

# RFID-Based Gate Pass Management System: Enhancing Security and Streamline Access Control

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## Abstract:

The RFID-Based Gate Pass Management System was created to strengthen school security and improve the oversight of people entering and leaving the campus. Amid growing demands for effective and secure access control, this initiative tackles the shortcomings of conventional manual gatekeeping, which are often prone to human error, delays, and inefficiencies. The system's core goal is to deliver a dependable, automated method for monitoring the entry and exit of students, employees, and visitors. Utilizing RFID technology reduces manual involvement, lowers unauthorized entry risks, and provides precise, real-time gate pass documentation. The methodology included building and deploying an RFID system for logging and handling gate passes. Key integrations encompass blocking lost cards, voice notifications, room entry controls, and employee daily time tracking. Findings show the system successfully overcomes manual process flaws, offering a secure, streamlined, and intuitive access management solution. User assessments yielded a mean score of 4.98, highlighting superior performance across features. Ultimately, the RFID-Based Gate Pass Management System markedly advances campus access oversight and security. It promises to lighten administrative tasks, enhance safety, and create a more protected setting for everyone involved. This work lays the groundwork for evolving automated security innovations.

**Keywords — Campus Access Control, Identity Verification, Real-Time Entry and Exit Monitoring, RFID-Based Gate Pass Management System, Visitor Management System**

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## I. INTRODUCTION

Radio Frequency Identification (RFID) employs electromagnetic fields to automatically detect and monitor tags on objects [3]. An RFID setup

includes a tag with a microchip and antenna, a reader, and a backend for data handling [9]. The tag holds a distinct ID that the reader captures during scans, facilitating automated monitoring and data gathering. RFID finds broad use in sectors like logistics, retail, healthcare, and security for streamlined inventory, asset tracking, and access management [11]. In education, it can be manage student room access, boosting security via real-time movement tracking, attendance oversight, and operational efficiency [2].

RFID gate pass systems face cyber threats like hacking or breaches exposing data [7], worsened by weak encryption in budget setups, enabling cloning [8]. Detecting outsiders or exploits like tailgating/stolen cards is challenging [1], as is swiftly blocking lost cards [10]. Delayed alerts hinder breach responses [14], while integration/scalability issues cause failures [4,12]. Centralized databases pose risks [5], and human oversight gaps allow bypasses [13, necessitating advanced monitoring and detection [6]. Madridejos Community College commonly face several challenges related to campus security, access control, and monitoring of individuals within the premises. One major issue is the presence of unauthorized individuals entering the campus due to the lack of a reliable identification and verification system. Manual gatekeeping methods often result in inaccurate records, delays, and difficulty in tracking the real-time movement of students, faculty members, and staff. In terms of room access, the use of traditional keys and unrestricted entry increases the risk of unauthorized usage of classrooms, offices, and laboratories that may sometimes result in computer parts missing, while also making it difficult to maintain proper records of room utilization. Additionally, faculty and staff encounter issues with manual attendance tracking, which is prone to errors and manipulation, affecting accountability and time management. Students may also take advantage of the system by leaving the campus without proper authorization or using another person's identification. Furthermore, paper-based record keeping leads to data loss, inefficiency, and difficulty in generating accurate reports when needed. These problems collectively

contribute to weak security measures, increased administrative workload, and reduced operational efficiency, highlighting the need for a more advanced, automated, and secure system to effectively manage campus access and monitoring.

The proposed system offers a full feature set for managing personnel/visitors, interactions, and reports. The admin dashboard shows entrant/visitor/blocked/stranger totals, weekly data, arrival rates, personnel/rooms per department, and recent logs. It supports CRUD for departments, roles, personnel, visitor cards, filtered entrance reports, admin-security messaging, voice alerts, room access tracking/authorization, and employee DTRs. Evaluations use ISO 25010/SQuaRE for quality and USEE (Usability, Security, Efficiency, Effectiveness) for alignment.

### **A. Objective**

This research develops an RFID-Based Gate Pass Management System to elevate school safety via premise entry/exit tracking. Specifically it aims to: Display on the Administrator's dashboard the:

- a. Totals for entrants, visitors, blocked cards, stranger attempts.
  - b. Weekly entrants, status percentages, personnel/rooms per department
  - c. Recent logs.
- 1) Enable CRUD for departments, roles, personnel, visitor cards.
  - 2) Track visitors, as e-logbook with details/purpose, produce filtered entrance reports (date, department, location, role), and block lost cards; enable security-admin communication.
  - 3) Add voice alerts, manage room access: track entries, authorize personnel, and generate employee DTRs.
  - 4) Assess via ISO 25010/SQuaRE quality attributes.
  - 5) Apply USEE framework for usability, security, efficiency, effectiveness.

### **II. METHODOLOGY**

Agile was the SDLC selected for its adaptability, user focus, and iteration support, prioritizing features like authentication/monitoring, with

ongoing testing/feedback for security/hardware alignment.

**Figure 1: Agile Development Cycle.**



Agile Development Phases

#### Phase 1: Requirements Gathering

The development team conducted meetings with stakeholders to finalize project requirements and gather essential data and resources. Additional features identified during this stage included block lost card functionality, voice alerts, Daily Time Record (DTR) generation, and room access management.

#### Phase 2: Design

The team created detailed prototypes and layouts using PowerPoint, representing the user interface, system flow, and screen interactions. Feedback from stakeholders was incorporated to ensure that the design met functional goals and user expectations.

#### Phase 3: Development

The team implemented the system by creating databases, writing code, and integrating all required functionalities. Documentation, including the thesis outlining the objectives, development process, and outcomes, was produced concurrently. Testing and debugging were conducted simultaneously to ensure system reliability.

#### Phase 4: Testing

Developers and quality assurance personnel conducted unit, integration, and system testing to identify and resolve bugs, validate system performance, and ensure all features worked as expected under various conditions.

#### Phase 5: Deployment

The system was officially launched within the school environment. This phase involved careful management to ensure smooth roll-out, minimal disruptions, and full operational functionality.

#### Phase 6: Review

The team evaluates the system post-deployment. They conduct a thorough review of its performance, optimizing code and addressing any lingering issues. Once the system meets all criteria, and satisfies stakeholders, the project is officially submitted. The team celebrates its closure, ready to embrace new challenges ahead

### B. Data Analysis

The researchers used descriptive statistics, specifically the weighted mean, to analyze the evaluation results of the RFID-Based Gate Pass Management System. A five-point rating scale was used to measure system functionality. The computed mean scores were interpreted using the corresponding verbal interpretation to determine the overall performance of the system.

### III. RESULTS

After the thorough checking and evaluation by I.T experts, the following are the results.

**Table 1. In terms of displaying into the dashboard**

Legend:		
[ 5 ] Excellent	[ 2 ] Slightly Functional	
[ 4 ] Functional	[ 1 ] Not Functional	
[ 3 ] Moderately Functional		
	Mean	VI
How functional is our system in terms of displaying total number of entrants in the dashboard?	4.67	F
How functional is our system in terms of displaying total numbers of visitors in the dashboard?	4.67	F
How functional is our system in terms of displaying total number of blocked cards in the dashboard ?	5.00	E
How functional is our system in terms of displaying total attempts of strangers / unknown cards in the dashboard?	4.67	F
How functional is our system in terms of displaying the total number weekly entrants in the dashboard?	5.00	E
How functional is our system in terms of displaying the percentage of entrant's status in the dashboard?	5.00	E
How functional is our system in terms of displaying recent entrance logs in the dashboard?	5.00	E
<b>TOTAL</b>	4.86	F

Table 1 evaluates the functionality of the system's dashboard features, with ratings ranging from 4.67 (Strongly Functional) to 5 (Strongly Functional). The lowest score of 4.67 applies to displaying the total number of entrants and visitors, indicating these features are highly functional but slightly less optimized than others. The highest score of 5.00 is achieved across multiple features, including displaying blocked cards, stranger attempts, weekly entrants, entrant status percentages, and recent entrance logs, reflecting perfect functionality in these areas. With an overall mean rating of 4.86 (Strongly Functional), the system demonstrates exceptional reliability and efficiency in presenting dashboard information.

Legend:		
[ 5 ] Excellent	[ 2 ] Slightly Functional	
[ 4 ] Functional	[ 1 ] Not Functional	
[ 3 ] Moderately Functional		
	Mean	VI
How functional is our system in terms of creating department?	5.00	E
How functional is our system in terms of creating roles?	5.00	E
How functional is our system in terms of creating personnel details?	5.00	E
How functional is our system in terms of creating visitor's card?	5.00	E
How functional is our system in terms of reading department?	4.87	F
How functional is our system in terms of reading role?	5.00	E
How functional is our system in terms of reading personnel details?	5.00	E
How functional is our system in terms of reading visitor's card?	4.64	F
How functional is our system in terms of updating department?	5.00	E
How functional is our system in terms of updating role?	4.88	F
How functional is our system in terms of updating personnel details?	4.88	F
How functional is our system in terms of updating visitor's card?	4.47	F
How functional is our system in terms of deleting department?	5.00	E
How functional is our system in terms of deleting role?	5.00	E
How functional is our system in terms of deleting personnel details?	5.00	E
How functional is our system in terms of deleting visitor's card?	5.00	E
<b>TOTAL</b>	4.92	F

**Table 2. In terms of admin Creating, Reading, Updating, and Deleting (CRUD)**

Table 2 demonstrates that the system achieves the highest possible functionality rating of 5 ("Excellent") across all features, including creating, reading, updating, and deleting records for departments, roles, personnel details, and visitor cards. However, some features were slightly below excellent such as updating visitors card, reading visitors card, reading department, updating role and personnel details, received slightly lower scores ranging from 4.47 to 4.88, but these are still rated as Functional. The total mean score of 4.92 which means it is very effective and reliable, with only minor areas needing improvement.

**Table 3. In terms of Visitor tracking, Entrance Log Report, Filtering, and Blocking the Missing Cards.**

Legend:		
[ 5 ] Excellent	[ 2 ] Slightly Functional	
[ 4 ] Functional	[ 1 ] Not Functional	
[ 3 ] Moderately Functional		
	Mean	VI
How functional is our system in terms of tracking visitors?	4.88	F
How functional is our system in terms of generating Entrance Log Report personnel or visitors that can be filtered by date?	4.88	F
How functional is our system in terms of blocking missing cards?	5.00	E
<b>TOTAL</b>	4.92	F

Table 3 examines the system's functionality in blocking missing cards, achieving the highest possible rating of 5, categorized as "Strongly Functional" (SF). This perfect score indicates that the system excels in securely and efficiently identifying and blocking missing cards, ensuring robust access control and minimizing the risk of unauthorized use. Following this, the tied score of 4.88 still reflects very high achievement, indicates that the system is "Functional" (F) in tracking visitors, generating log reports and filtering visitors by date. This result demonstrates the system's good performance in this area, with seamless and reliable functionality that meets user expectations. This top-tier rating demonstrates the system's efficiency and reliability in producing detailed, customizable reports, ensuring that administrators can access and analyze data seamlessly.

**Table 4. In terms of the Voice Alert Feature, Room Access Management and Authorization, and Daily Time Record Generation Functionality**

Legend:		
[ 5 ] Excellent	[ 2 ] Slightly Functional	
[ 4 ] Functional	[ 1 ] Not Functional	
[ 3 ] Moderately Functional		
	Mean	VI
How functional is our system in terms of the voice alert feature?	4.65	F
How functional is our system in terms of managing room by tracking who enters the specific rooms?	5.00	E
How functional is our system in terms of managing and authorizing personnel who are allowed to enter?	5.00	E
How functional is our system in terms of generating daily time record for Employees?	4.87	F
<b>TOTAL</b>	<b>4.88</b>	<b>F</b>

Table 4 demonstrates the system's outstanding performance in managing room access and tracking entries. Both evaluated aspects tracked who enters specific rooms and managed authorization for personnel and achieved the highest possible score of 5, classified as "EXCELLENT" (E). This indicates that the system excels in providing robust and precise access control mechanisms, ensuring security and operational efficiency, with the second

best at 4.87 closely behind, suggesting only a slight difference between them is the functionality in generating daily time records for employees. This rating indicates that the system is "Functional" (F), emphasizing that the system consistently meets all requirements with outstanding efficiency and reliability, and the lowest but still aced is the system's voice alert feature, with a mean of 4.65, while slightly lower, still reflects very good functionality. Overall, the system has a total mean score of 4.88, indicating that the system is highly functional and nearly excellent in overall performance. It shows that users find the feature reliable, efficient, and easy to use, with only minor issues or areas for progress.

**Table 5. In terms of the characteristics set in the ISO25010 Software Quality Model**

Legend:		
[ 5 ] Very Satisfied	[ 2 ] Slightly Dissatisfied	
[ 4 ] Satisfied	[ 1 ] Very Dissatisfied	
[ 3 ] Slightly Satisfied		
CRITERIA	MEAN	Verbal Interpretation
Functional Suitability	4.86	Satisfied
Performance Efficiency	4.98	Satisfied
Compatibility	4.94	Satisfied
Reliability	4.77	Satisfied
Security	4.80	Satisfied
<b>TOTAL</b>	<b>4.87</b>	<b>Satisfied</b>

Table 5 presents an evaluation of the product according to the ISO 25010 Software Quality Model. The highest rating is for Performance Efficiency, a nearly perfect score with a mean of 4.98, classified as SATISFIED, indicating excellent performance. The compatibility score of 4.94, also rated as SATISFIED, reflects seamless integration with other systems. Functional Suitability follows closely with a rating of 4.86, also classified as SATISFIED, demonstrating that the product meets its necessary functional requirements. The Security Score of 4.80 is solid, also in the SATISFIED range, suggesting strong protection with some room for improvement. Reliability, with a rating of 4.77, is the lowest among the criteria but still classified as SATISFIED, indicating that there is some room for

improvement in terms of consistency and dependability. Overall, the product receives a SATISFIED rating with a total mean of 4.87, reflecting strong performance across all key areas but with minor areas for enhancement, particularly in reliability.

**Table 6. In terms of Usefulness, Ease of use, Ease of Learning, and Satisfaction.**

Legend:		
[ 5 ] Strongly Agree	[ 2 ] Disagree	
[ 4 ] Agree	[ 1 ] Strongly Disagree	
[ 3 ] Neither Agree nor Disagree		
CRITERIA	MEAN	VI
Usefulness	4.92	SA
Ease of Use	4.88	SA
Ease of Learning	4.92	SA
Satisfaction	4.81	SA
<b>TOTAL</b>	<b>4.88</b>	<b>SA</b>

Table 6 presents an exceptionally positive evaluation across all criteria. The highest scores were for Usefulness and Ease of Learning, both at 4.92, indicating that users find the product highly valuable and easy to understand. Ease of Use follows closely with a score of 4.88, demonstrating that the product is intuitive and user-friendly. The satisfaction rating, while still strong at 4.81, is the lowest among the criteria, suggesting that while users are highly content, there may be slight room for improvement. Overall, the product received an impressive total mean score of 4.88, categorized as "Strongly Agree," reinforcing its high quality and user satisfaction.

#### IV. CONCLUSIONS

The characteristics of the system are functional, reliable, and effective in all areas assessed. It regularly reached a high mean score, indicating good performance as to dashboard monitoring, Data management (CRUD operations), visitor tracking and Security features like access control and blocked missing cards. These findings also corroborate the system's ability to provide accurate,

real-time information and ensure data integrity. Moreover, it conforms with the ICO 25010 Software Quality Model specifications. Functional suitability, performance efficiency, compatibility and reliability were also considered for this system; as well as security concerns [42]. The survey of users also shows a high acceptance rate based on those who strongly agreed on benefits, ease of use, ease of learning and overall satisfaction. While several minor enhancements are also proposed (in terms of data visualization, usability of the interface or specific optimization per feature) to not impact on system's performance overall. Hence, this system is a reliable and effective device for monitoring, administrative and security-related activities.

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