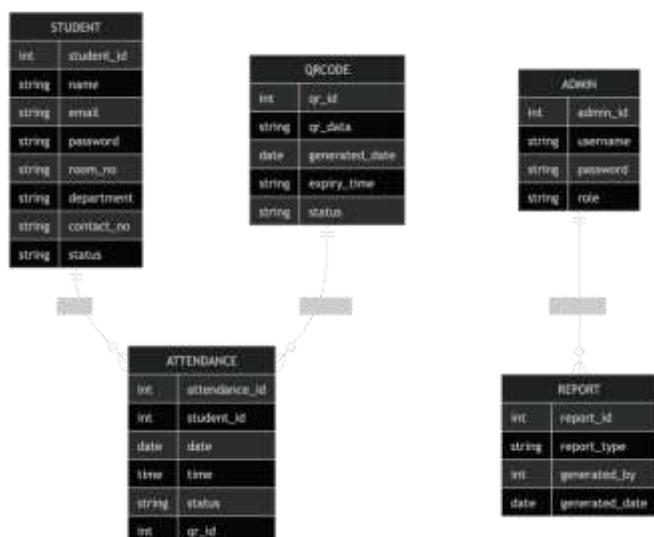


Fig. 3: Entity Relationship Diagram

### 3.6 Technology Stack

The system can be developed using the following technologies:

- **Frontend:** HTML, CSS, JavaScript, Bootstrap
- **Backend:** Python Django / Node.js
- **API Framework:** Django REST Framework / Express.js
- **Database:** SQLite / MySQL / MongoDB
- **Mobile Development:** Android Studio
- **QR Code Library:** QR code generator and scanner library
- **Development Tools:** Visual Studio Code, GitHub, Postman
- **Browser:** Google Chrome / Mozilla Firefox

The selected tools and frameworks support web development, API design, version control, documentation, and deployment [4]–[13].

## IV. Implementation

### 4.1 Development Environment

The system can be developed in a web-based or mobile-supported environment. During development, tools such as Visual Studio Code, Android Studio, XAMPP, Django development server, or Node.js server can be used depending on the selected backend technology.

The basic hardware requirements are:

- Smartphone with camera
- Computer or laptop for admin panel
- Internet connection

- Server or local machine for hosting
- Printed or digital QR code
- Minimum 4 GB RAM for development
- Minimum 10 GB storage space

### 4.2 Student Registration Implementation

The registration module collects student details such as name, email, mobile number, room number, department, year, and password. The system validates the entered data and stores it in the database.

Each student is assigned a unique student ID. This ID is used to link attendance records with student details.

### 4.3 Student Login and Authentication

Students log in using their email or username and password. The backend verifies the entered credentials with the database. If the credentials are valid, the student can access the QR scanning interface.

Authentication prevents unauthorized users from marking attendance.

### 4.4 QR Code Scanning Implementation

A unique QR code is placed at the hostel entrance. The QR code may contain a hostel ID, gate ID, or secure attendance link. Students scan this QR code using a smartphone camera or web-based scanner.

After scanning, the system sends the QR data to the backend for validation. If the QR code is valid, the student can proceed to mark attendance. If the QR code is invalid or expired, the system rejects the request.

### 4.5 IN/OUT Status Selection

After successful QR code validation, the student selects one of the following options:

- **IN:** When entering the hostel
- **OUT:** When leaving the hostel

The selected status is submitted along with student ID, date, time, and QR code details.

### 4.6 Backend Processing

The backend performs the following operations:

- Verifies student authentication
- Validates QR code data
- Checks current date and time
- Checks previous attendance status
- Prevents duplicate entries

- Stores valid attendance record

This ensures that attendance records are accurate and reliable.

#### 4.7 Admin Dashboard Implementation

The admin dashboard provides hostel authorities with a centralized view of attendance data. It displays:

- Total registered students
- Students currently inside the hostel
- Students currently outside the hostel
- Recent IN/OUT activity
- Daily attendance summary
- Search and filter options
- Report generation tools

#### 4.8 Report Generation Implementation

The admin can generate reports based on different filters, such as:

- Date-wise report
- Student-wise report
- Room-wise report
- Monthly report
- Late entry report
- Outside hostel student list

These reports help hostel authorities maintain records and analyze student movement.

#### 4.9 Security Implementation

The system includes multiple security measures:

- Student and admin authentication
- Role-based access control
- Password hashing
- QR code validation
- Secure API endpoints
- Input validation
- Session management
- Database access restrictions

For future improvement, dynamic QR codes, GPS verification, and face recognition can be added to improve security.

### V. Results and Discussion

#### 5.1 Functional Evaluation

The proposed system improves hostel attendance management by replacing manual registers with a digital QR

code-based platform. The system allows students to mark attendance quickly and enables hostel authorities to monitor movement records through an admin dashboard.

The major functional outcomes of the system are:

- Faster attendance marking
- Automatic date and time recording
- Real-time student movement tracking
- Digital storage of attendance records
- Easy search and retrieval of logs
- Quick report generation
- Reduced manual workload
- Improved hostel security

#### 5.2 Comparison with Existing Systems

Traditional manual attendance systems are simple and low-cost, but they are time-consuming, error-prone, and do not provide real-time tracking. RFID-based systems improve speed and digital record keeping, but they require RFID cards and reader devices, which increase hardware cost and maintenance. Biometric systems offer better accuracy and reduce proxy attendance, but they are expensive and may raise privacy, hygiene, and maintenance issues. Compared to these systems, the proposed QR code-based attendance system provides a balanced solution for hostel management. It requires only a smartphone and a printed or digital QR code, making it cost-effective and easy to implement. The system also supports real-time monitoring, digital record keeping, quick report generation, and improved hostel security. Therefore, the QR code-based system is more suitable for hostel environments where affordability, simplicity, and efficient student movement tracking are important.

#### 5.3 Advantages of the Proposed System

##### Reduced Manual Work

The system eliminates the need for handwritten register entries and reduces the workload of hostel staff.

##### Improved Accuracy

Attendance records are stored automatically with date and time, reducing human errors.

##### Real-Time Tracking

Admins can check whether a student is inside or outside the hostel at any time.

##### Enhanced Hostel Security

Digital movement records improve student accountability and help hostel authorities monitor late entries or unusual movement.

### Digital Record Keeping

All data is stored in a database, making it easy to search, retrieve, and generate reports.

### Cost Effectiveness

The system uses QR codes and smartphones, avoiding expensive RFID or biometric hardware.

### Scalability

The system can be expanded to multiple hostels, departments, or institutions.

## 5.4 Security and Privacy Discussion

Since the system stores student personal information and movement records, security and privacy are important. The system restricts access based on user roles. Students can only mark their own attendance, while admins can manage records and generate reports.

To improve QR code security, future versions may use dynamic QR codes that change periodically. GPS validation and face recognition can also be added to prevent misuse.

## VI. Future Work

The proposed system can be enhanced with advanced features to improve security, scalability, and usability.

Future enhancements include:

- Dynamic QR codes that change after a fixed time interval
- GPS-based location verification
- Face recognition for identity verification
- Parent notification system through SMS or email
- Automated alerts for late entry or exit
- Cloud-based data backup
- Mobile application for Android and iOS
- Integration with college ERP system
- Analytics dashboard for student movement patterns
- Export reports in PDF and Excel formats
- Multi-hostel support for large institutions

These enhancements can make the system more secure, intelligent, and suitable for large-scale deployment.

## VII. Conclusion

This paper presented a Hostel Management QR Code Attendance System for automating student entry and exit attendance in hostel premises. Traditional manual attendance registers are time-consuming, error-prone, and unsuitable for real-time monitoring. The proposed system addresses these problems by using QR code technology,

student authentication, centralized database storage, and an admin dashboard.

The system allows students to scan a QR code and mark their IN or OUT status quickly. Attendance records are automatically stored with date and time, reducing manual effort and improving accuracy. Hostel authorities can monitor student movement, view logs, manage student records, and generate reports efficiently.

Compared to RFID and biometric systems, the QR code-based system is cost-effective and easy to implement because it does not require expensive hardware. It is suitable for colleges, universities, private hostels, and residential institutions.

Overall, the proposed system provides a reliable, scalable, and efficient solution for modern hostel attendance management. With future enhancements such as dynamic QR codes, GPS verification, face recognition, parent alerts, and cloud integration, the system can become more secure and effective for institutional use.

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