RFID-Based Attendance System

Submitted in partial fulfilment of the requirements of the degree of

BACHELOR OF COMPUTER ENGINEERING

by

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CERTIFICATE

This is to certify that the Mini Project 2B entitled "**RFID Based Attendance System**" is a bonafide work of **Aditi Raut (20102182), Dhananjay Shinde (20102200), Pranay Patil (20102185), Raj Rehapade (20102053)"** submitted to the University of Mumbai in partial fulfilment of the requirement for the award of the degree of **Bachelor of Engineering** in **Computer Engineering.**

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Project Report Approval for Mini Project-2B

This project report entitled "**RFID Based Attendance System"** by Aditi Raut**,** Dhananjay Shinde, Pranay Patil, Raj Rehapade is approved for the partial fulfilment of the degree of ***Bachelor of Engineering*** in ***Computer Engineering***, ***2022-23***.

Examiner Name	Signature
1._____	_____
2._____	_____

Date:

Place:

Declaration

We declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

Attendance is a very important factor for all educational institutions in the world. The conventional approach of manually taking and managing attendance records is daunting for both the registrar and the registrant. There are existing techniques aimed at providing attendance identification and registry. However, most of these techniques fall short of some very important factors such as scalability, autonomous and flexibility of use from an attendee and administrator point of use. This work therefore presents an approach aimed at achieving a cost effective solution to revolutionize the conventional paper attendance procedure and provide scalability, autonomous and flexibility of use within the context of Indian educational institutions. This is achieved through the use of the new and fast-growing Radio Frequency Identification (RFID) technology to develop a modular device for the acquisition of attendees identity. The test outcomes of the design are presented to validate the approach used in this work.

Most educational institutions' administrators are concerned about student irregular attendance. Truancy can affect a student's overall academic performance. The conventional method of taking attendance by calling names or signing on paper is very time consuming and insecure, hence inefficient. Radio Frequency Identification (RFID) based attendance system is one of the solutions to address this problem. This system can be used to take attendance for students in school, college, and university. It also can be used to take attendance for workers in working places. Its ability to uniquely identify each person based on their RFID tag type of ID card makes the process of taking attendance easier, faster and secure as compared to conventional methods. Students or workers only need to place their ID card on the reader and their attendance will be taken immediately. With the real-time clock capability of the system, attendance taken will be more accurate since the time for the attendance taken will be recorded. The system can be connected to the computer through ESP32 or Universal Serial Bus (USB) port and store the attendance taken inside the database. A prototype of the system has been successfully fabricated.

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Chapter 1
Introduction

Radiofrequency identification (RFID) refers to the use of radio frequency waves to identify and track the tag implanted into an object or a living thing [1-3]. It is a wireless means of communication that uses electromagnetic and electrostatic coupling in the radio frequency portion of the spectrum to communicate between reader and tag through a variety of modulation and encoding schemes. Modulation refers to the variation in the amplitude, frequency, or phase of a high-frequency carrier signal to convey information. Encoding is a process of converting information from one format to another. RFID systems usually consist of an RFID reader and tag. It is very useful because it can uniquely identify a person, or a product based on the tag incorporated. It can be done quickly, and this usually takes less than a second. A prototype of the system has been designed and fabricated. The RFID reader used in the system is a passive type that has a maximum range of detection of around 5 cm above the reader. It operates at a frequency of 125 kHz and has a 12V power supply. The system can uniquely identify and take attendance for persons. The users only need to place their RFID tag on the reader to take attendance. They do not need to go through the long list to look for their name. Hence, it is very time efficient. Attendance will be taken if the encoded tag ID scanned matches the tag ID stored in the memory. Otherwise, an error message will be displayed. Attendance taken will be more accurate with the real-time clock included in the system. RS232 and Universal Serial Bus (USB) port allow the system to display the information and attendance of a particular person on a Personal Computer (PC). The power supply system designed will automatically switch to battery power if the ac power was removed. The size of the device is small. These two features make the system portable to be carried to class or other places.

The passive RFID reader implemented in the system uses Wiegand 26-bit protocol format for Transistor-Transistor Logic (TTL) input/output communication. Hence, it can directly connect to the microcontroller. There are two outputs and one input wire from the RFID reader. Then, the microcontroller will combine the strings of characters from both data lines into the original set of binary data. The RFID reader performs no processing or quality checking on the data received. It only receives RF signals from tags and converts them into Wiegand format data for transmission to the

microcontroller.

Numerous related works have been initiated and to some extent developed to tackle the attendance problem. Some of these related works make use of Barcode, Biometric, and magnetic technologies. Technology is an ever-increasing aspect. For ages, technology has been getting better and better. Basically, the reason behind the development of technology is that students are trying to make life better and easier. Historically, human-activity tracking techniques have focused on direct observation of people and their demeanour with cameras, worn accelerometers, or contact switches. A recent promising avenue is to supplement direct observation with a devious approach, inferring people's actions from their effect on the environment, especially on the objects with which they interact. It is essential to put an effort to stop bunking the lectures of students. And bring regularity and discipline in colleges, schools, offices, etc. along with an attempt to save time and maintain an attendance record of the students with human efforts.

The present Project can be used in union with an automated attendance monitoring system to monitor the attendance of students or other individuals whose whereabouts need to be tracked.

Chapter 2

Literature Survey

1. **T. S. Lim, S. C. Sim, and M. M. Mansor, "RFID based attendance system," 2009 IEEE Symposium on Industrial Electronics & Applications, Kuala Lumpur, Malaysia, 2009, pp. 778-782,**

The paper "RFID-based attendance system" by T. S. Lim, S. C. Sim, and M. M. Mansor was presented at the 2009 IEEE Symposium on Industrial Electronics & Applications in Kuala Lumpur, Malaysia. The paper presents a system for tracking attendance using Radio Frequency Identification (RFID) technology. The proposed system uses RFID tags and readers to automatically record attendance and eliminate the need for manual tracking. The system consists of two main components: RFID readers and a database server. The RFID readers are placed at the entrance of the room where attendance is to be taken. When a student or staff member enters the room, their RFID tag is read by the reader, and their attendance is automatically recorded in the database server. The system also includes a user interface for administrators to manage the attendance data.

2. **U. Koppikar, S. Hiremath, A. Shiralkar, A. Rajoor, and V. P. Baligar, "IoT based Smart Attendance Monitoring System using RFID," 2019 1st International Conference on Advances in Information Technology Advances in Information Technology (ICAIT), Chikmagalur, India, 2019, pp. 193-197,**

The paper presents an IoT-based smart attendance monitoring system that utilizes RFID technology. The proposed system aims to overcome the limitations of traditional attendance monitoring systems and improve the efficiency of attendance tracking. The authors describe the hardware and software components of the system and present the results of testing the system. The results showed that the system was able to accurately record attendance and was efficient in a real-world setting. Overall, the paper presents a practical and efficient solution for attendance monitoring using RFID technology

and IoT. The proposed system can be implemented in various settings, including schools, colleges, and workplaces, to improve attendance tracking and management.

3. **McDonald, P., & Thompson, P. (2013). Social media and the reshaping of public/private boundaries in employment relations. International Journal of Management Reviews.**

The paper explores the impact of social media on public and private boundaries in employment relations. The authors argue that social media blurs the line between public and private spheres and has significant implications for employers and employees. The authors conclude that social media has the potential to transform employment relations by challenging traditional notions of public and private spheres. They argue that employers need to develop clear policies on social media use and provide training for employees on how to use social media appropriately in the workplace. Overall, the paper provides valuable insight into the impact of social media on employment relations and highlights the need for employers to adapt to the changing landscape of social media use in the workplace.

Research Paper	ANALYSIS
1.T. S. Lim, S. C. Sim, and M. M. Mansor, "RFID based attendance system," 2009 IEEE Symposium on Industrial Electronics & Applications, Kuala Lumpur, Malaysia, 2009, pp. 778-782,	The authors describe the design and implementation of the system, including the hardware and software components. They also present the results of testing the system, which showed that it was able to accurately record attendance and was reliable in a real-world setting. Overall, the paper provides a useful and practical solution for tracking attendance using RFID technology.
2. U. Koppikar, S. Hiremath, A. Shiralkar, A. Rajoor, and V. P. Baligar, "IoT based Smart Attendance Monitoring System using RFID," 2019 1st International Conference on Advances in Information Technology (ICAIT), Chikmagalur, India, 2019, pp. 193-197,	The paper presents an IoT-based smart attendance monitoring system that utilizes RFID technology. The system consists of RFID tags, RFID readers, a microcontroller, and a cloud server. The RFID tags are attached to the student's or staff member's ID cards, and the RFID readers are placed at the entrance of the room. When a person enters the room, their ID card is read by the RFID reader, and the data is sent to the microcontroller. The microcontroller processes the data and sends it to the cloud server, where the attendance records are stored and managed.
3.S. Chintalapati and M. V. Raghunadh, "Automated attendance management system based on face recognition algorithms," 2013 IEEE	The paper presents an automated attendance management system based on face recognition algorithms. The proposed system consists of a camera, which captures the image of the student,

Research Paper	ANALYSIS
International Conference on Computational Intelligence and Computing Research, Enathi, India, 2013, pp. 1-5,	and a computer program, which processes the image to identify the student and record their attendance.
4. K. Aravindhan, S. K. B. Sangeetha, K. Periyakaruppan, K. P. Keerthana, V. Sanjay Girdhar and V. Shyamala Devi, "Design of Attendance Monitoring System Using RFID," 2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS), Coimbatore, India, 2021, pp. 1628-1631,	The paper presents the design of an attendance monitoring system using RFID (Radio Frequency Identification) technology. The proposed system consists of an RFID reader and RFID tags, which are attached to the ID cards of the students. When a student enters the classroom, the RFID reader reads the tag on the student's ID card and sends the information to a central database, which maintains the attendance records.
5. C. Sai Krisha, N. Sumanth and C. Raghava Prasad, "RFID based student monitoring and attendance tracking system," 2013 Fourth International Conference on Computing, Communications Networking Technologies (ICCCNT), Tiruchengode, India, 2013, pp. 1-5,	The paper presents an RFID-based student monitoring and attendance tracking system. The proposed system consists of an RFID reader and RFID tags, which are attached to the ID cards of the students. When a student enters the classroom, the RFID reader reads the tag on the student's ID card and sends the information to a central database, which maintains the attendance records. The system also includes a monitoring module, which monitors the behavior of the students in the classroom and generates alerts if any suspicious behavior is detected.

Chapter 3

Problem Statement, Objective & Scope

Problem Statement: -

To make the attendance system scalable and easy to use, proposing an IOT-based Attendance system using RFID.

Objective: -

- To provide seamless identification registration of attendees using IOT technology.
- Develop an attendance system with the help of RFID sensors.
- Make a user-friendly and scalable system for teachers and students.

Scope: -

- To provide a fully automated and secured attendance system convenient to traditional and conventional methods.
- To reduce truancy which can affect a student's overall academic performance.
- System with a simple interface making it easy for data manipulation and retrieval with data integrity.

Chapter 4

Proposed System Architecture

4.1 Proposed System:

An innovative idea to send RFID data via Arduino to the Php database is developed. In a nutshell, we can make an RFID reader supported by the attendance system, which can save attendance data on a database in real time. In contrast to other systems, RFID tags are developed so that the user is able to track the employee during the entire stay. The system maintains the history of the employee. The RFID-based attendance system has also allowed the administration to ensure that only accredited individuals have access to the facility. This is a great way to improve overall safety in the company. Our main proposal is the reduction of costs. This makes RFID the most comfortable platform in the organization for storing employee records since not much storage space is needed. This system has also been developed in a way that is user-friendly.

Connection:

ESP32 **RFID**

3V3 ——---------- 3V3/3.3V

GND ——---------- GND

D14 ——---------- RST

D4 ——---------- MISO

D19 ——---------- MOSI

D5 ——---------- SCK

D15 ——---------- SDA/SS

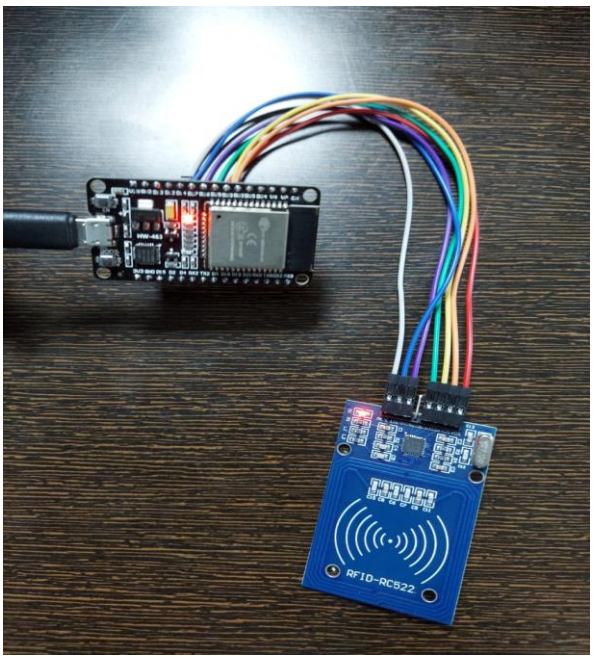

Figure 4.1 Connection

4.2 Architecture Diagram

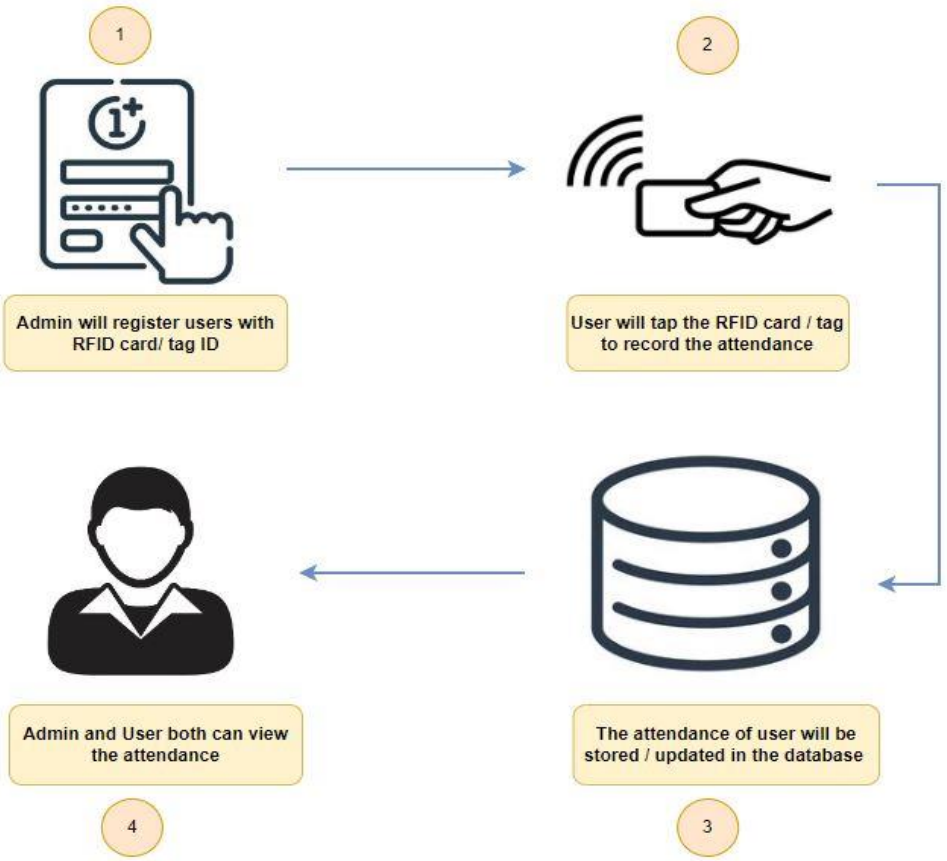

Figure 4.2 Architectural Diagram

This is a proposed design in which the admin will register users with an RFID card or tag ID. After registration users will be able to tap the RFID Card to record their attendance. The attendance would then get stored in the database, where it can also get updated. The database can then be viewed by the admin and user as well.

4.3 Data Flow Diagram (Level 0, Level 1 & Level 2)

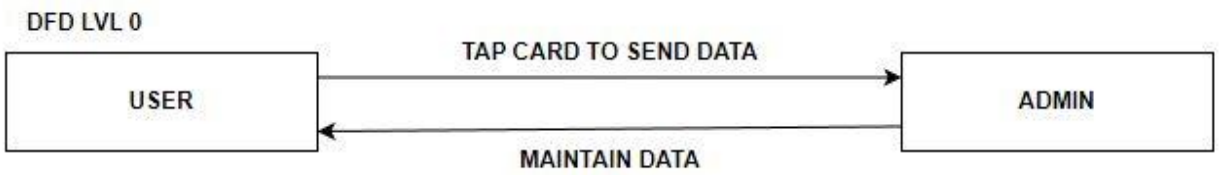

Figure 4.3 DFD Level 0

This represents Level-0 DFD Diagram which contains two entities, the user, and the admin. The user taps the RFID card to send data while the admin maintains the upcoming data.

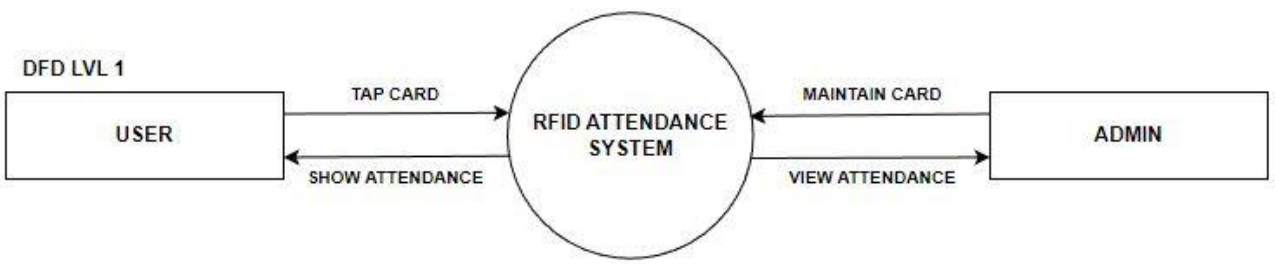

Figure 4.4 DFD Level 1

Updated DFD diagram with RFID Attendance System in the middle, which handles the card details and also maintains its data. It also displays attendance to users as well as admin.

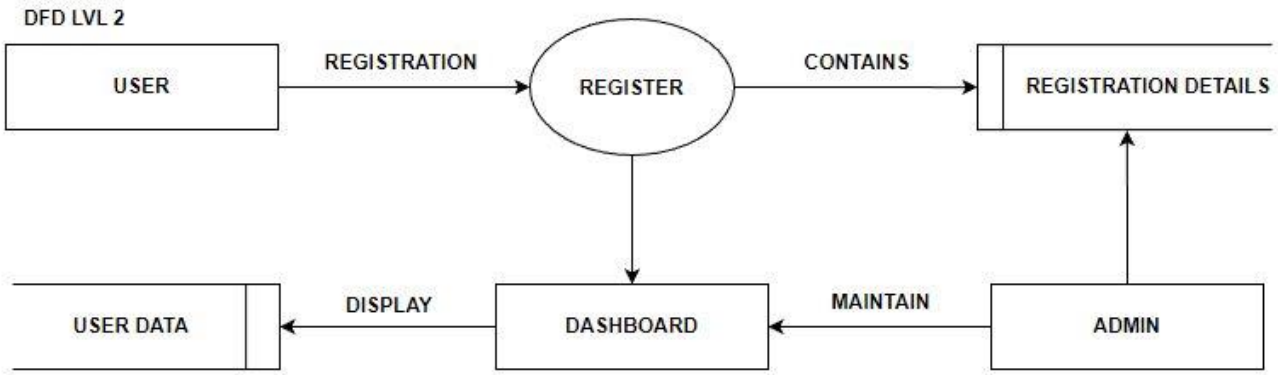

Figure 4.5 DFD Level 2

This advanced DFD module contains many components like databases and validations. Firstly the user needs to be registered so the admin registers the user by going to the registration module. Then it goes to the Dashboard which contains the user data. The admin can update and view the registration details in the database while it can maintain the dashboard of the project.

4.4 Use Case Diagram

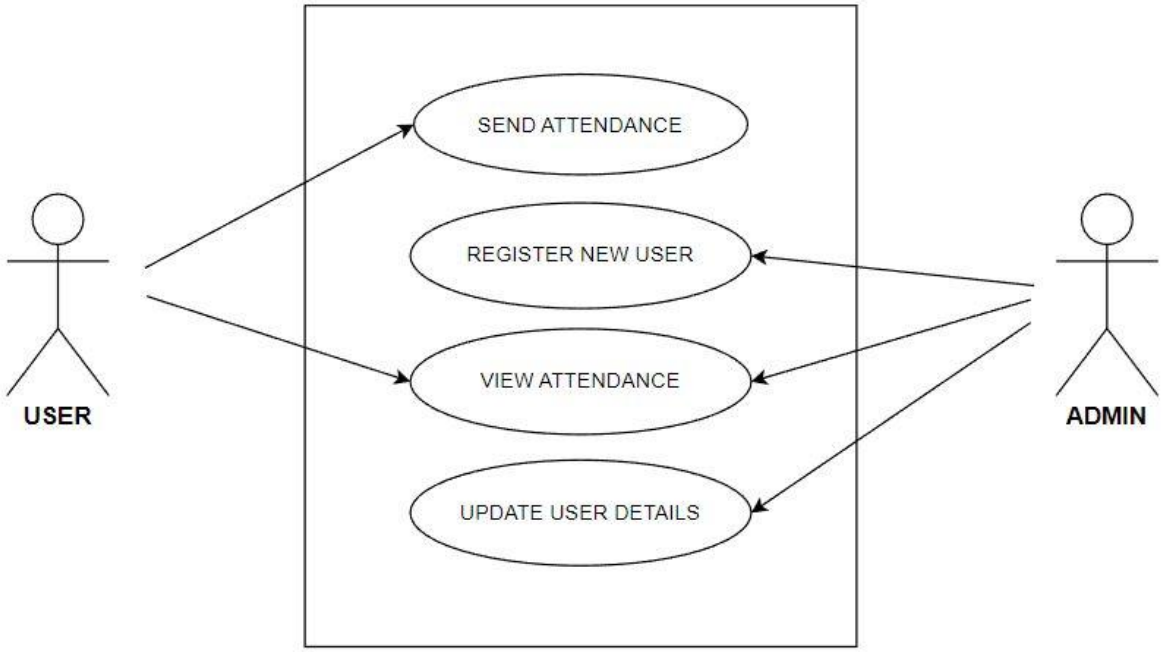

Figure 4.6 Use Case Diagram

Following is the use case diagram of the project it shows the action performed by the actor's user and admin. The user can send and view his/her attendance while the admin can register a new user, view the registered user's attendance, and can also update user details.

4.5 Sequence Diagram

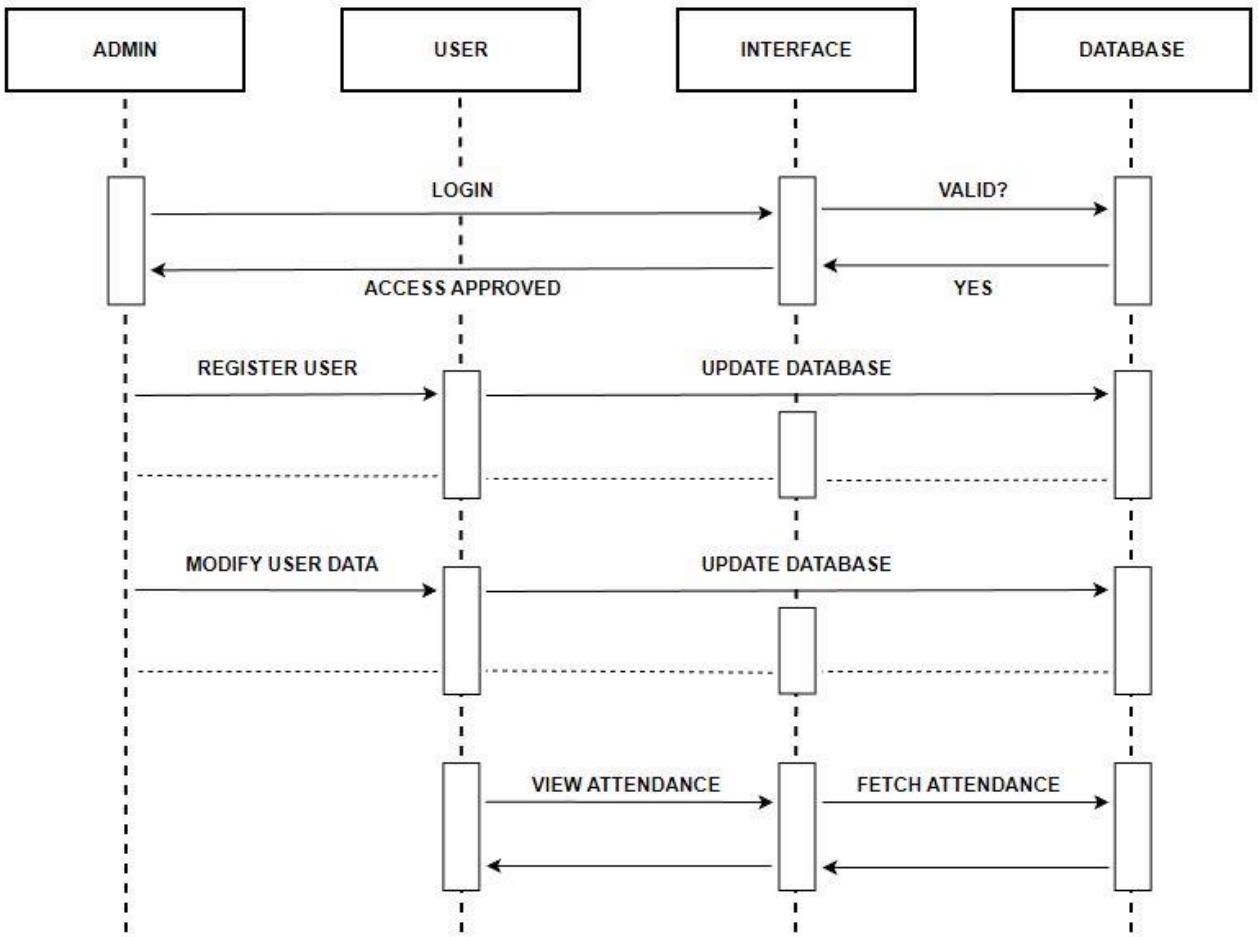

Figure 4.7 Sequence Diagram

The sequence Diagram of the project defines the admin will first login into the system through the interface. Interface will then check in the database if he/she is valid or not. If yes, then he will get access to the system.

Further, the admin can register users through the database and can also modify/update user data. The user can also view and fetch attendance through the database.

4.6 Activity Diagram

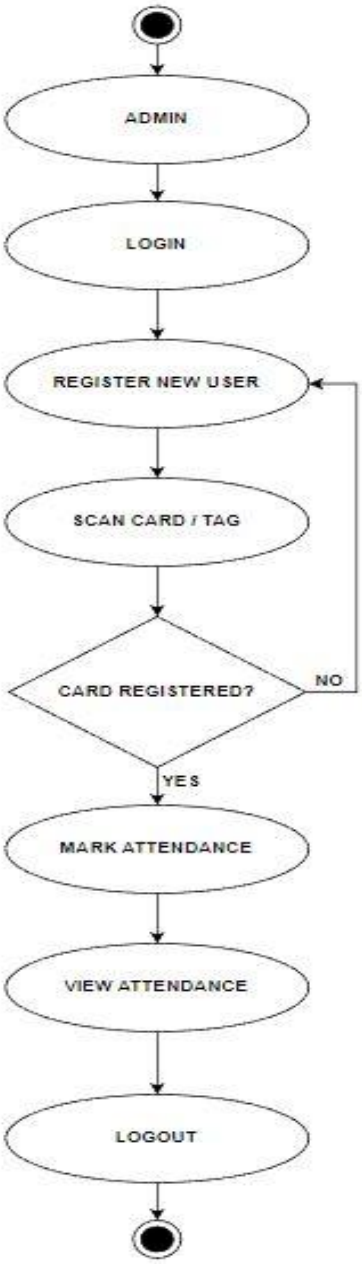

Figure 4.8 Activity Diagram

This diagram explains the activity of the project. Admin will first log in. If the user is a new user, then he needs to register himself first and if not then he can scan the card/tag. He can then successfully mark attendance and can also view attendance from the database. He/she can then log out of the system.

Chapter 5

Project Planning

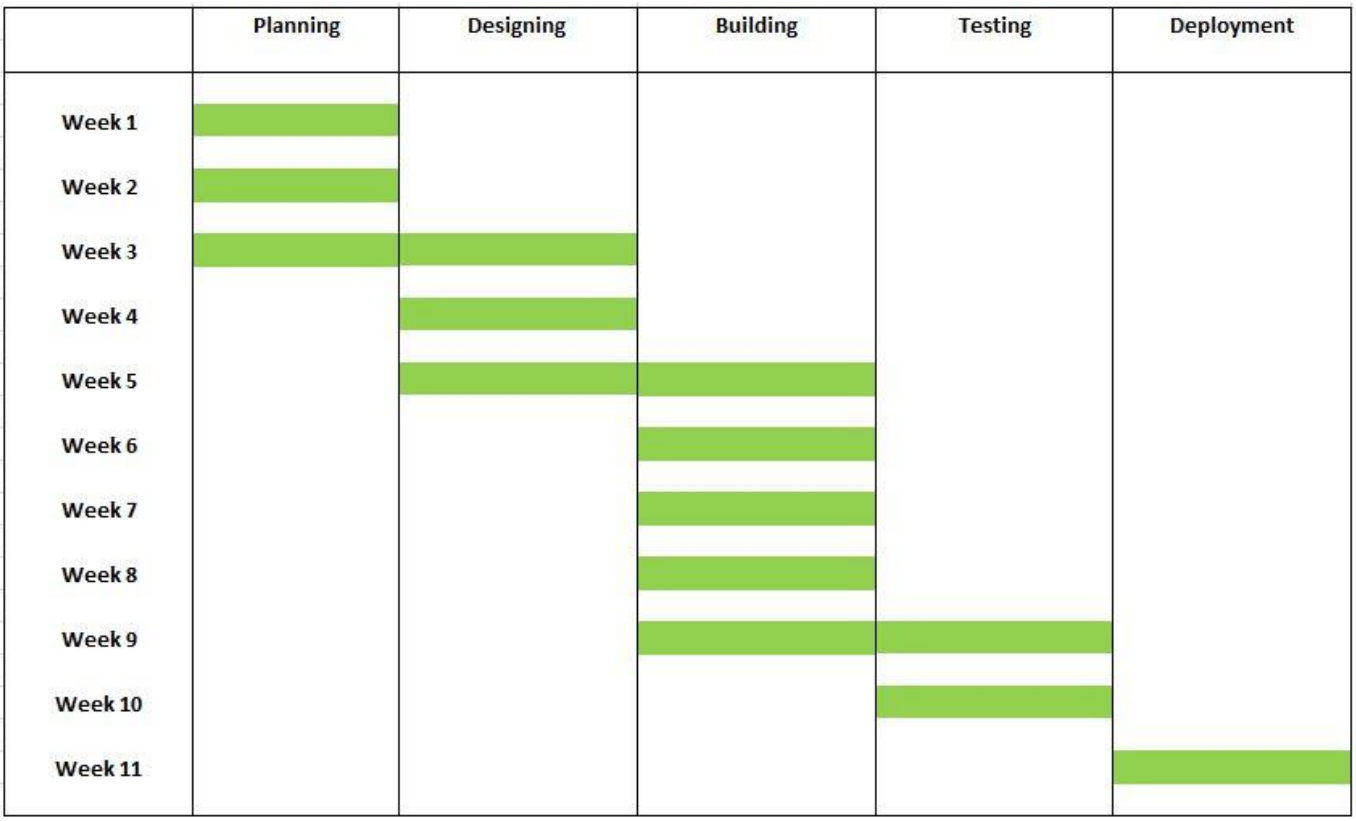

Figure 5.1 Gantt Chart

Gantt Chart is a chart in which a series of horizontal lines show the amount of work done or production completed in certain periods of time in relation to the amount planned for those periods.

- A Gantt chart is a visualization that helps in scheduling, managing, and monitoring specific tasks and resources in a project.
- It consists of a list of tasks and bars depicting each task's progress.
- The horizontal bars of different lengths represent the project timeline, which can include task sequences, duration, and the start and end dates for each task.

Chapter 6

Experimental Setup

6.1 Software Requirements: -

- C/C++:

C is a general-purpose, high-level language that was originally developed by Dennis M. Ritchie to develop the UNIX operating system at Bell Labs.

C++ is a statically typed, compiled, general-purpose, case-sensitive, free-form programming language that supports procedural, object-oriented, and generic programming.

- HTML and CSS:

HTML (Hypertext Markup Language) is the most basic building block of the Web. It defines the meaning and structure of web content.

Cascading Style Sheets (CSS) is a style sheet language used for describing the presentation of a document written in a markup language such as HTML or XML (including XML dialects such as SVG, MathML or XHTML). CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.

- XAMPP Server:

XAMPP is a free and open-source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages.

- MySQL:

MySQL is an open-source relational database management system. As with other relational databases, MySQL stores data in tables made up of rows and columns. Users can define, manipulate, control, and query data using Structured Query Language, more commonly known as SQL.A flexible and powerful program, MySQL is the most popular open-source database system in the world.

6.2 Hardware Requirements: -

- **CPU:** CPU with Pentium 4 or above.
- **GPU:** Integrated Graphic card sufficient
- **RAM:** 256 MB RAM on top of the requirements for the Operating System.
- **STORAGE:** 50 MB or Higher
- **OS:** Windows Server 2008 and later | Windows Vista and later
- RFID Reader
- RFID Tags/cards
- ESP32 Microcontrollers

6.3Arduino Minimum Specifications:

Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6 mm
Width	53.4 mm
Weight	25 g

Chapter 7

Implementation Details

1. Login Module:

- User will log in with the credentials after registration.
- Login page will consist of two input fields i.e., Username and password.
- Shows error if
    - Username not found in the user database.
    - The entered password is wrong.

2. Signup Module:

- Signup module is for the first-time authentication of the admin and it consists of data fields like name, username, password and confirm password.
- By creating an account, the user (admin) agrees to our terms and policy.
- After registration the user will be directed to the login page.

3. User Data Module:

- The users registered on the system will be displayed here in the table.
- This table will contain the user's name, ID, gender, email, Mobile No, and Action (Edit/Delete).
- Admin can have a clear view of the registered user data in this module.

4. Registration Module:

- Registration Module consists of Name, ID, Gender, Email Address, Mobile No.
- Users must first register their RFID Card into the system through this module.
- The data would then be displayed in the User Data Module.

5. Read Tag ID:

- This module displays user data after the RFID card has been tapped on the RFID Reader.
- It displays data only if the RFID card is registered on the system.
- Otherwise, this will pop a message that it is not a registered user.

Chapter 8

Result

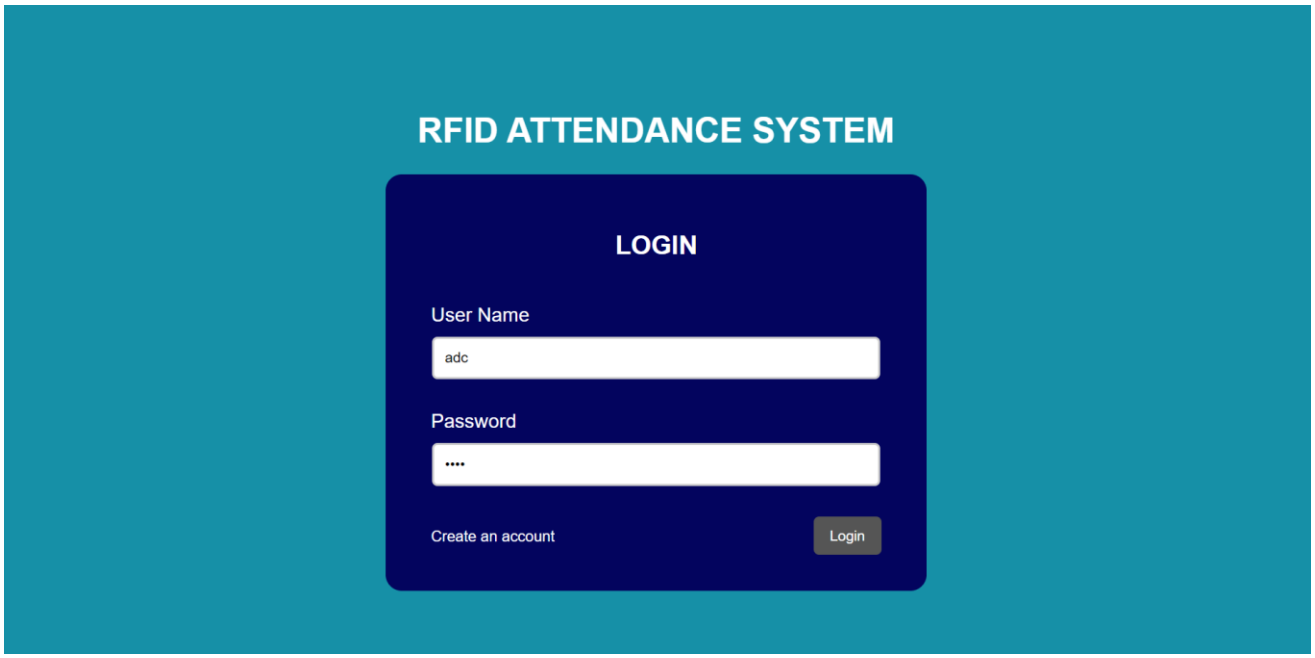

Figure 8.1 RFID Attendance System

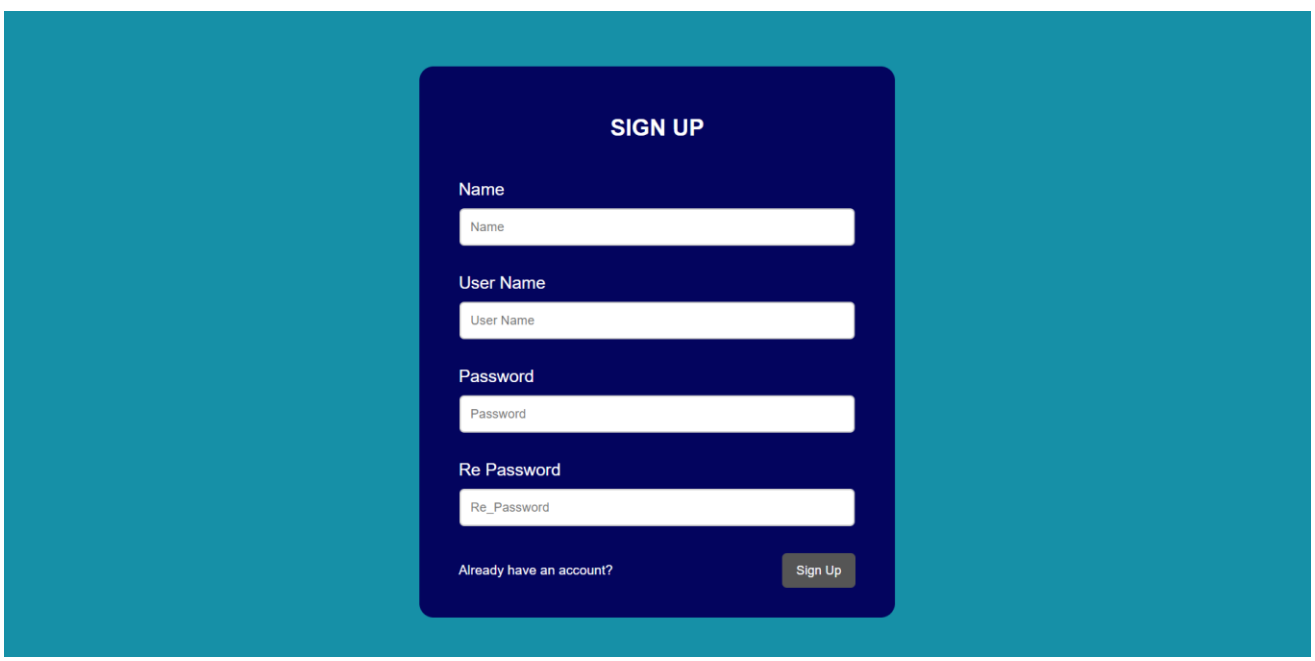

Figure 8.2 Admin Signup

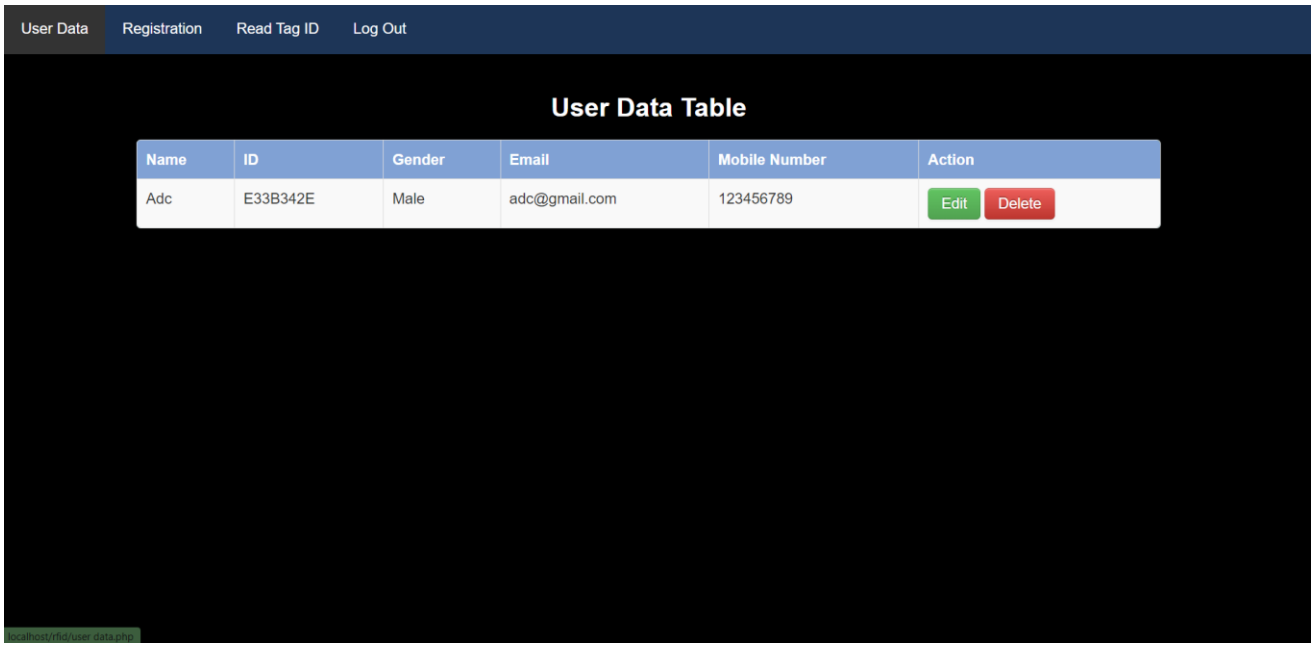

Figure 8.3 User Data Table

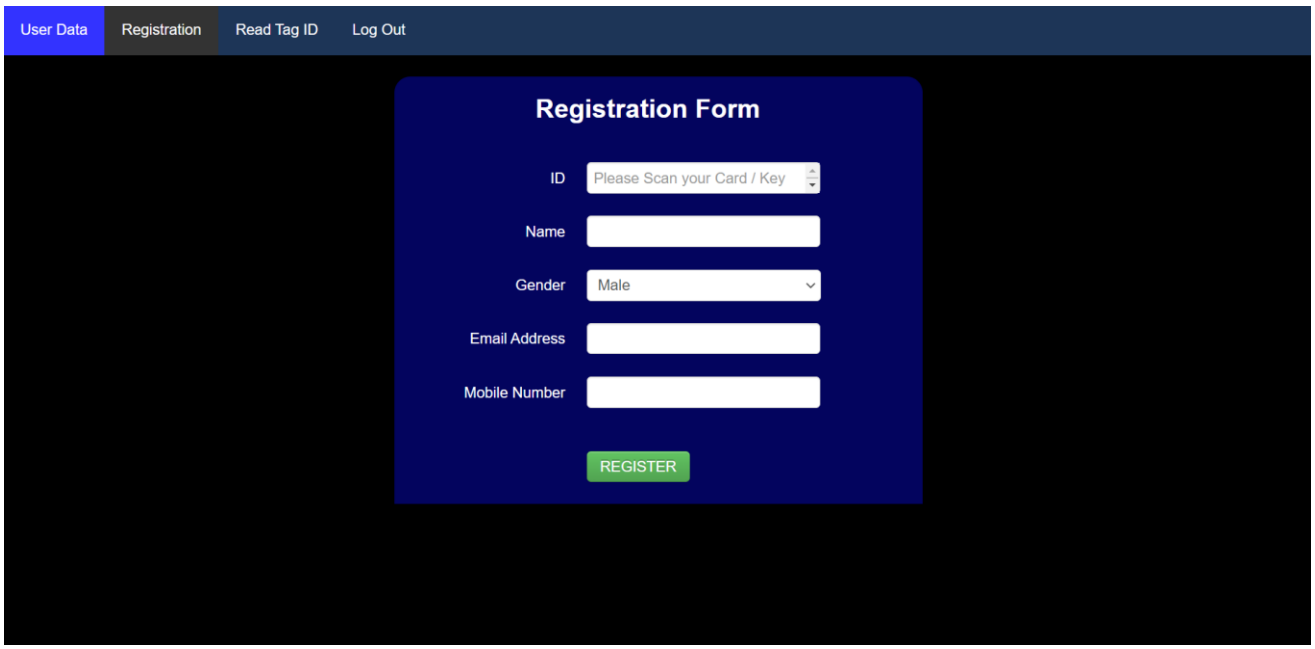

Figure 8.4 User Registration Form

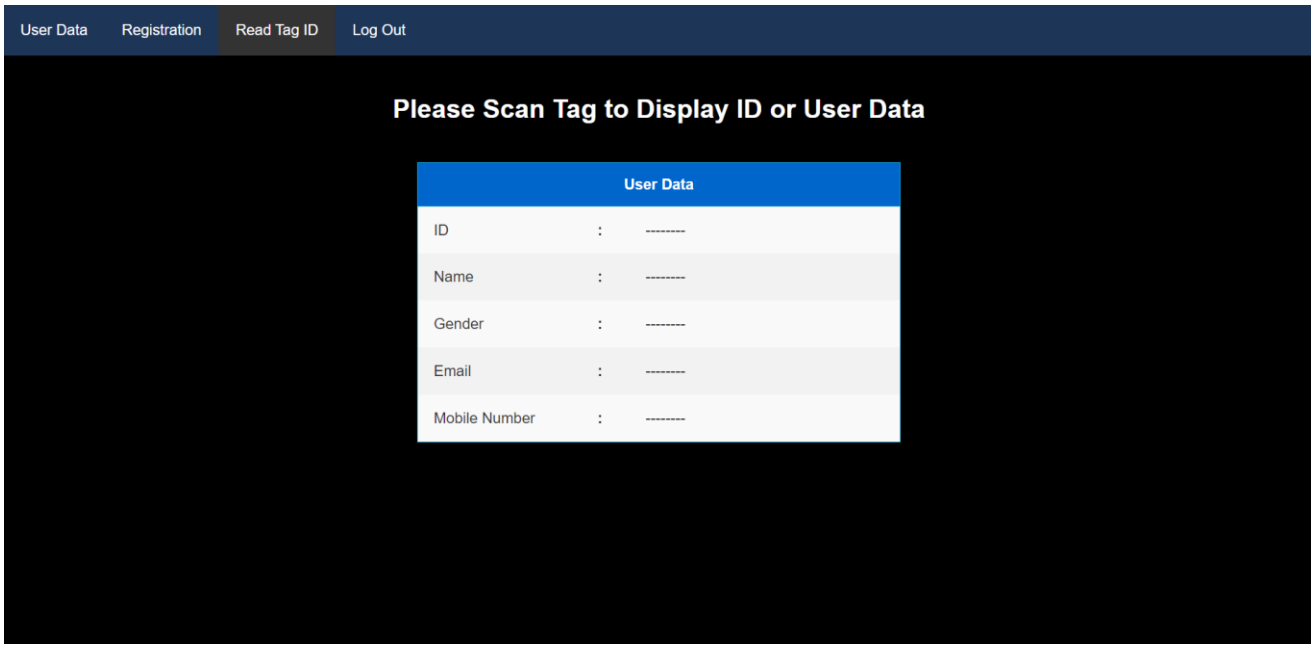

Figure 8.5 Read Tag ID

Chapter 9

Conclusion

A low-cost RFID Based Attendance System prototype has been successfully developed. The prototype of the system provides several advantages over conventional methods of taking attendance in class. The prototype developed in this project is compact and lightweight. Besides, it can run using a power adapter or battery power. Therefore, it is very portable and can be carried to the class for attendance.

The prototype is user-friendly with easily accessible switches and communication ports. Attendance can be stored and retrieved easily. Another advantage of the system is it has high identification and verification speed. This system can be applied not just in the classes but also in working places with the feature that total working hours can be recorded.

The ESP8266 is a low-cost Wi-Fi chip with a full TCP/IP stack and capability, and it only came to the market in August 2014. It costs 3 times less than the MRF24B0MA. Moreover, with the add-on MCU feature, one can use ESP8266 as the host controller for the RFID reader, rather than the existing MCU LM3S6950. Therefore, the size of the reader can be greatly reduced, making it easy to install and thus helping to reduce manufacturing costs.

Chapter 10

References

[1] T. S. Lim, S. C. Sim, and M. M. Mansor, "RFID based attendance system," 2009 IEEE Symposium on Industrial Electronics & Applications, Kuala Lumpur, Malaysia, 2009, pp. 778-782,doi: 10.1109/ISIEA.2009.5356360.

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