International Journal of Emerging Science and Engineering (IJESE)
ISSN: 2319–6378 (Online), Volume-14 Issue-5, April 2026

Student Attendance System Using RFID

Samiran Chatterjee, V. Ramesh Babu, A. Vijayalakshmi, B. Rama Rao

Abstract: ***The use of technology in educational institutions has grown significantly, improving efficiency in attendance tracking and overall administration. This project presents a NodeMCU-based RFID card-based attendance system designed to automate real-time student attendance. The system uses an RFID reader to identify student-issued RFID cards, a NodeMCU microcontroller for processing, and an I2C LCD for immediate feedback. Each student is assigned a unique RFID card, which they tap on the RFID reader to mark their presence. If the system recognises the card, it displays "Present: 1" or "Present: 2" depending on the student's ID number. In the case of an unregistered card, the system displays "Wrong Card!" on the LCD. The proposed system ensures accuracy, reduces manual intervention, and prevents attendance manipulation, making it ideal for schools, colleges, and other educational settings. The integration of IoT technologies like NodeMCU enables real-time monitoring and potential expansion into cloud-based systems for remote management. This low-cost, efficient system has practical applications for streamlining attendance records, minimising errors, and ensuring transparency. With the scalability to accommodate more students or features, this project provides a Reliable Solution for Modern Educational Institutions.***

Keywords: IoT, RFID, Attendance System, NodeMCU, Smart Attendance System.

Nomenclature:
LCD: Liquid Crystal Display
RFID: Radio Frequency Identification

I. INTRODUCTION

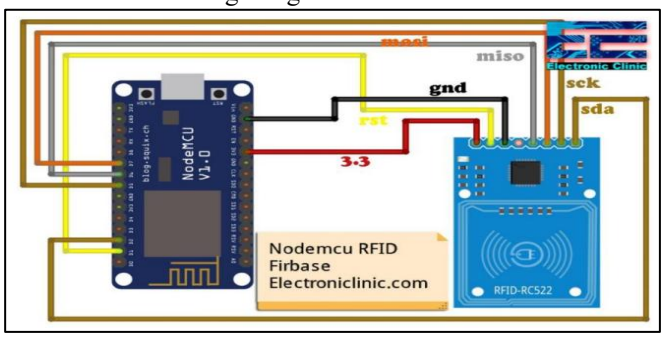
Attendance tracking is a critical part of academic administration, serving as a measure of student participation and a basis for performance evaluation. Traditional methods of attendance tracking, such as roll-calling or manual entries, are time- consuming, prone to errors, and susceptible to manipulation. These challenges necessitate an automated, efficient, and accurate system for recording student attendance. The Node MCU-based RFID card attendance system addresses these issues by utilizing Radio Frequency Identification (RFID) technology to identify students. RFID cards act as unique identifiers for each student, and the RFID reader, in combination with the NodeMCU microcontroller, authenticates the cards and records attendance. A Liquid Crystal Display (LCD) provides instant feedback, displaying messages such as "Present: 1" or "Present: 2" for recognized cards and "Wrong Card!" for unregistered cards. This system offers several advantages. Firstly, it saves time by automating attendance marking [5-8]. Secondly, it ensures accuracy and eliminates errors caused by manual entries. Thirdly, it enhances security by only recognizing preregistered RFID cards. Finally, it provides instant feedback to users, improving transparency. The use of NodeMCU, a Wi-Fi-enabled microcontroller, also opens possibilities for future upgrades, such as connecting the system to a cloud server for real-time attendance tracking and report generation [1-4]. This would allow administrators to monitor attendance remotely and provide detailed insights into student participation trends. The project emphasizes cost-effectiveness and ease of implementation, making it accessible to educational institutions of varying scales. By integrating IoT with RFID technology, this system modernises attendance tracking, aligning it with 21st-century technological advancements [9-12]. The following sections detail the hardware components, working principles, advantages, and potential applications of this innovative system [13-14].

Manuscript received on 20 March 2025 | First Revised Manuscript received on 12 December 2025 | Second Revised Manuscript received on 01 February 2026 | Manuscript Accepted on 15 April 2026 | Manuscript published on 30 April 2026.

*Correspondence Author(s)
Samiran Chatterjee*, Professor, Department of Electronics and Communication Engineering, Amrita Sai Institute of Science & Technology, Paritala, Andhra Pradesh, India. Email ID: Samiran.Chatterjee@amritasai.org.in, ORCID ID: 0000-0003-4524-8344
V. Ramesh Babu, Professor, Department of Electronics and Communication Engineering, Amrita Sai Institute of Science & Technology, Paritala, Andhra Pradesh, India. Email ID: v.rameshbabu@amritasai.org.in, ORCID ID: 0000-0003-3088-206X
A. Vijayalakshmi, Professor, Department of Electronics and Communication Engineering, Amrita Sai Institute of Science & Technology, Paritala, Andhra Pradesh, India. Email ID: vijayaavl6@gmail.com, ORCID ID: 0000-0001-5794-9936
B. Rama Rao, Associate Professor, Department of Electronics and Communication Engineering, Amrita Sai Institute of Science & Technology, Paritala, Andhra Pradesh, India. Email ID: b.ramarao@amritasai.org.in

II. CIRCUIT DESIGN AND BLOCK DIAGRAM

Above is the most basic circuit diagram explaining how the MFRC522 RFID module is interfaced with the NodeMCU module. The above connections are enough to get started with the NodeMCU and RFID module. You can power up all the electronics using your computer or laptop. Once you are done with the basic programming, you can follow the circuit diagram given below.



[Fig.1: RFID Reader With NodeMCU Connections]

A. Circuit Diagram

i. Schematic: Provide a clear and accurate

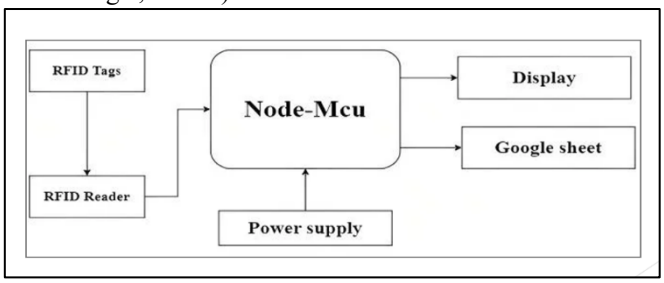
schematic diagram showing the wiring connections between the RFID reader and the NodeMCU.

ii. *Pin Connections:* Label each pin on both the RFID reader and NodeMCU, and clearly indicate which pins are connected.

iii. *Resistors, Capacitors:* If you've used any resistors or capacitors in the circuit (e.g., pull-up resistors), include them in the schematic and specify their values.

iv. *Power Connections:* Clearly show how power is connected to both the RFID reader and the NodeMCU.

v. *Crystal Oscillator (If Applicable):* If your NodeMCU requires an external crystal oscillator, show it in the circuit. * Software Used: Mention the software you used to create the circuit diagram (e.g., Fritzing, Eagle, KiCad).



[Fig.2: Block Diagram of Components]

B. Block Diagram

i. *Overall System:* Start with a high-level block diagram showing the main components and their interactions: * RFID Reader Module * NodeMCU (ESP8266) h=5, ε_r=1.05

ii. *RFID Tags*

iii. *Power Supply*

iv. *Database/Web Interface (if Applicable):* Show the flow of data and control signals between these blocks with arrows. For instance:

v. *RFID Tag* --> RFID Reader (Data Read)

vi. *RFID Reader* --> NodeMCU (Tag Data0)

vii. *NodeMCU* --> Database/Web Interface (Attendance Record)

viii. *Power Supply* --> All Components * Detailed Connection (Optional): You can include a more detailed block diagram specifically for the RFID Reader and NodeMCU, highlighting the connection lines between their pins.

III. RESULTS AND DISCUSSION

A. Time Measurement: Measure and record the time taken to mark attendance for a certain number of students.

B. Comparison: Compare the speed and efficiency of your RFID-based system with traditional attendance methods (if you have any data for comparison).

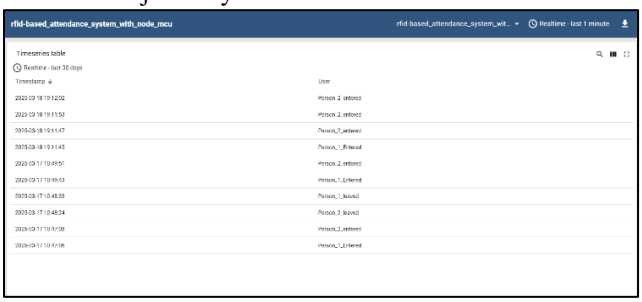
C. Analysis: Discuss the factors that affect the speed and efficiency of your system (e.g., tag reading range, processing time).

D. Objective Evidence: Base your results on actual tests and data. Don't just make claims without evidence.

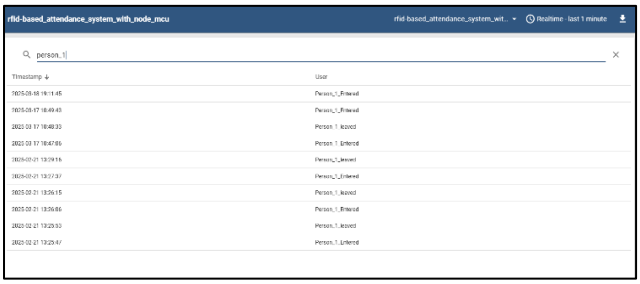
E. Quantitative Data: Whenever possible, use numbers and statistics to present your results (e.g., accuracy percentage, time taken).

F. Visualizations: Use graphs and charts to present your data effectively.

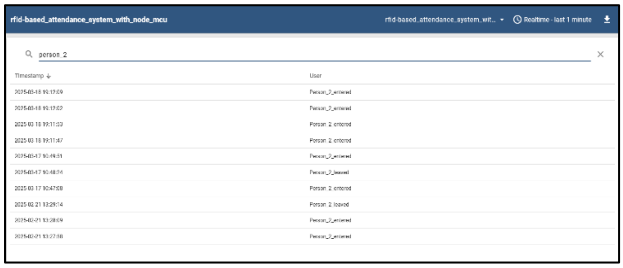
G. Clear Explanations: Explain your test methodologies, present your results clearly, and analyze their significance. By following these guidelines, you'll create informative and compelling chapters that showcase the design and performance of your RFID-based student attendance system. Remember to present your results clearly, concisely, and objectively.



[Fig.3: Users' Daily Logs]



[Fig.4: RFID Attendance Users Management]



[Fig.5: RFID Attendance Users Management]

IV. CONCLUSION

A. Restate the Project's Goal: Briefly remind the reader of the project's main objective (creating an RFID-based student attendance system using NodeMCU).

B. Summarize Key Results: Concisely summarize the key findings from your project, especially the results presented in Chapter 5. For example:

C. "The system achieved an accuracy of 98% in recording student attendance during testing."

D. "The RFID-based system significantly reduced the time required for attendance marking compared to manual methods."

Retrieval Number:100.1/ijese.E108114050425
DOI:10.35940/ijese.E1081.14050426
Journal Website: www.ijese.org

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)

E. "The use of NodeMCU provided a cost-effective and flexible platform for implementing the system."

F. Highlight Successes: Emphasise the successful aspects of your project. Did you meet your objectives? Did the system perform as expected?

G. Acknowledge Limitations: Briefly mention any limitations or challenges encountered during the project (e.g., limitations of the RFID reader range, potential issues with tag loss).

ACKNOWLEDGEMENT

We acknowledge all the faculty and staff members of the Electronics and Communication Engineering Department gratefully for their constant encouragement and moral support, and for providing us with all the facilities available in the department, especially the laboratories and the library, at any time. We express our profound thanks to our Principal, Dr M. Sasidhar, for extending all the college facilities to complete the paper. We acknowledge the Secretary, the correspondent, Mr K. Rama Mohana Rao, the CEO, Dr K. Sai Manoj, and the President, Dr K. Karthik, for their assistance in providing financial support.

DECLARATION STATEMENT

As the article's author, I must verify the accuracy of the following information after aggregating input from all authors.

- **Conflicts of Interest/ Competing Interests:** Based on my understanding, this article has no conflicts of interest.
- **Funding Support:** This article has not been funded by any organizations or agencies. This independence ensures that the research is conducted objectively and without external influence.
- **Ethical Approval and Consent to Participate:** The content of this article does not necessitate ethical approval or consent to participate with supporting documentation.
- **Data Access Statement and Material Availability:** The adequate resources of this article are publicly accessible.
- **Author's Contributions:** The authorship of this article is contributed equally to all participating individuals.

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