



Future Business & Technology Institute for Higher Training

Cybersecurity Department

“Enhancing Student Attendance System Through RFID-Integrated Identification”

A Software Project Proposal

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INTRODUCTION

Educational institutions find accurate and efficient tracking of attendance important, because it helps in monitoring and helps keep academic records of students participation. Nevertheless, a significant number of universities stick to the manual process of attendance taking, for example roll calls or paper sign-in sheets. Traditional methods are lengthy, they are subject to human error and proxy attendance or record manipulation.

As technology continues to advance and becomes increasingly integrated in various aspects of daily life from basic automation and the Internet of Things (IoT) sectors, the importance of assessing and innovating traditional methods is growing. Among one of those technologies is Radio Frequency Identification (RFID), which can help in the automation of such repetitive tasks such as recording the students' attendance.

This paper is a proposal to develop a prototype RFID-based attendance system that will be used in our university. The system will be designed to simplify the process of attendance-taking, decreasing the time required by teachers and improving the level of accuracy of student records. This system will be implemented in different departments— starting with the Cybersecurity department and later expanding to others, allowing the university to adopt a more reliable and modern method of managing attendance.

RATIONALE

The issue of maintaining accurate, efficient, and reliable attendance records remains a problem in universities and colleges worldwide. Paper-based sign-in and roll calls are often used as primary methods of taking attendance, but are prone to human error, time-consuming, and also open to manipulation. Technology is rapidly evolving, thus most institutions are considering automated systems as a way of solving these problems. Furthermore, the researchers noticed that the current method of tracking attendance in the institute requires one of two processes: one process involves the manual writing on a piece of paper a check mark on the box of the corresponding student's name; the paper is then passed around the class for everyone to check their corresponding box. The second process involves the teacher manually inputting a letter 'P' for each student that is present in class. While there is nothing inherently wrong with these methods, the researchers believe that this process can be automated for the benefit and convenience of both the students and teachers. Radio Frequency Identification (RFID) technology is one of such solutions, and it provides an opportunity to record attendance quickly and without contacts by using RFID tags and readers.

A systematic review by Ishaq and Bibi (2023) has stated that RFID-based attendance solves most of the inconveniences of manual attendance systems that include time-consuming, sheet loss and attendance fraud. This review looked at 21 studies, which indicates that RFID combined with IoT is a reliable and efficient alternative. These systems are automated to record attendance and built on the principle that the students only need to tap or flash their RFID cards at a reader, which saves on time and enhances the accuracy and the reliability of the data.

BACKGROUND

Student attendance plays a crucial role in academic performance and institutional success (Shingane et al., 2025). Regular attendance reflects a students' engagement with course content and development of consistent, academically beneficial behaviors (Krishna et al., 2023). However, lecturers managing large classes may encounter challenges in collecting students' manual signatures for attendance (Kassim, 2012). This issue is further supported by a study conducted by DMijic (2019), which found that manual process of attendance taking is prone to human error and manipulation. These limitations have prompted the exploration of innovative approaches, However, the majority of the attendance systems such as biometrics, NFC tags, and face recognition are developed using impractical designs that tend to be expensive, inefficient, and time consuming (Frag, 2023). As a result, institutions have turned to RFID technology to improve attendance tracking.

Radio Frequency Identification uses radio waves to automatically catch, detect, and track data that has a digital tag attached to them. A device or “tag” usually contains the information

that RFID uses, and is being used in everything from car keys to highway toll tags to employee identification (US Homeland Security, 2024). The use of RFID provides a secure, low-cost, and efficient way to record and track the daily attendance of students. RFID attendance systems automate the process by scanning RFID tags embedded or added to student ID cards as they enter classrooms or campus, significantly reducing manual labor and human error compared to traditional roll calls. These systems offer real-time attendance data, enabling rapid monitoring and management, which improves overall accuracy and enhances school security. Due to their affordability and reliability, RFID attendance systems are increasingly adopted in educational institutions worldwide to streamline attendance management and foster better student accountability (Engineerica Systems, Inc., 2025). Attached below is information pertaining to attendance records and how RFID can help manage these records.

A. The Benefits of Proper Attendance Keeping

Digital attendance systems improve student performance by enhancing attendance accuracy and fostering discipline. They reduce absenteeism and proxy attendance, promote punctuality, and encourage student accountability. These benefits lead to better engagement and academic outcomes, creating a positive learning environment. However, challenges such as technology issues and privacy concerns need addressing for successful implementation (Anderson, 2022).

B. Practical Uses of RFID for Attendance Checking Purposes

In the paper by Chandru et al (2025), they developed an automated attendance system using RFID and IoT technologies, that automatically recorded attendance when

RFID tags are scanned, reducing errors and administrative work. It supports real-time monitoring and generates reports, while also offering security features like admin approval for unknown tags. The system is scalable and user-friendly, suitable for various institutional uses.

A recent paper by Mazlan, Aziz, and Yusof (2025) presented "I-Attend," a smart attendance system for secondary schools using RFID technology. This system addresses inefficiencies and errors of manual attendance by automating the process through RFID tags and cloud computing. It improves attendance accuracy, reduces administrative workload, and provides real-time data access for teachers and administrators. The system achieved high usability scores and user satisfaction in testing, demonstrating practical effectiveness in managing attendance efficiently in educational environments.

C. The Benefits of Using RFID for Attendance Checking

The implementation of RFID-based smart school attendance and monitoring systems has demonstrated several clear benefits over the traditional methods of old. The system leverages passive RFID tags, an RFID reader, a Visual Studio interface, and a SQL database to automate the process of recording student attendance. The mentioned automation reduced both manual labor required as well as errors within the tracking of student attendance, resulting in a more reliable, timely, and efficient process overall. Furthermore, the system detected duplicate instances and removed those from the database, while providing faculty and staff a fast and efficient way to access and generate attendance records (Farag, 2025).

A comprehensive review by Singh et al. (2025) highlights the key benefits of using RFID technology for attendance systems. The RFID system increases accuracy by eliminating manual errors and proxy attendance through unique RFID tags. It improves efficiency by automating attendance recording and reducing administrative workload. Real-time data access enables immediate attendance monitoring and report generation. Additionally, RFID systems provide enhanced security features such as admin approval for unauthorized scans, prevent buddy punching, and support scalable deployment in schools, colleges, and workplaces. These advantages culminate in better resource management, accountability, and operational transparency.

The paper systematically reviews 21 key research studies on IoT-based attendance systems using RFID technology, highlighting how these systems automate and improve attendance tracking in educational institutions. The authors emphasize that RFID-based attendance systems address issues prevalent in manual attendance methods, such as time inefficiency, proxy attendance, and loss of attendance sheets. By automating attendance through RFID card scanning linked with IoT and Google Sheets, these systems provide accurate, reliable, and time-saving solutions. The review also discusses guiding principles, best practices, and significant advantages, offering insights for educational institutions aiming to implement efficient and secure attendance monitoring systems that enhance student engagement and academic performance (Ishak and Bibi, 2023).

PROJECT DESCRIPTION

I. Methodology

The researchers will develop an attendance system where RFID (card) scanning will be used to automatically record the attendance of the students. This system will make the process faster, more organized, and easier for both students and teachers to use.

A. Cost

The attendance system based on RFID is meant to be cost-effective. The RFID attendance system will be first created as the prototype for the Cybersecurity department only.

The prototype system consists of:

- RFID reader (one unit): **40 SAR**
- Microcontroller (e.g. ESP32): approx. **60 SAR**
- Accessories (wires, power adapter, casing): approx. **20 SAR**
- RFID tags (20 units of Cybersecurity students): **50 SAR**

All-in prototype cost: around **170 SAR**

Once the prototype has been tested and validated, the system will be expanded to add the other departments, namely: Psychology, Creative Computing, and Business Management. To implement the project completely, the purchase of another 40 RFID tags will be necessary (estimated at 50 SAR) to cover all the students. To reduce expenses, open-source software will be used to avoid any licensing fees or expiry issues.

B. Installation

Installing an RFID system is a multi-step process from planning a physical hardware to software configuration and final testing. The installation is planned to ensure maximum read accuracy and seamless integration with the university's existing IT infrastructure such as the student information system or administrative reporting tools. The process includes:

- **hardware placement:** strategically mounting the RFID near the classroom entrance
- **network configuration:** connecting the microcontroller to the campus network for real-time data transmission
- **software deployment:** installing the open-source backend and web interface on the designated server
- **data synchronization:** configuring the system to handle student data and export attendance logs in a compatible format

C. Efficiency

The RFID attendance system is very effective in enhancing accuracy and efficiency of taking attendance. A tag scan requires a second, which means that the students can be registered within a short time when they enter the room. This will save time, minimize the disturbance in the classroom, and remove the use of manual attendance sheets. Data can be accessed quickly through a web interface with data being stored on an SQL server, which simplifies the work of instructors and professors who

need to check on these files on a case-by-case basis. Additionally, even time of entrance may be recorded, as additional info to mark those early or otherwise tardy.

D. Technical Information

The proponents plan to use passive RFID tags for reliability, as passive tags do not need battery changes to stay operational. The data sent from the main transmitter that is to be installed at the front of the classroom will be sending data via API calls in programs coded in Python, C#, or C++, depending on the specific needs. Data stored and received will be stored in a SQL database for easy access and sorting. Tags will operate on the short-range MHz 56.13HF, which operates at close enough range to not trigger unnecessarily. The student information will be stored in a server and/or database for the transmitter to use as a basis for the attendance checking. When a successful read is made (such as checking in), the system will give a soft buzz, indicating that it has performed the correct action and recorded the person as “present”. If, for whatever reason, the system should not read the tag properly, it will give a different sounding, and more alarming buzz sound to indicate something happened, in which case the issue can be quickly checked or resolved. Duplicate instances, such as accidentally tapping twice or standing too close with the tags, will be automatically flagged and filtered out of the system.

II. Timeline

This project is expected to be completed in three (3) months. Ensuring that the system is thoroughly tested and verified to be completely functional before being implemented in the

institute, in order to reduce the possibility of technical issues and to work out any software bugs that may arise.

III. Objectives

This project seeks to achieve its general objective of enhancing student attendance system throughout the campus, through RFID by focusing on the following objectives:

1. Create a seamless method for teachers to monitor student attendance;
2. Streamline the attendance-taking process for both students and teachers; and
3. Improve the way attendance data is stored and collected; as well as possibly other data collection processes of FBT.

ANTICIPATED OUTCOMES

This project will enhance the institution's attendance system by integrating modern technology, aligning with the current technological advancements and improving efficiency. If implemented effectively, it empowers educators to monitor student attendance with greater ease, reducing the time and administrative burden compared to traditional manual attendance methods. The increased efficiency not only supports educators but also improves the students' experience by ensuring a faster and reliable attendance process. Furthermore, the method of collecting and storing attendance data will be greatly enhanced, leading to improved accuracy, better data security, and ease of access for everyone involved.

SUPPORT

The project requires the following materials to develop the system:

| Name of Material | Estimated Price per Quantity | Estimated Quantity |
|---|---------------------------------|-----------------------|
| RFID reader | 40 SAR for 1 unit | 1 |
| ESP32 (or other) | 60 SAR | 1 |
| Accessories (Wires, Power Adapter, Casing) | 20 SAR | 1 |
| RFID tag | 50 SAR for 1 pack (20 units) | 1 |

CONTACT INFORMATION

This project is proposed by the student-researcher from Level 4 Cybersecurity Department with the guidance of the Introduction to Programming instructor, and is presented to the school administration.

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