

# Smart QR Based Student Attendance

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**Abstract** — The QR Code Based Smart Online Student Attendance System is the application developed for educational institutes to simplify and automate student attendance taking process, so that most of the time in a class is devoted to teaching and learning. The system has been designed using Java (JSP), HTML, CSS and JavaScript frontend along with MySQL for database management. The system provides secure real-time attendance recording without the possibility of unauthorized access or proxy attendance. The two main components of the system are the staff and the students. In order to prevent unwanted access, staff members verify the comprehensive personal and academic information that students provide when they register. Students who have been approved are given a special ID card with a QR code on it, which they scan to record their attendance. To ensure verifiability, a photo of the student is taken with every attendance entry. Staff members can use the system to create thorough attendance reports for each student and the entire class, complete with verification photos. In order to keep track of their attendance status, students can monitor their attendance logs. This system is an affordable, scalable, and dependable solution for contemporary educational institutions because it integrates web technologies, database management, and secure QR code authentication.

**Keywords:** QR Code-Based Attendance, Student Attendance Management System, Secure Authentication, Web-Based Application, Real-Time Attendance Tracking, Educational Technology

## I. INTRODUCTION

An essential component of institutional administration, attendance management has a direct impact on student engagement, academic achievement, and general discipline. In addition to guaranteeing accountability, precise attendance monitoring is essential for student involvement and institutional effectiveness. Historically, sign-in sheets or paper registers have been used to manually record attendance. These traditional approaches, however, are laborious, prone to human error, vulnerable to data manipulation, and ineffective assessing when dealing with big student populations.

Numerous automated attendance systems, such as biometric and RFID-based systems, have been introduced as a result of technological advancements. These strategies have significant disadvantages even though they are more reliable than manual techniques. Many educational institutions cannot afford biometric systems because they require expensive hardware components and ongoing maintenance. Furthermore, shared touch-based systems have become less appealing due to post-pandemic hygiene concerns. However, if students trade cards, RFID-based systems are vulnerable to card loss and proxy attendance.

These issues are resolved by the suggested QR Code-Based Smart Student Attendance System, which employs an affordable, safe, and contactless solution. Every student is given a unique QR code that is connected to their database profile, and the system uses web technologies to record attendance in real time. By using a webcam or a mobile camera to scan the QR code, which serves as a digital identity marker, attendance can be automatically recorded. Data integrity is guaranteed, administrative workload is decreased, and manual intervention is eliminated.

From the standpoint of computer engineering, this project represents a real-world application of full-stack web development principles, which include backend integration using Java and MySQL and frontend design using HTML, CSS, JavaScript, and JSP. Additionally, it presents authentication protocols, database normalization, and multimedia processing, including taking pictures while recording attendance. As a result, the project offers a thorough educational experience that connects theoretical understanding of computer engineering with practical system design and implementation.

## II. PROBLEM STATEMENT

The existing management system for attendance is facing a number of challenges:

- Manual attendance: Labor-intensive and error-prone
- Biometric attendance: Hardware-dependent with high costs
- attendance using mobile apps: Network-dependent; vulnerability to fraudulent access.

The proposed system addresses these problems in the following ways:

- 1) Automating Attendance Recording System using QR code technology.
- 2) Preventing unauthorized or proxy attendance through staff verification and QR authentication
- 3) Offering a safe, immediate, and easily accessible attendance record with photographic evidence.

## III. OBJECTIVE OF THE PROJECT

- Design a robust and automated system of recording student attendance with minimal human intervention and error rates.
- Preclude unauthorized attendance or proxy through unique authentication and verification using QR codes.
- Allow real-time attendance tracking that is accessible by students and staff members.
- Keep a detailed attendance record and captured images during attendance marking.
- Offer a web-based, scalable solution, potentially suitable for use by different departments or in different organizations.

- Minimize paper consumption and encourage electronic documentation to support environmentally friendly campus practices.

#### IV. SCOPE OF THE PROJECT INCLUDED

- Student registration and staff approval process.
- QR code generation for verified students.
- Webcam-based QR scanning for attendance
- Real-time photo capture at the time of attendance.
- Attendance records available through a web interface.
- Monthly and annual reports with verification data.

#### Excluded

- Integration with RFID or biometric hardware.
- Offline attendance tracking.
- AI-Based Predictive Analytics.

#### V. LITERATURE SURVEY/EXISTING SYSTEM

##### A. Research Paper Design and Implementation of a Secure QR Code-Based Attendance Management System for Higher Education

Authors (Year): Emmanuel Ifeoluwa Oyerinde — (2025)

Description: QR-based attendance system with high security, incorporating mobile apps and web portals, which use QR codes, face verification, and geolocation tracking for attendance in higher education institutions, eliminating fake attendance, reducing marking time, and increasing accuracy.

##### B. Research Paper

Title: Implementing QR Code and Geolocation Technologies for the Student Attendance System

Authors (Year): Semmy Wellem Taju, Yonatan Putra Mamahit, Jeremy Andrew Pongantung

Description: Web and mobile attendance system with QR code and GPS technology used to check the attendance of students. It prevents proxy attendance and maintains authenticity.

##### C. Research Paper Name: A Novel QR Code Based Smart Attendance Tracking System

Author

Soham Pati

Souvik Bhanja

Arpan Majum

Gobinda Sen – 2023 A.D

Description: Students are provided with unique QR codes on their ID cards for attendance marking.

The system can better record student attendance, save lecture time, and is user-friendly for students and teachers.

##### D. Research Paper Name: QR-Attendance System with Geo-Location

Authors: Soni Kumari, Piyush Kumar — (2024 A.D.)

Description: QR-based system combined with geo-location and photo capture. Guarantees presence of students and adds accuracy to their attendance.

#### VI. PROPOSED SYSTEM

##### A. Features of the Proposed System:

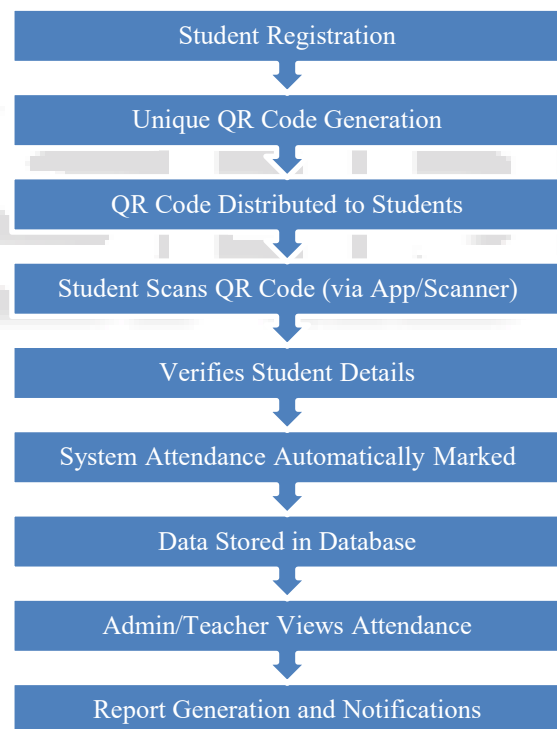
- Automated attendance marking using QR codes.

- Student verification through photographs to prevent proxy attendance.
- Student registration approval by staff to ensure security.
- Real-time attendance tracking and monitoring for students and staff.
- Generation of detailed attendance reports (individual and class-wise) with verification images.
- Web-based interface using JSP, HTML, CSS, and JavaScript with MySQL backend.
- Easy scalability and secure database management.

##### B. Advantages over Existing Systems:

- Eliminates manual errors associated with traditional register-based attendance.
- Prevents unauthorized or proxy attendance effectively.
- Faster and more efficient than biometric systems, without extra hardware costs.
- Provides real-time data access for both students and staff.
- Cost-effective and easily deployable across educational institutions.
- Enhances transparency and accountability in attendance management.

##### C. High-Level Workflow:



#### VII. METHODOLOGY

##### A. Requirement Analysis

1) Identify functional and non-functional requirements.

Define the user roles: Student and Staff.

Design the database schema.

2) Phase 2: System Phase Design:

Create UML diagrams: Use Case, Sequence, Class.

Create frontend layouts and workflow diagrams.

3) Phase 3: Frontend Development

Responsive UI using JSP, HTML, CSS, and JavaScript.

Create login, registration, attendance marking, and report views.

4) *Phase 4: Backend Development*

Implement business logic using Java Servlet & JSP.  
MySQL database integration for data storage.

5) *Phase 5: QR Code Integration*

Developing different QR codes for the students.  
Implementing QR scanning using a webcam and validating attendance.

6) *Phase 6: Testing & Verification*

Unit testigation of modules.  
Integration tests for entire workflow.  
User Acceptance Testing (UAT) using sample students and staff.

7) *Phase 7: Deployment & Maintenance*

Deploy system on local or cloud server.  
Regular Backup of Database.  
Maintain and update the system as needed

VIII. EXPECTED OUTPUT/RESULT

The proposed QR code-based smart online student attendance system is intended to provide a fully automated, secure, and efficient online attendance management solution for educational institutions, wherein every student can easily mark their presence online by scanning a unique QR code embedded on their ID cards. Marking of attendance will be done along with a photograph of the students

Staff members would have access to a comprehensive dashboard, which would help them verify the details of students, control student registrations, and create detailed attendance reports. The attendance reports would cover the attendance of students individually, as a class, and would feature verification images.

Students would also have the opportunity to use a real-time attendance system, which would help them monitor their own attendance and ensure compliance with institutional standards.

By utilizing technologies like JSP, HTML, CSS, JavaScript, and a reliable database system like MySQL for the backend, the system provides real-time management of data with reliable authentications that reduce errors, administrative burden, and costs, while increasing transparency, accountability, and effectiveness of the attendance tracking system.

IX. APPLICATION/FUTURE SCOPE

Daily attendance management in schools, colleges, and universities.

Attendance tracking in corporate training programs, workshops, and seminars.

Integrations with smart campus systems.

A. *Future Scope:*

This can be further extended through mobile application integration, allowing systems to scan QR codes directly via smartphones. Further, this makes marking attendance quick, very secure, and user-friendly. An Institution can adopt a cloud-based centralized system for seamless access and management of attendance data across multiple campuses, ensuring scalability and reliability.

AI-based analytics will further enable attendance trend forecasting and automatically trigger low-attendance alerts for better student engagement and compliance. Linking the system with institutional ERP platforms will facilitate automatic report generation and reduce manual efforts involved in administration. Future development plans also include faculty attendance tracking, bringing ease to students and staff with a comprehensive solution.

X. SOFTWARE REQUIREMENTS

A. *Requirements:*

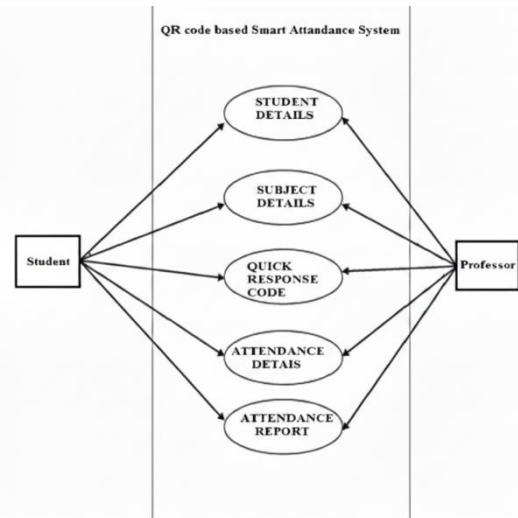
1) *Hardware*

- Intel i3 or higher
- RAM: 4 GB minimum
- Storage: 250 GB Hard Disk
- Webcam: For QR code scanning
- Monitor: 15-inch or higher

2) *Software requirements*

- Frontend: HTML, CSS, JavaScript, JSP
- Backend: Java Servlet & JSP
- Database: MySQL
- Tools: Eclipse, NetBeans, XAMPP/WAMP Server
- OS: Windows / Linux

XI. SYSTEM DESIGN



XII. CONCLUSION

The QR Code Based Smart Online Student Attendance System proposes a new smart online attendance system for educational institutions. This system provides a highly secured online attendance system based on QR codes and can solve the drawbacks associated with traditional online attendance systems used hitherto. It aims to provide transparency and reduce the workload for the administration. It can be used for practical implementation.

REFERENCES

[1] Research Paper Name: Design and Implementation of a Secure QR Code-Based Attendance Management System for Higher Education, Authors (Year): Emmanuel Ifeoluwa Oyerinde — (2025 A.D.)

- [2] Research Paper Name: Implementing QR Code and Geolocation Technologies for the Student Attendance System, Authors (Year): Semmy Wellem Taju, Yonatan Putra Mamahit, Jeremy Andrew Pongantung — (2024 A.D.)
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