International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 13 Issue: 07 | Jul 2026 www.irjet.net p-ISSN: 2395-0072

IoT based RFID Tag Attendance System with Data Monitoring in Web Application

[1]Arsath Jafar D, [2]Mrs. N. Sivasankari

[1]PG Scholar Department of Electrical and Electronics Engineering PSN Colleg of Engineering and Technology Tirunelveli, India
[2]Assistant Professor, Department of Electrical and Electronics Engineering, PSN Colleg of Engineering and Technology, Tirunelveli, India

---

Abstract-*This paper presents an IoT-based RFID attendance system for automated tracking and display of attendance logs on a custom-built webpage, without using third-party platforms like ThingSpeak or Blynk. The system uses an RFID reader and an ESP8266 microcontroller with built-in Wi-Fi to transmit attendance data to a dedicated server in real time. An LCD display provides immediate visual feedback by showing the scanned card ID. The custom web application allows authorized users to monitor and manage attendance records efficiently, featuring user profiles, logs, device management, and secure admin login. Each scan records the user's time in and out, automatically updating the logs for review. Administrators can configure the hardware through a "manage device" section. By avoiding third-party platforms, the system ensures data privacy, quick server communication, and customization, offering a secure, efficient, and real-time attendance tracking solution for organizations.*

Keywords-RFID, IoT, ESP8266, Web Server

I. INTRODUCTION

The RFID-based attendance system utilizing IoT technology represents a robust solution for streamlined, automated attendance management in educational institutions, workplaces, and restricted-access environments. By leveraging Radio Frequency Identification (RFID) technology, this system provides a contactless and efficient approach to tracking attendance. Each user is issued a unique RFID card, containing embedded information linked to their identity. When scanned by an RFID reader placed at entry points, the system automatically records the individual's presence, eliminating the need for manual entry and reducing the likelihood of errors or proxy attendance. IoT integration enhances the system's functionality by enabling real-time data transmission to a centralized server, which can be accessed remotely via a secure web portal. This connectivity allows administrators to monitor attendance from anywhere, receive instant updates, and generate comprehensive reports, thus improving administrative efficiency. The use of IoT also supports scalability, as multiple readers can be deployed across various locations within the same network, feeding data back to central server without significant lag.

In addition to the previously mentioned drawbacks, the most prevalent issue is that all these methods require additional equipment. The proposed system has been designed to tackle these drawbacks. The primary benefits of this system include flexible usage, zero equipment expenses, no wasted time, and straightforward accessibility. The classroom attendance system utilizes face recognition technology in conjunction with RFID technology, effectively confirming the identities of students in the class. Through real-time testing of the algorithm, it meets the attendance time requirements during classes, reduces the costs associated with attendance, and successfully addresses issues related to signing in and other concerns. For the web-server platform, XAMPP software is utilized. XAMPP provides a comprehensive PHP, Apache, and MySQL web development environment. This free and open-source web server is ideal for the local development of web-based applications. SQL is a specialized programming language intended for managing data stored in relational database management systems. The mySQL tool within XAMPP is PHPMyAdmin. To store unique IDs on student cards, mySQL is necessary. Within mySQL, four tables have been established, which include a staff table, a student table, a student attendance table, and a student marks table.

II. PROPOSED SYSTEM

The block diagram depicts an RFID-based attendance system centered around an ESP8266 microcontroller. The RFID tag, carried by individuals, communicates with the RFID module, which reads the tag's unique ID. This data is sent to the ESP8266, which processes it and interacts with various peripherals. The ESP8266 is powered by a dedicated power supply and connects to an I2C LCD display to visually present attendance status or user-specific messages. It also drives a LED and a buzzer for audio-visual feedback, such as indicating a successful scan or errors. The system is capable of storing attendance data in a MySQL database via a Wi-Fi connection, ensuring a centralized and secure record. This architecture makes the system

reliable for real-time attendance monitoring with clear feedback and robust data management.

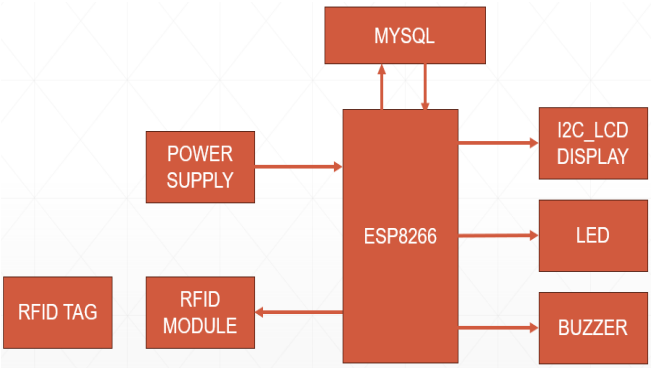

Figure 1 Input and Output interface of ESP8266 system

III. COMPONENTS DESCRIPTION

a. NodeMCU ESP8266

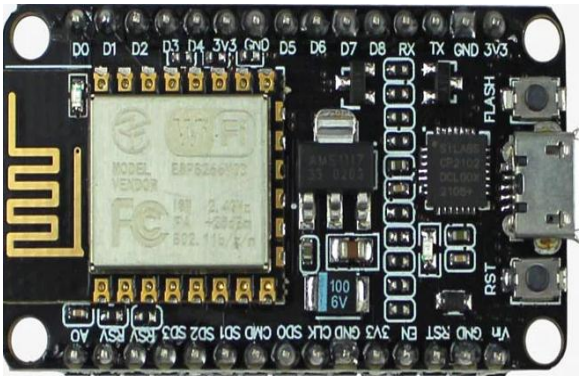

Figure 2 NodeMCU ESP8266

In this paper, we utilized the NodeMCU, an open-source platform built around the ESP8266 microcontroller. The NodeMCU is a versatile and cost-effective device that enables seamless connectivity for IoT (Internet of Things) applications, allowing objects to connect and exchange data over Wi-Fi.

The primary goal of this paper is to leverage the NodeMCU's capabilities to streamline attendance management by transmitting attendance data to a database via a Wi-Fi network. This is achieved by embedding specific URL links directly into the firmware code, enabling the NodeMCU to interact with the database. Once the attendance information is recorded, the NodeMCU sends the data to the designated database server, ensuring efficient and real-time updates.

This approach not only simplifies attendance tracking but also demonstrates the potential of IoT-based solutions in automating routine tasks. The integration of the Wi-Fi module makes the system more flexible and scalable, paving the way for future enhancements and applications.

b. RFID Reader

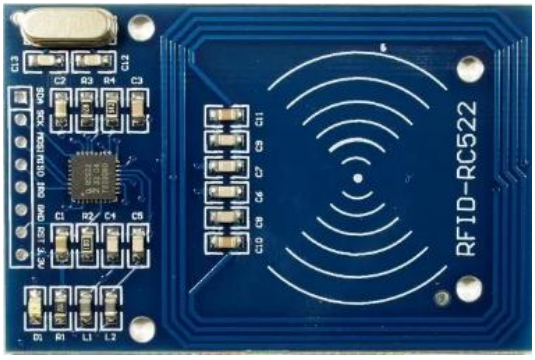

Figure 3 RFID-RC522 Module

An antenna and radio frequency module, which together create a high-frequency electromagnetic field, make up an RFID reader. As everyone is aware, an RFID tag is a passive device, meaning it lacks a power source or the battery. The information is processed and stored on a microchip found in an RFID reader. Additionally, it features an antenna that is utilized for both signal transmission and reception. It must be put quite close to the reader in order for the reader to read the information on the RFID tag. In essence, an RFID reader creates an electromagnetic field that drives electrons through the tag in the antenna and activates the chip.

c. RFID Card or Tag

Figure 4 RFID Tag Reader

There are two types of RFID tags: passive and active. The gadget is referred to as a passive RFID tag if it is not powered on. As a result, passive tags must be within extremely close proximity to an RFID reader and use the radio waves that the reader broadcasts to power the response; alternatively, active RFID tags, which run entirely on battery power, can be used.

d. I2C LCD Display

Figure 5 LCD Display with IO expansion

Here we uses a 12x6 pixel LCD display interfaced with an I2C module. The inclusion of the I2C module significantly reduces the number of pins required for communication with the microcontroller, simplifying the overall circuit design. The I2C interface operates with just two pins: SCL (Serial Clock Line) and SDA (Serial Data Line), ensuring efficient data transfer while conserving GPIO pins on the microcontroller.

The LCD display is used to show the scanned tag's unique ID number along with the corresponding registered name. This real-time display provides immediate feedback, making it a practical and user-friendly solution for applications like access control, attendance systems, or inventory management.

e. Buzzer

Figure 6 Buzzer

This buzzer plays a significant part in this module as well. To let the person who scanned the card know that it was successfully scanned, this buzzer sounds for a few seconds throughout each card scan. The buzzer is crucial in this situation since without it, one can only presume that the card has been detected.

IV. FLOWCHART

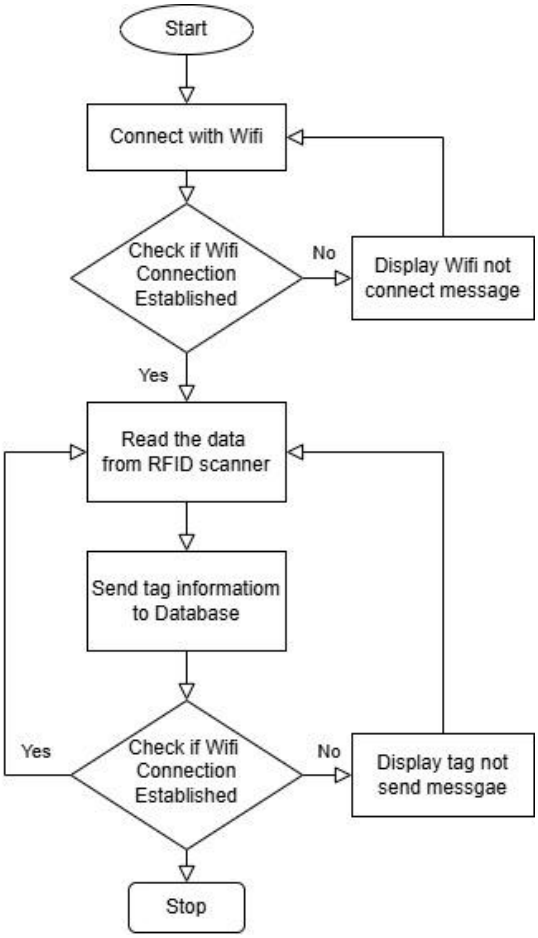

Figure 7 Flowchart of proposed model

The flowchart illustrates the operation of an RFID-based attendance system. The process begins with the system attempting to establish a connection to a WiFi network. If the connection is successful, the system proceeds to read the data from an RFID scanner. However, if the WiFi connection fails, the system displays a message stating, "WiFi not connected," and stops further operations. Once the RFID scanner reads the tag data, the system sends this information to a database for attendance tracking. Before completing this step, it rechecks the WiFi connection. If the connection remains intact, the process concludes successfully. However, if the WiFi connection is lost during this step, the system displays a message, "Tag not sent," indicating that the attendance record could not be uploaded to the database. The process is designed to ensure that attendance records are updated reliably and provides clear feedback in case of connectivity issues.

V. CIRCUIT DIAGRAM

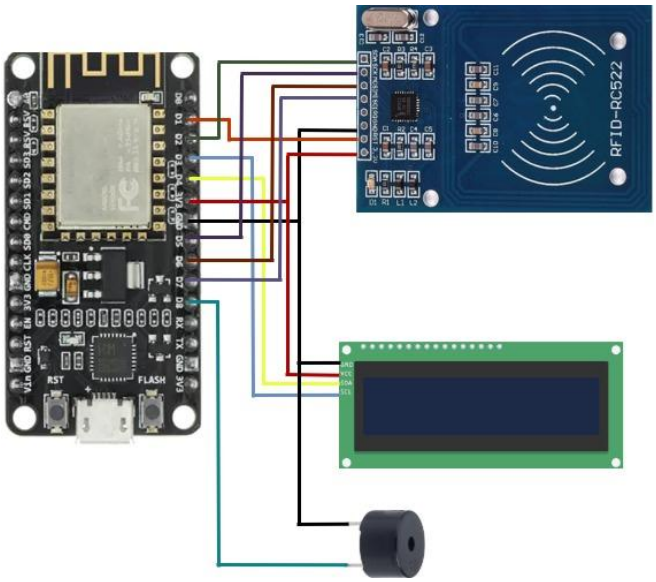

Figure 8 Circuit connection of the system

This circuit diagram illustrates an RFID-based identification system using NodeMCU, an RC522 RFID reader, a 16x2 LCD with an I2C module, and a buzzer. The NodeMCU, based on the ESP8266 microcontroller, acts as the central processing unit, handling data from the RFID reader and displaying relevant information on the LCD. The RC522 module scans RFID tags and communicates the unique tag ID to the NodeMCU via SPI protocol. The RFID reader's connections include SDA, SCK, MOSI, and MISO pins interfacing with the respective GPIO pins on the NodeMCU. The module is powered by the NodeMCU's 3.3V pin and shares a common ground.

The I2C LCD module reduces the number of required GPIO pins for the display by using only two lines: SDA (for data) and SCL (for the clock signal). These lines connect to the corresponding I2C pins on the NodeMCU, enabling the display of the scanned tag's ID and the associated registered name in real-time. The LCD is powered by the NodeMCU, with its VCC and GND pins connected accordingly.

Additionally, a buzzer is included in the circuit to provide audio feedback upon a successful scan. The positive terminal of the buzzer is connected to a GPIO pin on the NodeMCU, while the negative terminal is grounded. When an RFID tag is scanned, the system reads the tag's ID, displays it on the LCD, and activates the buzzer to confirm the operation. This setup offers a compact, efficient, and user-friendly solution for applications such as access control or attendance tracking.

VI. RESULT AND DISCUSSION

Figure 9 Place the RFID tag in RFID reader module

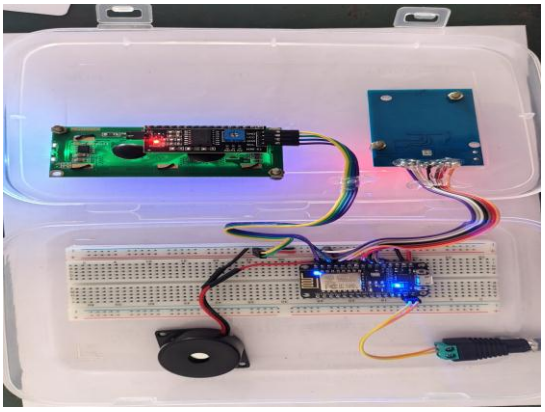

Figure 10 Components assembly

The study was carried out on a group of 60 students, registered in a specific course. The use of RFID technology has undoubtedly accelerated the whole process of tracking attendance. The conventional approach to tracking attendance requires separate manual entries, which is a labor-intensive and lengthy procedure. On average, according to experiments, the total duration required to manually record the attendance of a class with 60 students was around 10 minutes. This suggests that around 10 seconds for each student was needed to take their attendance. This period encompasses visual and written verification, following which the teacher notes the attendance. When comparing (refer to figure 8), the overall duration for marking the attendance of 60 students with barcode and RFID technology is 120 seconds and 12 seconds, respectively (refer to table 2). Using the established relationship, a projection for a group of 100 students is also anticipated.

Table 1 Result of the study

Method	Total Number of students			
	1	10	60	100
Manual Entry	10 seconds	100 seconds	600 seconds	1000 students
Bar Code	2 seconds	20 seconds	120 seconds	200 seconds
RFID Technology	0.2 seconds	2 seconds	12 seconds	20 seconds

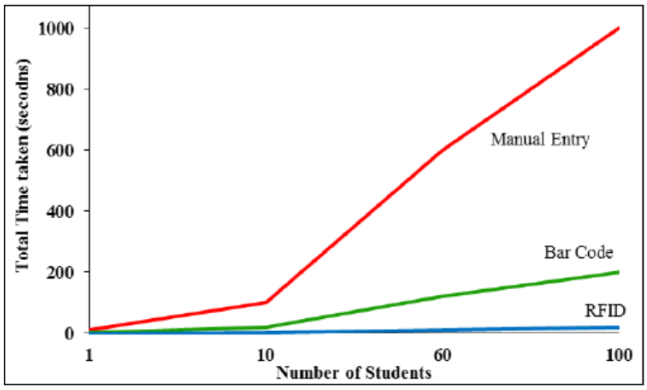

Figure 11 A line graph showing the comparison of total time taken to record the attendance of student

As indicated in table 1, when compared to the time taken for data entry across various technologies, RFID technology significantly reduces time expenditure and enhances operational efficiency. The implementation of this technology can enhance the process and product quality by decreasing entry mistakes caused by manual human actions. As a result, labor expenses are minimized to execute the value-added activities.

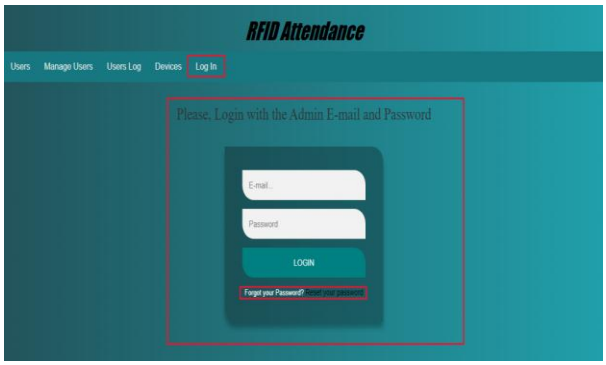

Figure 12 Admin Panel Login Page

The picture shows the login screen of an RFID Attendance System intended for administrative entry. At the upper section of the interface, a navigation menu offers several choices, such as "Users," "Manage Users," "Users Log," "Devices," and "Log In," enabling easy access to diverse system functionalities. The page prominently displays a login form, asking the administrator to input their email and password details to enter the system. Under the login form, there's a "Forgot your Password?" link, which enables users to reset their passwords if necessary, improving security and user ease.

The interface is sleek and user-friendly, showcasing a contemporary design with a teal color palette that reflects professionalism. The system guarantees that only authorized individuals possessing valid login credentials can access and handle sensitive attendance records, devices, and user information. This login page serves as an essential entry point for preserving the integrity of the system and safeguarding the data linked to the attendance management procedure.

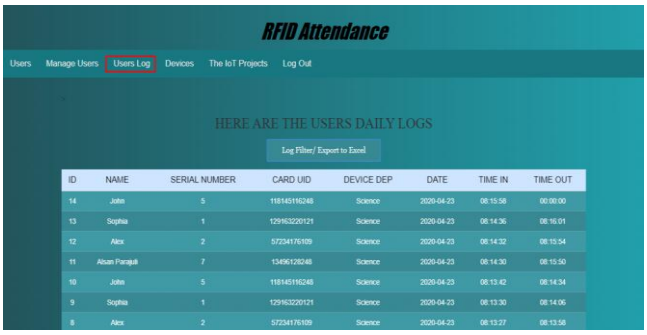

Figure 13 View Users log on RFID Based Attenance System

The image displays the Users Log area of an RFID Attendance System, allowing administrators to access daily attendance data. The page features a header menu that offers navigation choices, including "Users," "Manage Users," "Users Log," "Devices," and "Log Out," facilitating simple access to other system features. The title "HERE ARE THE USERS DAILY LOGS" signifies the function of the page, which is to present user activity records.

The main table provides comprehensive attendance information, featuring the subsequent columns:

- ID – A distinct identifier for every log entry.
- Name – The name of the person whose attendance is noted.
- Serial Number – An automatically assigned serial number for monitoring purposes.
- Card UID – The distinct identifier of the RFID card utilized.
- Device/Dept – Signifies the device or department linked to the entry.
- Date – The date on which the attendance was logged.
- Check-In Time – The moment the user registered their arrival.

- Time Out – The moment the user finished.

Extra options, including "Log Filter" and "Export to Excel," can be found above the table. These alternatives enable the administrator to refine records based on certain criteria or transfer the logs to Excel for reporting and analytical purposes. The interface features a sleek teal-colored design for better clarity and aesthetic appeal, serving as an effective tool for tracking attendance and overseeing user activity records.

VII. CONCLUSION

The research has pinpointed and clarified the significant advantages of RFID technology. RFID has the potential to unlock a wide range of applications across various industries [9]. While the primary obstacle to its adoption is the initial investment cost, RFID technology offers a wealth of profitable business opportunities that may persuade many companies to embrace it [10]. The initial section of the paper outlines the development of RFID technology and the functions of its individual components within the system. The subsequent section examines the practicality of implementing RFID technology and how it contributes to enhanced efficiency at reduced costs. The final section showcases one of the many real-world applications of RFID technology. RFID technology certainly offers the promise of greater effectiveness and improved efficiency in business operations [11]. Ultimately, as the costs of tags and readers continue to decline, numerous businesses will be positioned to take advantage of the benefits that RFID technology provides.

REFERENCE

1) Sri Madhu BM, Kavya K, Devansh. IoT based automatic attendance management system, IEEE International Conference on Current Trends in Computer, Electrical, Electronics and Communication, September 2017. DOI: 10.1109/CTCEEC.2017.8455099

2) Sri Madhu BM, Kavya K, Devansh. IoT based automatic attendance management system, IEEE International Conference on Current Trends in Computer, Electrical, Electronics and Communication, September 2017. DOI: 10.1109/CTCEEC.2017.8455099

3) Intermec, "ABCs of RFID: Understanding and using radio frequency identification", White Paper, (2009).

4) S. Shepard, (2005), "RFID Radio Frequency Identification", (2005), USA, ISBN:0-07-144299-5.

5) Hassan S, Ertan Z, Ghassan AH. New anti-collision protocol for RFID – Based Student Attendance system. 2nd International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT). October 2018.

6) DOI: 10.1109/ISMSIT.2018.8567278

7) K. D. Mahajan, P. Pandey and B. K. Pandher, "Application of RFID Technology in Libraries and Role of Librarian," In 12th MANLIBNET Convention 2010, Jaipur (India), pp. 109-118, 2010.

8) C. E. Geoffrey, "Automatic Access Control System using Student's Identification Card based on RFID Technology," Unpublished Thesis Faculty of Electrical Engineering, University of Teknologi Malaysia, 2012

9) Juels, A., Weis, S.A. (2005). Authenticating Pervasive Devices with Human Protocols. Advances in Cryptology – Crypto '05. Lecture Notes in Computer Science. Volume 3621. pp 293-308.

10) J. Xiong, and K. Bai, "RFID middleware design and implementation in enterprise information public service

11) platform," Proc. of the 2009 Third International Conference on Genetic and Evolutionary Computing, Guilin, China, pp. 27-30, October 2009.

12) RFID Journal. (2003). Gillette Confirms RFID Purchase. RFID Journal. Available at: http://www.rfidjournal.com/article/articleview/258/1/1

13) Shafi, Q. Khan, J. Munir, N. Baloch, N.K., Fingerprint Verification over the Network and its Application in Attendance Management,2011 2nd International Conference on Electronics and Information Engineering, IEEE 2010

14) L. Srivastava, RFID: Technology, Applications and Policy Implications, Presentation, International Telecommunication Union, Kenya, (2005).

15) Bhagat, Rinku. "An MQTT based IoT-RFID Attendance System using NodeMCU Firmware: A Review." International Research Journal of Engineering and Technology (IRJET) 7, no. 06 (2020): 1255-1259.

16) Lim, T. S., S. C. Sim, and M. M. Mansor. "RFID based attendance system." In 2009 IEEE Symposium on Industrial Electronics & Applications, vol. 2, pp. 778-782. IEEE, 2009.

17) Meghana, Inturi, J. D. N. V. L. Meghana, and Ramesh Jayaraman. "Smart Attendance Management System using Radio Frequency Identification." In 2020 International Conference on Communication and Signal Processing (ICCSP), pp. 1045-1049. IEEE, 2020.

18) Kovelan, P., N. Thisenthira, and T. Kartheeswaran. "Automated attendance monitoring system using IoT." In 2019 International Conference on Advancements in Computing (ICAC), pp. 376-379. IEEE, 2019.

19) Shah, Soumil Nitin, and Abdelshakour Abuzneid. "IoT based smart attendance system (SAS) using RFID." In 2019 IEEE Long Island Systems, Applications and Technology Conference (LISAT), pp. 1-6. IEEE, 2019.

20) Hidayat, Muhammad Ayat, and Holong Marisi Simalango. "Students attendance system and notification of college subject schedule based on classroom using iBeacon." In 2018 3rd International Conference on Information Technology, Information System and Electrical Engineering (ICITISEE), pp. 253-258. IEEE, 2018.

21) Arunraja, A., G. M. Rajathi, and S. Mathumitha. "Smart attendance system using esp8266." International Journal of Scientific and Technology Research 8, no. 9 (2019): 1051-1056

22) Bharathy, Ms GT, Ms S. Bhavanisankari, and T. Tamilselvi. "Smart Attendance Monitoring System using IoT and RFID."

23) Miao, Qianwen, Fu Xiao, Haiping Huang, Lijuan Sun, and Ruchuan Wang. "Smart attendance system based on frequency distribution algorithm with passive RFID tags." Tsinghua Science and Technology 25, no. 2 (2019): 217-226.