UTTARA UNIVERSITY

Department of Electrical & Electronics Engineering

Project Title

RFID Based Online Attendance System

SUBMITED BY

Name	ID
MD. ALI AKBER	: 2221171055
TASLIMA AKTER	: 2221171042
MD.RUHUL AMIN	: 2221171051

A project Submitted to the Uttara University (UU) Department of Electrical and Electronics Engineering (EEE).Under the Guidance of Md.Tanvir Shahed (Assistant Professor EEE Dept Uttara University).

DECLARETION

We do hereby cordially declare that the work presented in the project report has been carried out buys and has not been previously submitted for any Degree in University/College/Organization or any professional qualification.

MD. ALI AKBER
(ID: 2221171055)

TASLIMA AKTER
(2221171042)

MD.RUHUL AMIN
(ID: 2221171051)

Signature of Supervisor

MD.TANVIR SHAHED
Assistant Professor
Uttara University Dept. of EEE

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Abstract

Most of the institutional authorities are troubled with the cumbersome method of maintaining manual attendance of their employees. The manual process of signing on a paper is prolonged and insecure. An efficient attendance monitoring system needs to be enforced at such places. Radio Frequency Identification (RFID) based attendance system provides us with a solution that caters to issues like proxy attendance. This paper describes the design of an RFID based attendance monitoring system which uniquely identifies each employee/student based on their RFID tag which is attached to their ID card. This makes the mechanism of recording the attendance effortless, quicker and protected as compared to conventional method. This system is designed to be used at different educational institutions, corporate offices, government offices etc. The proposed system consist of both hardware and software components based on IoT Technology. The hardware component consists of RC522 RFID card reader and RFID tags/cards. The software component consists of the Web-based GUI for viewing the employee's or student's attendance, which is hosted on a web server and which stores the data in a database server. The employees or students just need to place their RFID card or tag on the reader and their attendance will be recorded for the day. Also, the attendance recorded will be more accurate as the system is synced with a real-time clock.

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List of Abbreviations

01	PWM	Pulse Width Modulation
02	IoT	Internet of Things
03	IPS	Instant Power Supply Unit
04	LCD	Liquid Crystal Display

Chapter 1
Introduction

1.1 Introduction

The use of Radio Frequency Identification (RFID) technology is ubiquitous in a number of businesses and sectors, including retail sales, smart cities, agriculture, and transportation. Additionally, educational institutions have started using RFID to track student attendance, combining this technology with Google Sheets and the Internet of Things (IoT) to build a realtime attendance tracking system. For a thorough examination of the creation of a student attendance system, this paper includes a systematic literature evaluation of 21 major research published on IoT based attendance systems employing RFID. This RFID-based attendance system enables automation, eliminating several problems connected with the manual process, such as time wasting, proxies, and the possibility of losing the attendance sheet, in contrast to the traditional attendance system, which depends on manual signatures. By creating a system that automatically registers students' attendance by merely flashing their student cards at the RFID reader, all the aforementioned difficulties may be successfully addressed. This automated method guarantees attendance monitoring accuracy and dependability while also saving time. This paper's conclusion highlights the significant advantages of implementing an IoT-based attendance system based on RFID technology. The suggested solution provides a trustworthy, efficient, and secure alternative to manual attendance techniques, successfully addressing their shortcomings. This paper offers helpful insights for institutions looking to create a cutting-edge attendance system that increases student involvement and academic achievement by looking at guiding principles, best practices, and the successful resolution of difficulties.

1.2 Problem Statement

Traditional attendance systems, which rely on manual entry or paper-based processes, are often time-consuming, prone to errors, and difficult to manage,

especially in large organizations such as schools, universities, or offices. This inefficiency can lead to issues such as inaccurate attendance records, fraudulent entries, and delays in reporting. Additionally, there is a lack of real-time access to attendance data for administrators, teachers, or managers, making it challenging to track attendance trends and respond to absenteeism issues promptly.

The problem is further exacerbated in scenarios where scalability is required, as manually tracking large numbers of individuals becomes increasingly complex and resource-intensive. Traditional systems also lack integration with modern data analytics tools, preventing organizations from gaining insights into attendance patterns, trends, or employee/student behavior.

1.3 Objective of the Project

The main objective of the RFID-based online attendance system project is to develop a reliable, automated, and real-time solution for tracking and managing attendance using RFID technology and the Internet of Things (IoT). The system aims to replace traditional, manual attendance processes with a more efficient and accurate method that can be easily monitored and managed online.

The specific objectives include:

1. **Automate Attendance Tracking:** Eliminate manual processes by using RFID tags for automatic identification and attendance marking when individuals enter or exit a location, such as a classroom or office.
2. **Real-Time Data Access:** Provide real-time access to attendance data through an online platform, enabling administrators, teachers, or managers to monitor attendance immediately from anywhere.
3. **Enhance Accuracy and Eliminate Fraud:** Reduce errors and prevent fraudulent attendance entries (e.g., proxy attendance) by ensuring that only individuals carrying valid RFID tags can have their attendance recorded.
4. **Improve Efficiency and Save Time:** Streamline the attendance process, reducing the time required for marking attendance and generating reports.
5. **Centralized Data Management:** Store attendance data in a centralized online database, enabling easy retrieval, analysis, and integration with other systems (e.g., payroll systems, academic management tools).
6. **Scalability and Flexibility:** Design a system that is scalable to accommodate

different numbers of users, whether for small classrooms or large organizations, while being flexible enough to integrate with existing infrastructure.

7. **Generate Attendance Reports:** Provide automated, customizable attendance reports that can be easily generated and accessed by the management, allowing for better decision-making and attendance monitoring.
8. **Improve Security:** Securely store data and ensure that only authorized personnel can access or modify attendance records.

1.4 Background of the Project

In recent years, RFID technology has been widely used in various sectors, such as in-education, transportation, agriculture, animal husbandry, store sales and other sectors. RFID utilization in education is student attendance monitoring system, by using Internet of Things (IoT) and Cloud technology, it will produce a real time attendance monitoring system that can be accessed by various parties, such as lecturer, campus administration and parents. With this monitoring system if there are students who are not present can be immediately discovered and can be taken immediate action and the learning process can run smoothly. In our project we will punch the card of the RFID module with the door itself. Name and ID can be seen from the LCD display and Automatic doors will open to enter. Internet connection is kept with the system from which all data including time can be monitored through Internet.

1.5 IoT System

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The definition of the Internet of Things has evolved due to the convergence of multiple technologies, real-time analytics, machine learning, commodity sensors, and embedded systems.

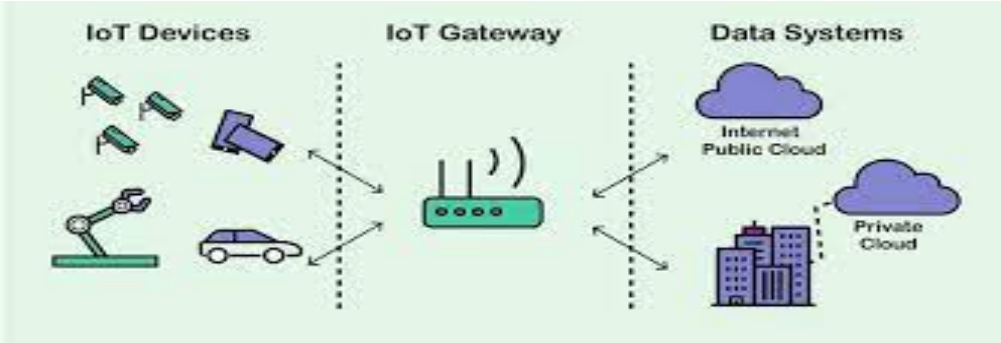

Figure -1.1: IoT System

Traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), and others all contribute to enabling the Internet of Things. In the consumer market, IoT technology is most synonymous with products pertaining to the concept of the " **RFID Based IoT Attendance System ",** covering devices and appliances (such as lighting fixtures, thermostats, home security systems and cameras, and other home appliances) that support one or more common ecosystems, and can be controlled via devices associated with that ecosystem, such as

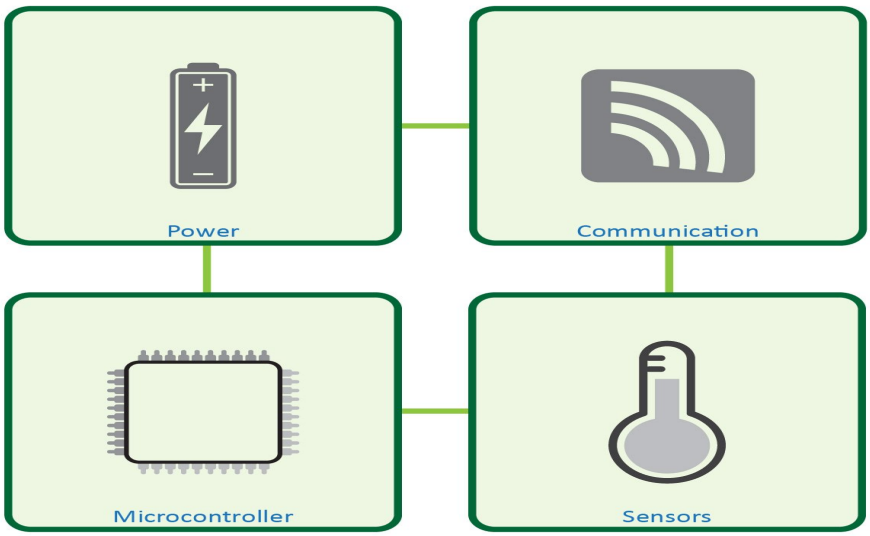

Figure -1.2: Block Diagram of IoT

Smart phones and smart speakers. There are a number of serious concerns about dangers in the growth of IoT, especially in the areas of privacy and security; and consequently industry and governmental moves to begin to address these.

1.6 Methodology

Methodology for RFID-Based Online Attendance System Project

The development of an RFID-based online attendance system involves several key phases, including system design, hardware integration, software development, and testing. Below is a step-by-step methodology for implementing the project:

1. Requirement Analysis and Feasibility Study

Identify Stakeholders: Understand the needs of key users (students, employees, teachers, managers, administrators) and the environments where the system will be implemented (schools, offices, etc.).

Set System Requirements: Define functional and non-functional requirements, including hardware specifications (RFID readers, tags) and software (cloud-based database, web or mobile interface).

Feasibility Study: Evaluate the technical, financial, and time-related feasibility of the project, ensuring the proposed solution is viable and can be integrated into the existing infrastructure.

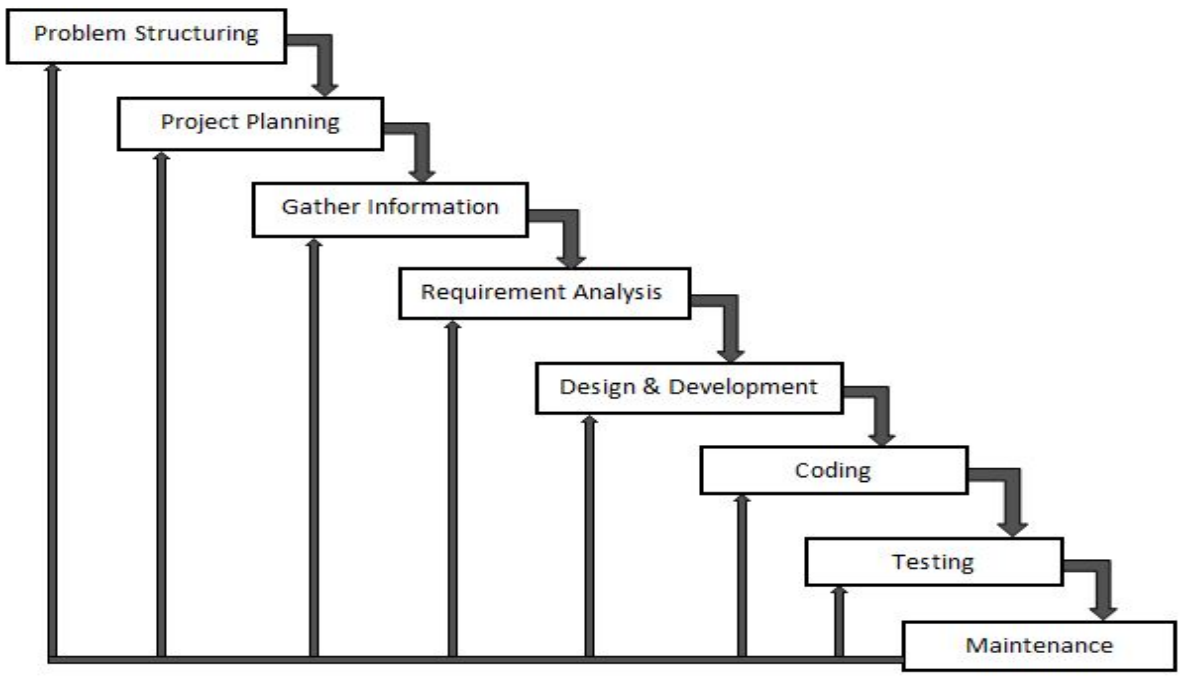

Figure -1.3: Methodology

2. Software Development

Database Development:

Develop a cloud-based database using platforms such as MySQL, Firebase, or MongoDB to store attendance records securely.

Implement data security measures like encryption, authentication, and access control to ensure only authorized users can access the data.

Backend Development:

Develop a backend application (using Node.js, Python, or similar technology) to handle communication between the RFID system and the database. The backend should:

Receive data from RFID readers.

Store attendance logs in the database.

Validate attendance records.

Frontend Development:

Build a web-based or mobile interface for users to access real-time attendance data, manage records, and generate reports.

Use front-end frameworks like React, Angular, or mobile platforms like Flutter to create user-friendly interfaces.

Integration with Analytics Tools:

Optionally integrate the system with analytics tools to derive insights from attendance data (e.g., attendance trends, absenteeism rates).

3. Data Analysis and Reporting

Data Analytics:

Implement analytics features to allow users to generate automated attendance reports, track attendance trends, and analyze absenteeism.

Customizable Reports:

Provide customizable report generation options, enabling users to export attendance data for specific time periods, departments, or individuals.

1.7 Motivation for Project

The motivation behind developing an RFID-based online attendance system arises from the inefficiencies and limitations of traditional attendance management

methods. Manual attendance systems, such as roll calls, paper-based records, or even biometric systems, present several challenges that can be addressed through automation and modern technology integration. Below are the key factors motivating the development of this project:

1. Elimination of Manual Processes:

Traditional methods of attendance tracking are time-consuming and require significant human effort to record, compile, and verify attendance data. Human errors such as incorrect entries or missed records are common in manual systems. An RFID -based solution eliminates the need for manual attendance logging, providing an automated, fast, and accurate process.

2. Time Efficiency and Convenience:

Manually marking attendance can take a considerable amount of time, especially in large groups such as classrooms or office settings. An RFID-based system allows individuals to have their attendance marked automatically as they pass through RFID-enabled checkpoints, significantly reducing the time spent on attendance-related tasks.

3. Accuracy and Data Integrity:

One of the main motivations is to ensure accuracy and integrity of attendance data. Manual systems are prone to errors, including incorrect entries, overlooked absences, or proxy attendance (someone marking attendance on behalf of another person). RFID systems use unique tags, ensuring that only the rightful individual's attendance is marked, thus increasing data accuracy and reliability.

4. Real-Time Monitoring and Data Availability:

Traditional attendance systems often do not provide real-time data. In large organizations, it may take days or weeks to process attendance records. An RFID-based IoT system allows for real-time tracking and immediate data availability, enabling administrators and managers to monitor attendance from anywhere using an online platform. This helps in identifying attendance trends and addressing absenteeism promptly.

5. Enhanced Security and Fraud Prevention:

In settings where attendance records are critical (e.g., schools, workplaces), preventing fraudulent attendance is essential. The RFID system ensures that only individuals with valid, unique RFID tags can register their attendance. This prevents issues such as proxy attendance or manipulation of attendance records.

6. Scalability for Large Organizations:

Managing attendance manually in large organizations or educational institutions can be complex and inefficient. An RFID-based system provides a scalable solution, capable of handling attendance for a large number of users without increased administrative burden. As organizations grow, the system can be easily expanded to accommodate additional users and locations.

7. Centralized and Accessible Data Management:

The motivation to move towards a centralized, cloud-based system stems from the need for easier access to attendance data. In traditional setups, attendance data is often fragmented and stored locally, making it difficult to access, analyze, or share across departments. With an RFID-based online attendance system, data is stored centrally, allowing authorized personnel to access it in real-time from any device with internet connectivity.

8. Automated Reporting and Analytics:

Another driving factor is the ability to generate automated reports and derive insights from attendance data. Manual systems require significant effort to compile reports and analyze trends. With an RFID-based solution, reports can be generated instantly, providing valuable insights into patterns such as frequent absentees, latecomers, or overall attendance rates. This helps organizations make informed decisions based on data.

9. Integration with Other Systems:

Many organizations seek to integrate their attendance systems with other management tools (e.g., payroll, academic grading, or human resource systems). RFID-based attendance systems can be easily integrated with these existing platforms, streamlining operations and reducing administrative overhead.

10. Eco-Friendly Solution:

Moving towards an RFID-based system can help reduce the environmental impact associated with paper-based attendance systems. By eliminating the need for physical attendance sheets, the project supports eco-friendly initiatives and promotes the use of digital solutions.

1.8 Project Management

Effective project management is crucial for ensuring the successful implementation of an RFID-based online attendance system. The following project management

framework outlines the key phases, tasks, timelines, and resources required to ensure the project is completed on time and within budget while meeting quality standards.

1. Project Planning and Initiation

Objective: Define the project scope, objectives, stakeholders, and resources needed.

Scope Definition:

Identify project goals, deliverables, and the boundaries of the RFID-based online attendance system.

Outline the functionalities (e.g., RFID integration, real-time attendance tracking, report generation, etc.).

Stakeholder Identification:

Identify key stakeholders, including project sponsors, users (employees, students, managers, teachers), and the development team.

Resource Allocation:

Assign necessary resources such as hardware (RFID readers, tags), software (database, cloud services), and human resources (developers, testers, etc.).

Risk Assessment:

Identify potential risks (e.g., hardware failures, integration issues) and develop mitigation strategies.

Budgeting and Timeline:

Develop a project budget to cover the costs of hardware, software, personnel, and testing.

Establish a project timeline with milestones and deadlines for each phase.

2. Project Team Formation

Objective: Assemble a project team with the required skills and expertise.

Role Assignment:

Project Manager: Oversees the overall project, manages timelines, and ensures stakeholder communication.

Hardware Engineers: Handle RFID tag and reader setup, installation, and integration.

Software Developers: Develop the backend, frontend, and database.

Database Administrators: Manage cloud-based storage and real-time data synchronization.

Testers/QA Team: Ensure quality control, test functionalities, and validate system performance.

Skill Development:

Ensure the team is well-versed in RFID technology, IoT integration, cloud services, and web/mobile development.

3. Project Resources:

Hardware Resources:

RFID readers and tags

IoT gateways

4. Servers (cloud-based or physical)

Software Resources:

Development tools (e.g., Node.js, React, Python, etc.)

Cloud services (e.g., AWS, Azure, Firebase)

Database (e.g., MySQL, MongoDB)

5. Human Resources:

Project Manager

Software Developers

Hardware Engineers

Testers/QA Team

UI/UX Designers

Database Administrators

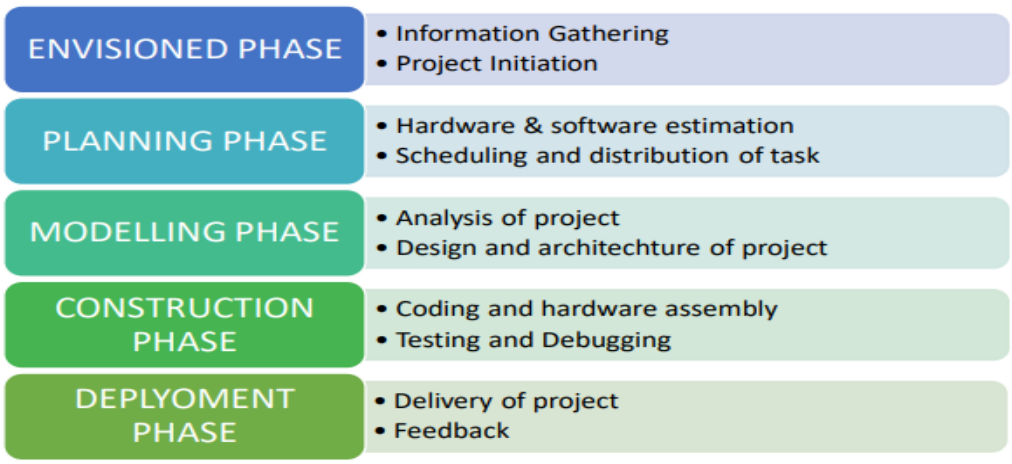

Figure -1.4: Project Management

Chapter 2
Literature Review

2.1 Introduction

One of the factors that support the success of the learning system is the presence of students, because if students are often absent then the material they received becomes less and can't understand the material that has been taught, one that causes the absence of students is they ditch, so the attendance monitoring system becomes very important because with this process the attendance of students can be monitored properly. Various kinds of presences can be used from manual way to automatic way using electronic equipment, if the monitoring system attendance using electronic equipment so the recording of attendance data becomes easier, fast and accurate. In this research, attendance monitoring system using RFID technology and with the application of Internet of Things (IoT) and cloud technology will be obtained a presence system that can run and monitored in real time, so that all parties who need information such as lecturers, parents, and energy the administration can immediately find out if there are students who skip classroom, it can immediately be prevented so that the next meeting does not ditch again.

2.2 Internet of Things (IoT) Basic Concept

The intercommunication between gadget to gadget or AI associated through the web with inserted innovation frameworks utilizing remote sensors, actuators which is distantly controlled, screen and upgraded by the client for mechanization is alluded as Internet of things (IoT). Here the expression "Things" signifies actual gadgets, for example, chips, cameras, sensors and other such gadgets. These actual gadgets are capable to impart, gather data and trade information by interfacing an organization.
The implanted innovation of these actual gadgets makes this trade of data each other conceivable. There are an arrangement of modern robotization incorporates that can help making life at mechanical progressively invaluable and less difficult to administer, especially for involved, immense families. Assume you could therefore

oversee and control the contraptions that you usually turn on and off every day. With a modern computerization structure, you can oversee apparatuses when you're out of the house and contemplating whether you made sure to kill light or not, savvy framework will be there to address the inquiry. The creating proximity of the Internet of Things in person's lives has made turn of events and progression in the clever mechanical space, empowering customers to relate their devices through the web to their telephones and tablets, and improve than at any other time benefits for nuclear families. Also, as house proprietor are changing their devices to one central application, device or focus, they further comprehend the value these modern robotization things can bring to a family. It is the network separated from the regular gadgets utilizing web, for example, work area, PCs, Smartphone, tablets and so on.

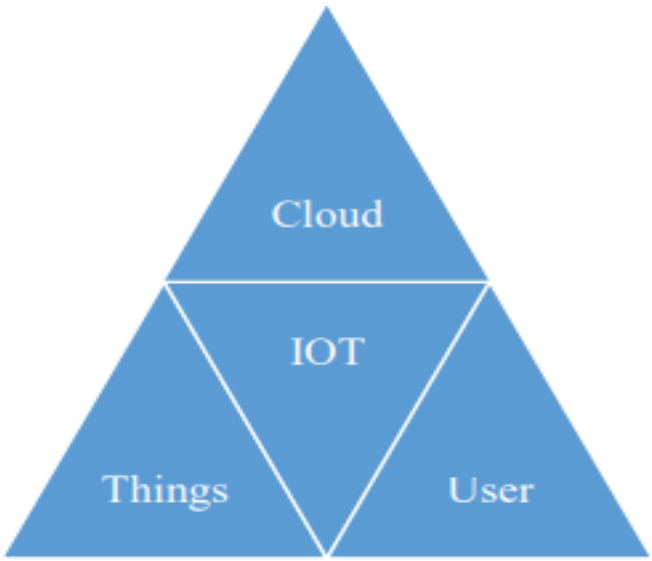

Figure -2.1: IoT Basic Concept

2.3 Software Tools

The software that is used to program the microcontroller is open-source-software and can be downloaded for free on www.arduino.cc. With this “Arduino software” we can write little programs with the microcontroller. These programs are called “Sketch”.In the end the sketches are transferred to the microcontroller by USB cable.

More on that later on the subject “programming”.

Installation Now one after another the Arduino software and the USB driver for the board have to be installed.

Installation and setup of the Arduino software

1. We have downloaded the Arduino software from www.arduino.cc and installed it on the computer (This was NOT connected to the PC). After that we opened the software file and installed the program named arduino.exe.

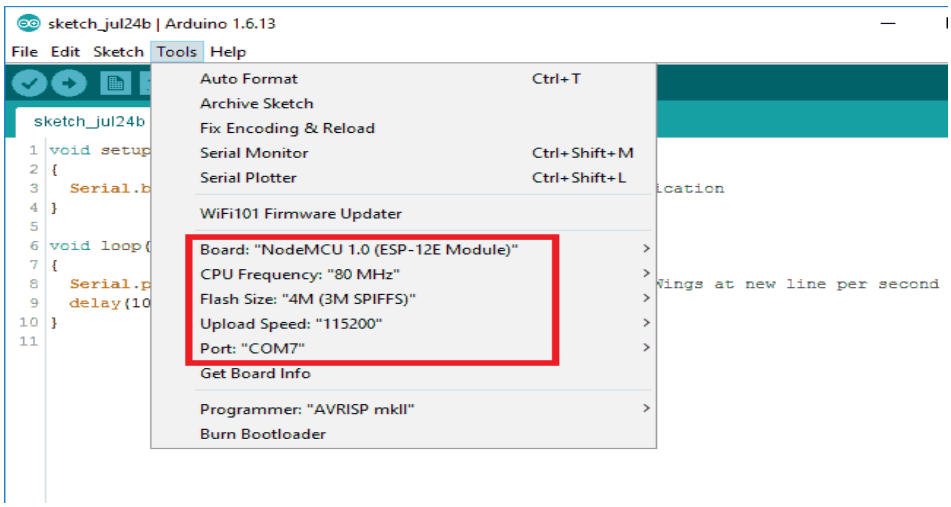

Figure - 2.2: Program Installation Process

Two set ups on the program are important and should be considered.

a) The board that we want to connect has to be selected on the arduino software. The “Arduino Uno” is here known as “Arduino / Genuino Uno”.

b) We have to choose the right “Serial-Port”, to let the Computer know to which port the board has been connected. That is only possible if the USB driver has been installed correctly. It can be checked this way:

At the moment the Arduino wasn’t connected to the PC. If we now choose “Port”, under the field “Tool”, we will already see one or more ports here (COM1/ COM2/ COM3…). The quantity of the shown ports doesn't depend on the quantity of the USB ports on the computer. When the board gets connected to the computer, we will find one more port.

2.4 Programming

The development cycle is divided into 4 phases:

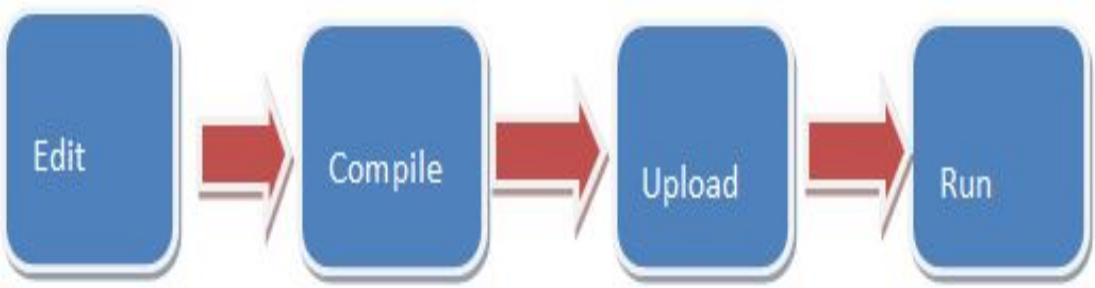

Figure -2.3: Flowchart of the Compiling Process

Compile: Compile means to translate the sketch into machine language, also known as object.

Code Run: Arduino sketch is executed as soon as terminates the step of uploading on the board.

2.5 Arduino Program Development

Based on C++ without 80% of the instructions.

- A handful of new commands.
- Programs are called 'sketches'.
- Sketches need two functions:
- void setup ( )
- Void loop ( )
- Setup ( ) runs first and once.
- loop ( ) runs over and over, until power is lost or a new sketch is loaded.

2.6 Ubidots IoT

Ubidots is a cloud-based Internet of Things (IoT) platform that enables users to collect, visualize, and analyze real-time data from connected devices. It is widely used by developers, businesses, and educational institutions to build and deploy IoT applications without needing extensive technical expertise. Ubidots simplifies the process of working with IoT devices and provides tools for data management, analysis, and visualization through dashboards, APIs, and other user-friendly features.

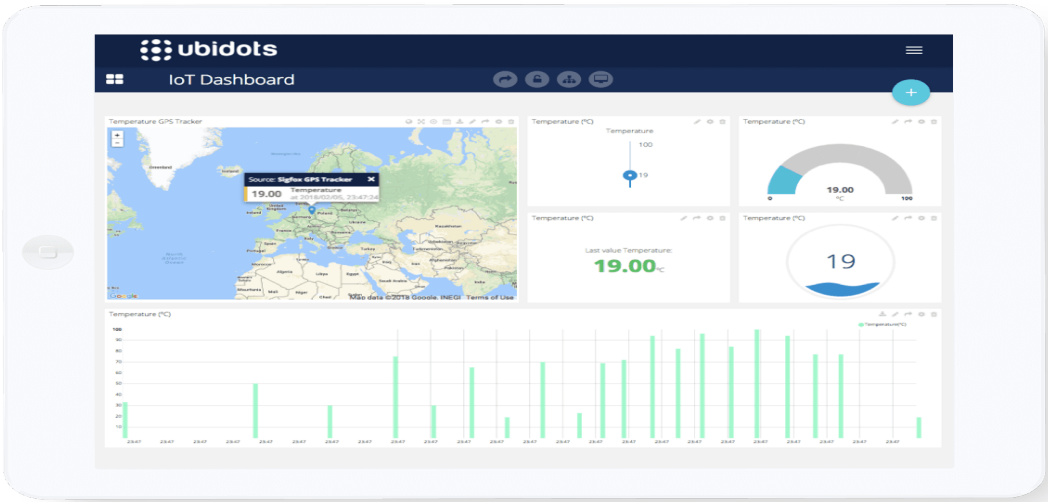

Figure -2.4: Ubidots IoT Platform

2.7 Proposed Project in Proteus

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards. It was developed in Yorkshire, England by Labcenter Electronics Ltd and is available in English, French, Spanish and Chinese languages.

The first version of what is now the Proteus Design Suite was called PC-B and was written by the company chairman, John Jameson, for DOS in 1988. Schematic Capture support followed in 1990, with a port to the Windows environment shortly thereafter. Mixed mode SPICE Simulation was first integrated into Proteus in 1996 and microcontroller simulation then arrived in Proteus in 1998. Shape based autorouting was added in 2002 and 2006 saw another major product update with 3D

Board Visualisation. More recently, a dedicated IDE for simulation was added in 2011 and MCAD import/export was included in 2015. Support for high speed design was added in 2017.Feature led product releases are typically biannual, while maintenance based service packs are released as it is required.

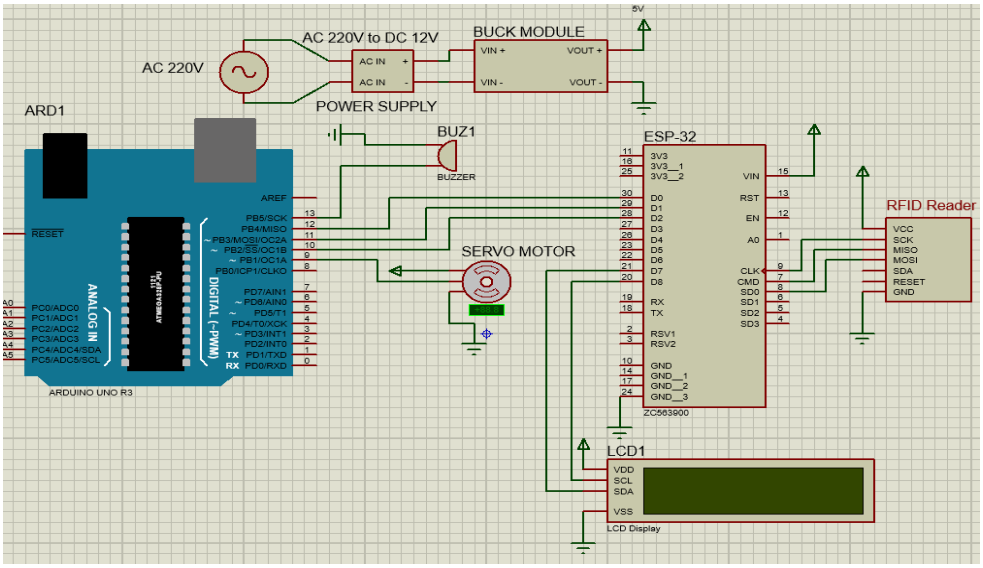

Figure -2.5: User Interface of Proteus

2.8 Literature Survey

A.A. Olanipekun et al., (2017) have implemented a system called RFID Based Automatic Attendance systems [3]. This attendance system software has been developed using VB.net and database (Microsoft Access). Each student has RFID tag attached with their Student ID card. There is a serial connection amid computer and RFID reader also has been maintained for connection between RFID and the computer system. The RFID reader is placed at the lecture hall door. Whenever students enter the lecture hall RFID reader read the RFID tag and it store the all information (Entry time, Name, etc.) of students into database via serial connection and maintain the system. Here admin of this system can view all documents using the software interface by retrieving information from database without any difficulties not like traditional system [1].

Hasanein D.Rjeib et al., (2018) implemented an attendance system with the combination of RFID and Web-Based system. This system uses a RFID tag and reader for getting students' attendance and read particular student. Then this reader connects with Arduino microcontroller which passes the RFID reader response to web server by using Arduino shield, finally the attendance of students can be stored in web server by using PHP and MySQL. The admin of the system can view all students documents by login to this particular web based application and also can view the student's details using LCD displays [2]. Electronic copy available at: https://ssrn.com/abstract=33727343

Srivignessh PSS et al.,(2019) Found a system that, RFID and Pose Invariant Face Verification for automatic attendance system. This system works under two-factor verifications. In the first step, students need to use RFID tag which is read by RFID reader. If the first step is succeeded then it moves to second step of verification, if not, student becomes under unrecognized category. The second step is Face verification, if the face match with particular RFID tag then it marks attendance into database. Missing the above both readings, the system identifies the fraud students. This two-factor automatic system reduces the misuse of identity theft for the purpose of getting attendance [3].

Moth Myint Thein et al., (2020) Chaw developed a Students' Attendance Management System Based on RFID and Fingerprint Reader. This system also works as two factor verification. In this system RFID reader is connected with computer and computer has specific software to measure automatic attendance of students which is developed by Microsoft Visual studio and a SQL database also maintain in this system. At the initial, every student must register his/her RFID tag and Fingerprints and it is stored in the database. When students enter the class room they need to use RFID tag and this will be reading by RFID reader which checks the database to confirm the tag, if it is correct then next verification starts. In second step fingerprint of the student is verified. If it is matched then attendance will be stored in server. Admin can view, edit and delete the system. Also, teachers have authentication to use this system, they also can act as admin. This is very speed (since the RFID) and secure system (finger print). In case, Tag can be used by others as well but two factor mitigates the issues and attendance stored automatically proper as well as there are fraud free actions [4].

"Arduino Based Smart RFID Security and Attendance System with Audio Acknowledgement" is developed by Yashi Mishra et al. (2017) SD card module with

RFID tag which carry different voice codes is used in this system. The tag ID and code of the voice greeting stored in SD card module. While a student enters the class room door, his / her RFID tag is 4 being read. If the ID of the tag matched with stored data in the SD card then particular person needs to use the voice greeting, if it is matched then the door will be opened and the attendance will store in excel sheet. Student can view the attendance detail using the LCD placed in Arduino. Here Arduino working as microcontroller to connect LCD, RFID reader, SD card module and so on. This system is also working as two-factor verification process. Moreover, this system is very simple schematics than other system because of very simple components and design. Also here we get fast response with accuracy [5].

2.9 Time Plan

The following tables define the main tasks in the project introduction and project itself.

T1	Project Definition	1 Week
T2	Collecting data	11 Weeks
T3	Analysis	7 Weeks
T4	Theoretical calculation	4 Weeks
T5	Documentation	10 Weeks
T6	Prepare for presentation	2 Weeks

Table- 01: Time Scheduled Table for Project Introduction

The time of the project introduction is scheduled over 16 weeks, table 2 shows how the work was scheduled over this time:

Task \ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
T1																
T2																
T3																
T4																
T5																
T6																

Table-02: Time Plan Table for Project Introduction

The following table defines the main tasks in the project:

T1	Collecting data	3 Week
T2	Implementation	10 Weeks
T3	Analysis	5 Weeks
T4	Building and testing the system	8 Weeks
T5	Documentation	10 Weeks
T6	Prepare for presentation	2 Weeks

Table-03: Time Scheduled Table for Project

The time of the project is scheduled over 16 weeks, table 4 shows how the work was scheduled over this time:

Task \ Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
T1	■	■	■													
T2			■	■	■	■	■	■	■	■	■	■				
T3				■	■	■	■	■								
T4							■	■	■	■	■	■	■	■		
T5					■	■	■	■	■	■	■	■	■	■		
T6															■	■

Table-04: Time Plan Table for Project

Chapter 3
Methodology

3.1 Introduction

The concept “Internet of Things” (IoT) has recently attracted growing attention from both academia and industry. IoT is a scenario where devices (even animals or people) are provided with unique identifiers and the ability to automatically transmit data over a network without requiring human-to computer interaction. IoT is a scenario where devices (even animals or people) are provided with unique identifiers and the ability to automatically transmit data over a network without requiring human-to computer interaction. RFID forms an essential block of IoT where RFID devices are wireless microchips used for tagging objects for automated identification. RFID can help to identify and to monitor items (products, people, student, etc.) wirelessly within a specified distance (a few centimeters to hundreds of meters). In this paper, we describe the proposed Smart Attendance System (SAS) using RFID technology. Our framework utilizes RFID tags which allow school/college to monitor the student attendance in and out of the class, upload the data on Google Spreadsheet, send alert to parents using SMS/email and generate a report quickly.

3.2 Block Diagram of This Project

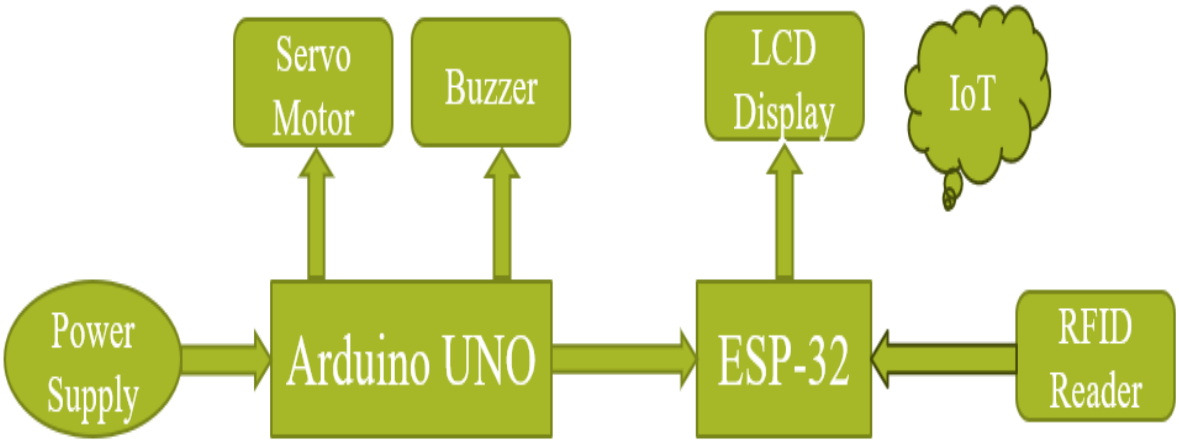

Figure -3.1: Block Diagram

3.3 Circuit Diagram of This Project

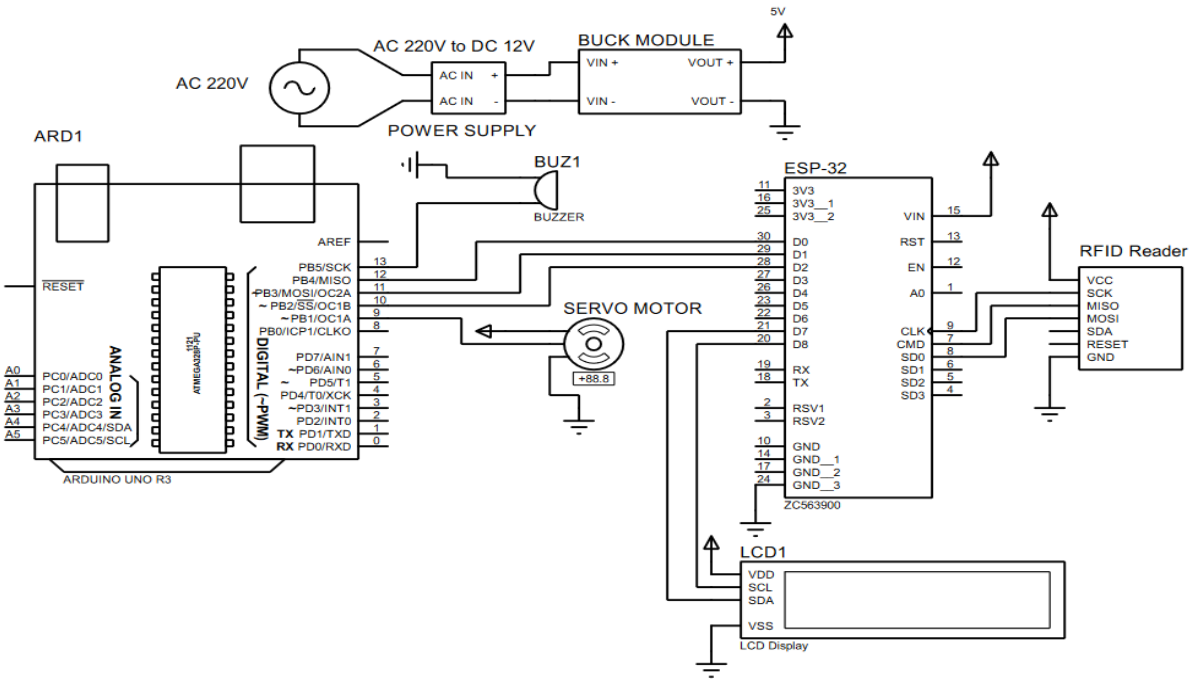

Figure -3.2: Circuit Diagram

This RFID based online attendance system circuit diagram.The project mainly used 5 volt dc power.the project used a 12 volt dc power supply.This buck module converts 12 volt dc power into 5 volt dc power.In this project used two microcontroller one is the Node MCU & the other is ESP-32.

3.4 The list of Devices used in the Project is Given Below

- ESP-32.
- Buck Module.
- Power Supply.
- LCD Display.
- Servo Motor.
- Arduino UNO.

3.5 ESP-32

The ESP32 is a powerful microcontroller and system-on-chip (SoC) developed by Espressif Systems. It's widely used in various IoT (Internet of Things) applications due to its versatility, low cost, and rich set of features. Here are some details about the ESP32:

Microcontroller: The ESP32 features a dual-core Xtensa LX6 microprocessor, which can be clocked at up to 240 MHz. Having dual cores allows for better multitasking capabilities and performance optimization.

Wireless Connectivity: One of the key features of the ESP32 is its built-in Wi-Fi and Bluetooth connectivity. It supports Wi-Fi 802.11 b/g/n/e/i, Bluetooth v4.2 BR/EDR and BLE (Bluetooth Low Energy), making it suitable for a wide range of IoT applications that require wireless communication.

Memory: The ESP32 typically comes with various configurations of Flash memory (up to 16 MB) and RAM (up to 520 KB SRAM), providing ample storage space for program code and data storage.

Peripheral Interfaces: The ESP32 offers a rich set of peripheral interfaces, including SPI, I2C, UART, I2S, PWM, ADC, DAC, and more. These interfaces allow the ESP32 to interact with a wide variety of sensors, actuators, displays, and other external devices.

Security Features: Security is a priority in IoT applications, and the ESP32 includes several security features such as hardware-accelerated encryption (AES, SHA-2, RSA), secure boot, and flash encryption to protect data and firmware integrity.

Low Power Consumption: The ESP32 is designed to operate efficiently in low-power scenarios, making it suitable for battery-powered IoT devices. It includes various

power-saving modes and features such as deep sleep mode, which allows the device to consume minimal power when idle.

Development Environment: Espressif provides comprehensive development tools and resources for programming the ESP32, including the ESP-IDF (Espressif IoT Development Framework) for low-level programming and the Arduino IDE with ESP32 board support for easier development using the Arduino ecosystem.

Community Support: The ESP32 has a large and active community of developers and enthusiasts who contribute libraries, examples, and tutorials, making it easier for newcomers to get started and for experienced developers to find solutions to their problems.

Overall, the ESP32 is a versatile and capable microcontroller platform that has become a popular choice for IoT projects due to its combination of features, performance, and affordability.

3.5.1 Technical Specification

- Microcontroller: Tensilica 32-bit Single-/Dual-core CPU Xtensa LX6
- Operating Voltage: 3.3V
- Input Voltage: 7V to 12V DC
- Digital I/O Pins (DIO): 25
- Analog Input Pins (ADC): 6
- Analog Outputs Pins (DAC): 2
- UARTs: 3
- SPIs: 2
- I2Cs: 3
- Flash Memory: 4 MB
- SRAM: 520 KB
- Clock Speed: 240 Mhz
- Wi-Fi: IEEE 802.11 b/g/n/e/i

Figure - 3.3: ESP-32

3.6 Buck Module

The LM2596 series of regulators are monolithic integrated circuits that provide all the active functions for a step-down (buck) switching regulator, capable of driving a 3-A load with excellent line and load regulation.

Figure -3.4: LM2596 Voltage Converter

These devices are available in fixed output voltages of 3.3 V, 5 V, 12 V, and an adjustable output version. Requiring a minimum number of external components, these regulators are simple to use and include internal frequency compensation, and a fixed frequency oscillator. The LM2596 series operates at a switching frequency of 150 kHz, thus allowing smaller sized filter components than what would be required with lower frequency switching regulators. Available in a standard 7-pin TO-220 package with several different lead bend options, and a 7-pin TO-263 surface mount package.

3.7 Power Supply

A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently.

Like other power supplies, an SMPS transfers power from a DC or AC source (often mains power, see AC adapter) to DC loads, such as a personal computer, while converting voltage and current characteristics. Unlike a linear power supply, the pass transistor of a switching-mode supply continually switches between low-dissipation, full-on and full-off states, and spends very little time in the high dissipation transitions, which minimizes wasted energy. A hypothetical ideal switched-mode power supply dissipates no power. Voltage regulation is achieved by varying the ratio of on-to-off time (also known as duty cycles). In contrast, a linear power supply regulates the output voltage by continually dissipating power in the pass transistor. The switched-mode power supply's higher electrical efficiency is an important advantage.

Switched-mode power supplies can also be substantially smaller and lighter than a linear supply because the transformer can be much smaller. This is because it operates at a high switching frequency which ranges from several hundred kHz to several MHz in contrast to the 50 or 60 Hz mains frequency. Despite the reduced transformer size, the power supply topology and the requirement for electromagnetic interference (EMI) suppression in commercial designs result in a usually much greater component count and corresponding circuit complexity.

Switching regulators are used as replacements for linear regulators when higher efficiency, smaller size or lighter weight is required. They are, however, more complicated; switching currents can cause electrical noise problems if not carefully

suppressed, and simple designs may have a poor power factor.

Figure - 3.5: Switched Mode Power

3.7.1 Technical Specifications

- Input Voltage: AC 85-265V
- Output Voltage: DC 12V
- Current: 10A
- Size:128mm*98mm*40mm
- Shell Material: Metal case / Aluminum base
- Protection: Shortage Protection, Overload Protection, Over Voltage Protection
- Widely used in Industrial automation, LED display, communications, etc.
- Safety Compliance: CCC/ FCC / CE
- Working Temperature: 0~40℃
- Storage Temperature: -20~60℃
- Ambient Humidity: 0~95% Non-Condensation

3.8 LCD Display

A Liquid crystal display (LCD) is a flat display that uses the light modulating properties of liquid display. They are common in consumer devices such as video players, gaming devices, clocks, telephones, computers, calculators etc.

A (20×4) LCD panel consists of 20 columns and 4 rows.It can show upto 16 characters in 2 lines.

You may want to have a look on these similar products:

1. LCD Display (20×4) with Header soldered
2. LCD display module (20×4)
3. LCD display module advanced (20×4)
4. 3 wire LCD module (20×4)
5. I2C LCD Display (20×4)
6. Arduino LCD keypad shield
7. LCD Display (20×4)

Pin	Function
VSS	connected to ground
VDD	connected to a +5V power supply
VO	to adjust the contrast
RS	A register select pin that controls where in the LCD's memory you are writing data to. You can select either the data register, which holds what goes on the screen, or an instruction register, which is where the LCD's controller looks for instructions on what to do next.
R/W	A Read/Write pin to select between reading and writing mode
E	An enabling pin that reads the information when High level (1) is received. The instructions are run when the signal changes from High level to Low level.
D0-D7	to read and write data
A	Pins that control the LCD backlight. Connect A to 3.3v.
K	Pins that control the LCD backlight. Connect K to GND.

Table 05: LCD Display Outline

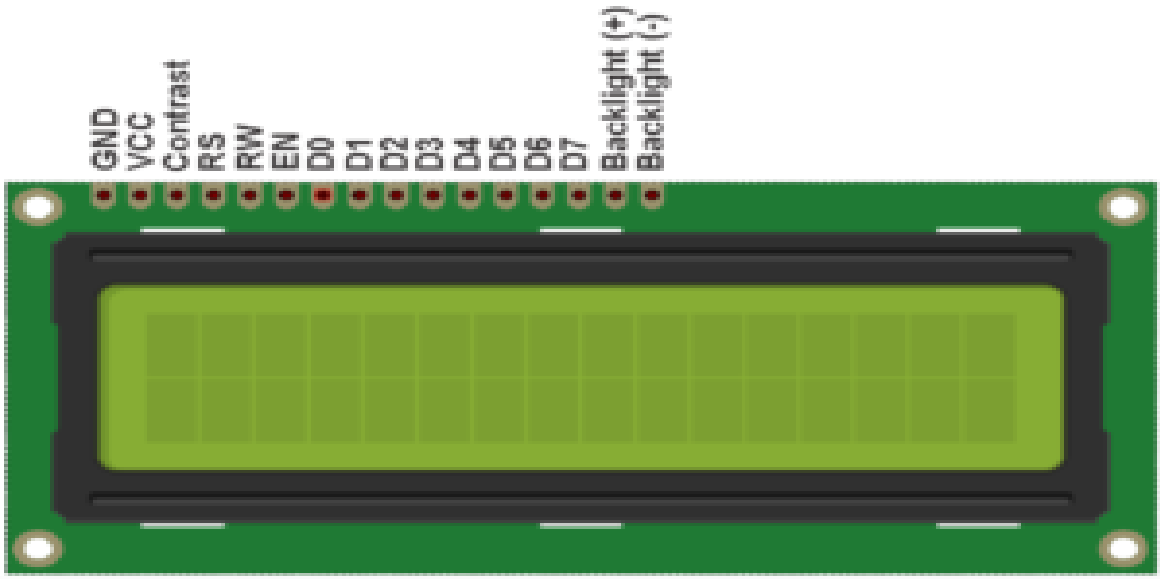

Figure -3.6: LCD Display

3.9 Servo Motor

There are lots of servo motors available in the market and each one has its own speciality and applications. The following two paragraphs will help you identify the right type of servo motor for your project/system.

Most of the hobby Servo motors operates from 4.8V to 6.5V, the higher the voltage higher the torque we can achieve, but most commonly they are operated at +5V. Almost all hobby servo motors can rotate only from 0° to 180° due to their gear arrangement so make sure you project can live with the half circle if no, you can prefer for a 0° to 360° motor or modify the motor to make a full circle. The gears in the motors are easily subjected to wear and tear, so if your application requires stronger and long running motors you can go with metal gears or just stick with normal plastic gear.

Next comes the most important parameter, which is the **torque** at which the motor operates. Again there are many choices here but the commonly available one is the

2.5kg/cm torque which comes with the Towerpro SG90 Motor. This 2.5kg/cm torque means that the motor can pull a weight of 2.5kg when it is suspended at a distance of 1cm. So if you suspend the load at 0.5cm then the motor can pull a load of 5kg similarly if you suspend the load at 2cm then can pull only 1.25. Based on the load which you use in the project you can select the motor with proper torque. The below picture will illustrate the same.

Figure -3.7: SG-90 Servo Motor

3.9.1 Technical Specifications

- Operating Voltage is +5V typically
- Torque: 2.5kg/cm
- Operating speed is 0.1s/60°
- Gear Type: Plastic
- Rotation : 0°-180°
- Weight of motor : 9gm
- Package includes gear horns and screws

3.10 Arduino UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip

ATmega328P microcontroller and developed by Arduino.cc.The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.The board has Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable.It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.
It is also similar to the Arduino Nano and Leonardo.The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

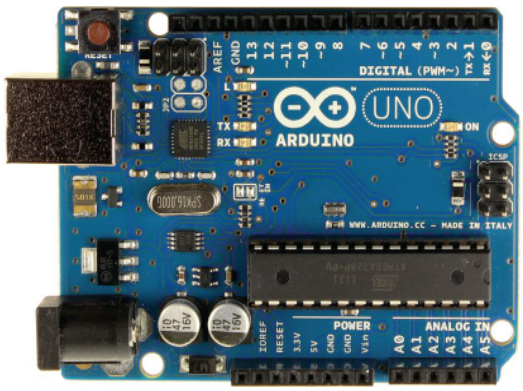

Figure - 3.3: Arduino uno

3.10.1 Technical Specifications

- Microcontroller: Microchip ATmega328P
- Operating Voltage: 5 Volts
- Input Voltage: 7 to 20 Volts
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 20 mA

- DC Current for 3.3V Pin: 50 mA
- Flash Memory: 32 KB of which 0.5 KB used by bootloader
- SRAM: 2 KB
- EEPROM: 1 KB
- Clock Speed: 16 MHz
- Length: 68.6 mm
- Width: 53.4 mm
- Weight: 25 g

Chapter 4
Results & Discussion

4.1 Introduction

RFID is an acronym for “radio-frequency identification” RFID technology is an automatic wireless identification system that works by the help of two components: a card and a reader. Using the RFID technology, the conventional system of taking attendance can be completely transformed to be more in line with strides in digitalization. This system will help the authorities manage the attendance system in a more methodical, efficient and time saving manner. The proposed system has been implemented through a prototype that has proved the effectiveness of the concept in easing the logistics of taking attendance as a result of the automation due to the use of the RFID technology. The design of the system is simple, cost effective and agile making it a good candidate for commercial and academic purposes.

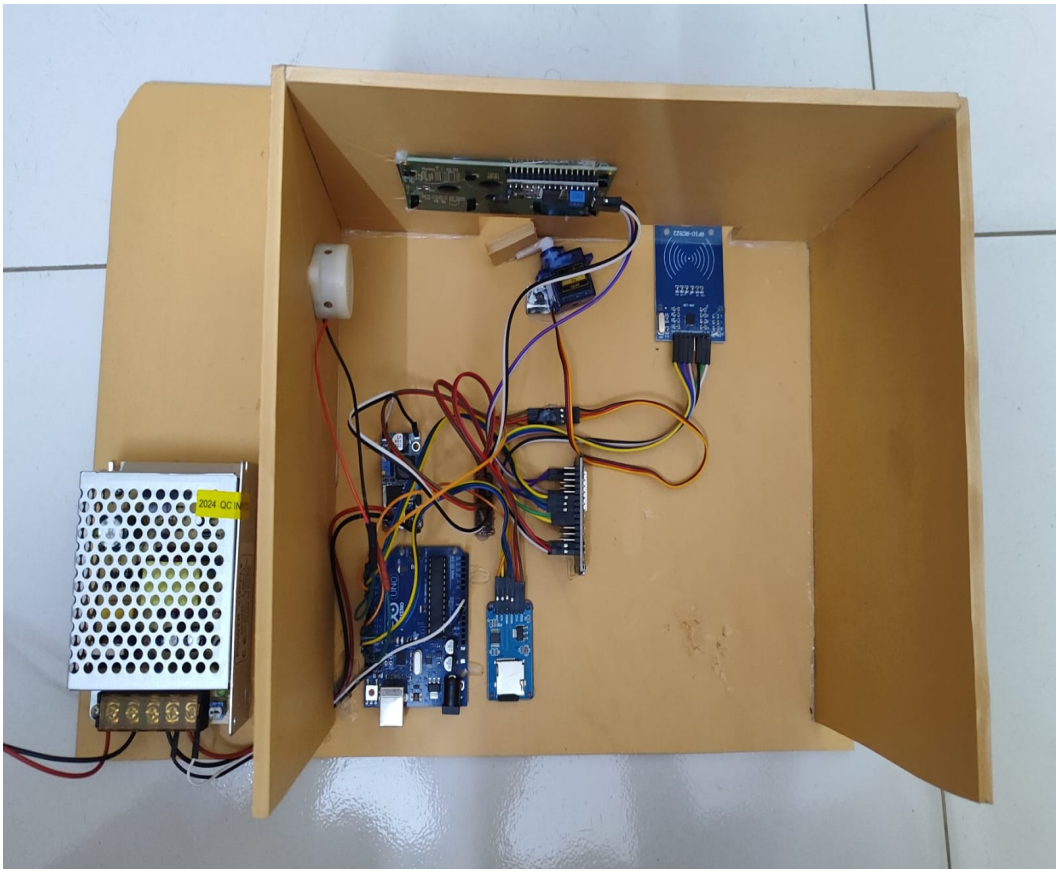

Figure -4.1: Project Picture

4.2 Result

An RFID-based online attendance system project typically aims to automate the process of attendance marking using Radio Frequency Identification (RFID) technology. Here are the key results and outcomes you would expect from such a project:

1. Efficient and Accurate Attendance Marking:

Reduction in manual errors: The system eliminates the need for manual recording, ensuring more accurate and reliable attendance data.

Speed: RFID systems can quickly detect and record the attendance of a large number

of people, improving efficiency, especially in schools, colleges, or large organizations.
Real-time recording: Attendance is marked in real-time, reducing the chances of backdating or manipulation of attendance records.

Figure -4.2: LCD Display System

2. Automation and Time-Saving:

Elimination of traditional methods like roll-calling or sign-in sheets, leading to faster processing and fewer interruptions during classes or meetings.

Less administrative overhead for staff, as the system automatically logs attendance data into a centralized database, saving time.

3. Centralized Data Management:

Online access to attendance records: Attendance data is stored in a central database that can be accessed through a web portal, enabling teachers, managers, or administrators to track attendance remotely.

Real-time updates: The system can provide live updates to supervisors, notifying them of absentees or latecomers instantly.

4. Integration with Other Systems:

The system can be integrated with student or employee management systems to

automate actions based on attendance records, such as:

Sending automated alerts to parents, employees, or supervisors for absenteeism.

Generating automated reports for monthly or yearly attendance summaries.

Facilitating payroll management by linking attendance with salary deductions (in case of employee attendance).

Figure : LCD Display Card Punch Time.

5. Security Features:

Minimization of proxy attendance: Since RFID tags are unique to each individual, the system reduces the chances of students/employees marking attendance on behalf of others (common in traditional systems).

Access control: The system can be integrated with doors or gates to allow only authenticated individuals to enter, improving security.

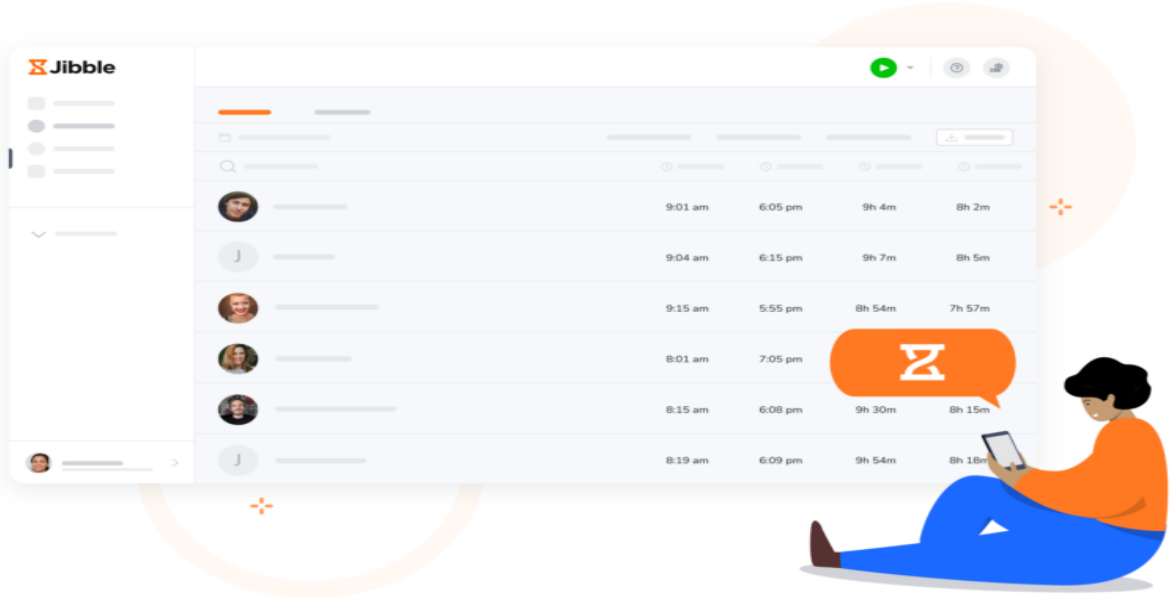

Figure -4.3: Online Monitoring System

Result Data Table

Date	Time	Student Name	Id Number	In / Out
30/01/25	15:08	Taslima Akter	1042	1
30/01/25	15:10	Taslima Akter	1042	0
30/01/25	15:16	Md.Ali Akber	1055	1
30/01/25	15:20	Md.Ali Akber	1055	0
30/01/25	15:25	Md.Ruhul Amin	1051	1
30/01/25	15:28	Md.Ruhul Amin	1051	0

6. User-Friendly Interface:

The online system typically features a web-based interface for administrators to manage attendance, monitor reports, and make adjustments.

Mobile integration: Some systems may offer mobile apps for users to track their attendance or for administrators to monitor attendance on the go.

7. Scalability:

The system can be scaled to handle the attendance of hundreds or thousands of students or employees, making it ideal for schools, universities, or large corporate offices.

8. Reports and Analytics:

The system can generate comprehensive reports, such as:

Daily, weekly, or monthly attendance reports.

Trend analysis to identify patterns, such as repeated tardiness or absenteeism.

Exportable data in formats like Excel, PDF, or CSV for further analysis.

9. RFID Card or Tag Features:

Each individual (student/employee) carries an RFID card or tag, which is unique and linked to their profile in the system. When they pass through an RFID reader, the system automatically logs their attendance.

These cards can also serve multiple purposes, such as library access, payments, or identity verification in institutions.

In our project we will punch the card of the RFID module with the door itself. Name and ID can be seen from the LCD display and Automatic doors will open to enter. Internet connection is kept with the system from which all data including time can be monitored through Internet.

Chapter 5
Conclusion

5.1 Discussion

From the test results can be concluded that the presence by using RFID faster than the traditional way and the implementation of the Internet system of things and data storage cloud enables the system to run in real time with accurate data.

5.2 Advantage

An RFID-based online attendance system offers numerous advantages over traditional attendance methods such as manual sign-in sheets or roll calls. These advantages range from improving efficiency and accuracy to enhancing security and ease of data management. Here are some key benefits:

1. Speed and Efficiency:

Instant Attendance Logging: RFID readers can quickly and automatically log attendance when an individual passes near the reader, reducing the time taken for manual attendance.

Faster Process: Large groups can have their attendance recorded simultaneously without queuing, which is especially beneficial in large institutions or organizations.

2. Accuracy and Elimination of Errors:

No Human Error: Manual attendance systems are prone to errors, such as misreading names or misplacing records. RFID-based systems minimize these risks by automating the entire process.

Precise Data Collection: Attendance is recorded with exact timestamps, ensuring accurate records of when individuals arrived or left.

3. Reduction in Proxy Attendance (Buddy Punching):

Unique Identification: RFID tags are uniquely assigned to individuals, making it nearly

impossible for someone to fake or manipulate attendance on behalf of someone else. This is especially useful in educational institutions where students might ask friends to mark them present or in workplaces where employees might punch in for each other.

4. Real-Time Attendance Monitoring:

Live Updates: Attendance data can be uploaded to a central system in real time, allowing administrators to monitor attendance remotely. This is helpful for large organizations with multiple locations.

Instant Alerts: Systems can be programmed to send automatic notifications (SMS or email) to management, teachers, or parents regarding attendance issues (e.g., absentees or latecomers).

5. Easy Data Management:

Automated Record Keeping: All attendance data is stored digitally, removing the need for paper records. This allows for easy storage, retrieval, and analysis of data.

Searchable Database: Attendance data can be searched and filtered based on dates, names, departments, or other criteria, making it easy to generate reports or track patterns.

6. Scalability:

Handling Large Numbers: RFID-based systems can easily scale to handle attendance for hundreds or thousands of people, making them ideal for large universities, companies, or events.

Multiple Locations: For businesses or institutions with multiple campuses or branches, the system can track attendance across locations and consolidate data in one central platform.

7. Enhanced Security:

Secure Access Control: In addition to tracking attendance, RFID tags can be integrated with doors or access control systems, ensuring that only authorized personnel can enter specific areas.

Protection of Attendance Records: Since data is digitized and stored in a secured database, it is less susceptible to tampering or unauthorized access compared to paper-based systems.

8. Cost-Effectiveness in the Long Run:

While the initial setup cost for an RFID system may be higher than traditional methods, the long-term savings from reduced administrative work, automated data handling, and fewer errors often outweigh the upfront cost.

Fewer Paper and Supplies: The system minimizes or eliminates the need for paper-based attendance sheets, reducing costs related to supplies and storage.

9. Automated Reports and Analytics:

Customizable Reports: The system can generate various types of reports, such as daily, weekly, or monthly attendance summaries, making it easier for teachers, managers, or HR to track and evaluate attendance trends.

Pattern Recognition: The system can help identify trends in attendance, such as frequent tardiness or absenteeism, allowing for proactive measures.

10. Integration with Other Systems:

Linking with Payroll Systems: In workplaces, attendance data can be linked to payroll systems, ensuring employees are compensated correctly based on their attendance records.

Integration with Educational Tools: In schools and universities, the system can be integrated with other software for tracking student performance, grades, or behavior, providing a more comprehensive student management system.

11. User Convenience:

Simple to Use: Individuals need only carry their RFID card or tag, which they simply pass near a reader, reducing the need for more complicated processes like fingerprint scanning or manual sign-in.

Mobile Integration: Some systems allow users to monitor their attendance via mobile apps or web interfaces, giving them the ability to track their own attendance records and reports.

12. Environmentally Friendly:

Paperless System: Since attendance is recorded digitally, this reduces the use of paper and other physical materials, making the system more environmentally friendly.

5.3 Application

An RFID-based online attendance system can be applied in a variety of sectors to streamline and automate the attendance-tracking process. Here are some key applications:

1. Educational Institutions (Schools, Colleges, and Universities):

Student Attendance: Automating student attendance in classrooms, lecture halls, or examination centers to avoid manual roll-calls.

Library Check-ins: Monitoring the presence of students in libraries or study areas using RFID cards.

Parental Alerts: Automatically sending notifications to parents if a student is absent or tardy.

Examination Monitoring: Tracking student attendance during exams and preventing unauthorized access.

2. Corporate and Workplaces:

Employee Attendance: Automating employee attendance in offices, factories, or remote workplaces. This can be linked with HR systems for payroll processing.

Remote Attendance: For companies with multiple locations or employees working remotely, RFID systems can record attendance across various branches.

Shift Management: Tracking employees' arrival and departure times, especially in shift-based jobs, to ensure adherence to schedules.

3. Government Offices and Public Institutions:

Civil Servant Monitoring: Government agencies can use RFID to monitor employee attendance, ensuring compliance with working hours and reducing absenteeism.

Public Libraries and Community Centers: Tracking attendance of visitors and staff members, ensuring accurate data collection for usage metrics.

4. Healthcare Institutions (Hospitals and Clinics):

Staff Attendance: Monitoring the attendance of healthcare professionals like doctors, nurses, and administrative staff.

Patient Check-ins: Tracking patient visits or staying durations within hospitals for better management of medical care and services.

Access Control: Ensuring that only authorized medical personnel have access to restricted areas such as operation theaters or ICUs.

5. Event Management (Conferences, Seminars, and Trade Shows):

Visitor Check-in: Automating the check-in process at conferences, seminars, or trade shows, ensuring smooth crowd control and eliminating long queues.

VIP and Staff Management: Ensuring VIPs and staff can access certain restricted areas without delay, as RFID tags can be used for both attendance and access control.

Attendance Analytics: Collecting data on visitor attendance patterns, such as how long they stay or which sessions they attend, for post-event analysis.

6. Transportation and Logistics:

Driver Attendance: Monitoring the attendance of drivers in logistics companies and ensuring they comply with scheduled departure and arrival times.

Access Control for Secure Areas: Implementing RFID systems to ensure that only

authorized personnel can access high-security areas such as maintenance facilities, airport terminals, or ports.

7. Construction Sites:

Worker Attendance: Tracking daily attendance of laborers and employees on construction sites, especially when dealing with large teams and outdoor locations.

Safety Management: Ensuring that workers who enter specific hazardous areas are authorized and trained, using RFID to restrict access where needed.

8. Hotels and Hospitality Industry:

Staff Attendance: Monitoring staff attendance, including cleaning staff, front desk personnel, and other hotel employees.

Conference Rooms and Facilities: Managing attendance for guests attending events, meetings, or banquets within the hotel.

Guest Tracking: Monitoring the check-in and check-out of guests at various facilities within the hotel (like spas, gyms, etc.) using RFID wristbands or cards.

9. Retail and Shopping Malls:

Staff Monitoring: Monitoring the attendance of employees, including salespeople, cashiers, and inventory staff in retail outlets.

Access Control for Restricted Areas: Ensuring that only authorized personnel can access areas such as stockrooms or management offices.

Customer Tracking (Optional): Using RFID cards for customer loyalty programs where customer movements and time spent in specific sections of the store can be tracked.

10. Sports and Fitness Centers:

Member Attendance: Automating the check-in and check-out of gym members, ensuring that their visits are recorded.

Class Scheduling: Tracking attendance in fitness classes, personal training sessions, and other programs to ensure accurate scheduling and resource allocation.

Facility Access: Limiting access to certain areas of the gym (e.g., pool, sauna) based on the member's subscription package.

11. Attendance in Prisons and Rehabilitation Centers:

Inmate Attendance: Monitoring inmate movements, including attendance at scheduled events such as meals, workshops, or exercise periods, and ensuring they are present at mandatory check-ins.

Staff Attendance: Tracking the presence of prison guards and administrative staff for better management and security.

5.4 Future Scope

The future scope of an RFID-based online attendance system is promising, with various technological advancements and integration possibilities that can further enhance its effectiveness, scalability, and functionality. Here are several key areas where such systems can evolve and expand in the future:

1. Integration with IoT (Internet of Things):

Smart Campus/Smart Office: RFID systems can be integrated with IoT devices to create smart environments in schools, universities, and corporate offices. For instance, attendance data can trigger automatic adjustments in the environment (e.g., lighting, air conditioning) based on occupancy.

Wearables: RFID tags embedded in wearables like smartwatches or bracelets could be used for seamless attendance tracking without the need for cards, offering more convenience for users.

2. AI and Data Analytics Integration:

Predictive Analytics: Using AI to analyze attendance data patterns, institutions can predict absenteeism trends and take proactive measures. For example, in schools, AI could help identify students who may be at risk of dropping out based on irregular attendance patterns.

Automated Scheduling: AI could use attendance data to automatically optimize schedules, ensuring efficient use of resources and better time management.

Attendance Behavior Analysis: Advanced data analytics could help identify productivity issues by analyzing employees' attendance trends and break durations, enabling organizations to improve workforce management.

3. Cloud-Based and Mobile Applications:

Mobile Integration: More advanced mobile apps can be developed to track attendance, provide real-time updates, and allow for easy reporting from anywhere. These mobile apps could integrate with GPS to track remote or off-site employees.

Cloud Storage and Management: Cloud-based RFID systems will make attendance data accessible globally, allowing real-time monitoring and reporting from multiple locations. Cloud solutions offer scalability, improved security, and remote access, making it ideal for large organizations with multiple branches.

4. Biometric and RFID Hybrid Systems:

Multi-Factor Authentication: Future systems could integrate RFID with biometrics

(e.g., fingerprint or facial recognition) to increase security and accuracy. This would further reduce the risk of fraud, such as proxy attendance (where someone else uses the RFID card).

Smart Access Control: Combining RFID and biometric systems could create more secure and intelligent access control solutions, ensuring that only authorized personnel enter sensitive areas based on both physical presence (RFID) and biometric identity.

5. Blockchain for Secure and Immutable Records:

Decentralized Attendance Systems: By using blockchain technology, attendance data could be stored on a decentralized ledger, ensuring that the records are tamper-proof and immutable. This would be especially useful for high-stakes environments like exams or legal compliance in workplaces.

Increased Data Privacy: Blockchain can also ensure that attendance records are securely shared between institutions while maintaining user privacy, making it ideal for global organizations.

6. Remote and Flexible Work Management:

RFID for Remote Work: As remote work becomes more prevalent, RFID systems can be expanded to track attendance virtually. For example, RFID tags could be linked with a home office setup, tracking employees' login and logout times from remote workstations.

Flexible Working Hours: Organizations could use RFID data to support flexible working models, allowing employees to clock in and out at multiple locations or remotely, while still ensuring productivity.

5.5 Conclusion

The successful design and implementation of an automated attendance system based on RFID technology has been successfully presented through the means of this paper. The system developed provides an accurate, simple and cost effective means to register the attendance in educational institutions and effectively shifts the paradigm towards a digital and contactless environment. Moreover, owing to the compactness and the portability of the system, it makes it all the more conducive to be deployed as and when required.

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Appendix:

Program:

```
#include <SPI.h>
#include <MFRC522.h>
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include "Ubidots.h"
#include <Servo.h>
Servo myservo;  // create servo object to control a servo
const char* UBIDOTS_TOKEN = "BBUS-aqqeUs3zpQTp5qjonwAGr6yzWxJ1wS";  // Put here your Ubidots TOKEN
const char* WIFI_SSID = "student";                    // Put here your Wi-Fi SSID
const char* WIFI_PASS = "iotstudent";                   // Put here your Wi-Fi password

Ubidots ubidots(UBIDOTS_TOKEN, UBI_HTTP);
LiquidCrystal_I2C lcd(0x27, 16, 2);
#define SS_PIN D3
#define RST_PIN D0
#define ACCESS_DELAY 2000
#define DENIED_DELAY 1000
MFRC522 mfrc522(SS_PIN, RST_PIN);  // Create MFRC522 instance.
int flag, flag1, flag2, flag3;
int Exit = D8;
int exitdata;
void setup() {
  Serial.begin(9600);  // Initiate a serial communication
  // pinMode(user1, OUTPUT);
  // pinMode(user2, OUTPUT);
  pinMode(Exit, INPUT);
```

```
  // myservo.setPeriodHertz(50);           // standard 50 hz servo
  myservo.attach(D4);  // attaches the servo on pin 18 to the servo object
  myservo.write(0);
  SPI.begin();        // Initiate  SPI bus
  mfrc522.PCD_Init();  // Initiate MFRC522
  lcd.init();
  lcd.backlight();
  ubidots.wifiConnect(WIFI_SSID, WIFI_PASS);
}
void loop() {
  delay(1000);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("Place ID Card");
  exitdata = digitalRead(Exit);
  if (exitdata == 1) {
    myservo.write(180);
    delay(3000);
    myservo.write(0);
  }
  if (!mfrc522.PICC_IsNewCardPresent()) {
    return;
  }
  // Select one of the cards
  else if (!mfrc522.PICC_ReadCardSerial()) {
    return;
  }
  //Show UID on serial monitor
  //Serial.print("UID tag :");
  String content = "";
  byte letter;
  for (byte i = 0; i < mfrc522.uid.size; i++) {
    //Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
    //Serial.print(mfrc522.uid.uidByte[i], HEX);
```

```
    content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " "));
  }
  //Serial.println();
  //Serial.print("Message : ");
  content.toUpperCase();

  if (content.substring(1) == "83 B2 3F FC")  // && flag == 0)  //change here the UID of
the card/cards that you want to give access
  {
    // digitalWrite(user1, HIGH);
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Jaman Rizvi");
    lcd.setCursor(0, 1);
    lcd.print("ID:31007");
    // iot data send
    ubidots.addContext("Sarowar Jaman Rizvi");
    char* context = (char*)malloc(sizeof(char) * 60);
    /* Builds the context with the array above to send to Ubidots */
    ubidots.getContext(context);
    int Student_id = 31007;
    ubidots.add("Student_name", Student_id, context);  // Change for your variable
name
    if (bufferSent) {
      // Do something if values were sent properly
      Serial.println("Values sent by the device");
    }
    myservo.write(180);
    delay(3000);
    // digitalWrite(user1, LOW);
    myservo.write(0);
    flag = 1;
    flag1 = 1;
  }
  if (content.substring(1) == "53 CE 6D FC")  // && flag1 == 0)  //change here the UID
```

```
of the card/cards that you want to give access
  {
    // digitalWrite(user2, HIGH);
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Abu Sama Sordar");
    lcd.setCursor(0, 1);
    lcd.print("ID:31008");
    // iot data send
    ubidots.addContext("Abu Sama Sordar");
    char* context = (char*)malloc(sizeof(char) * 60);
    /* Builds the context with the array above to send to Ubidots */
    ubidots.getContext(context);
    int Student_id = 31008;
    ubidots.add("Student_name", Student_id, context);  // Change for your variable
name
    if (bufferSent) {
      // Do something if values were sent properly
      Serial.println("Values sent by the device");
    }
    myservo.write(180);
    delay(3000);
    // digitalWrite(user2, LOW);
    myservo.write(0);
    flag = 1;
    flag1 = 1;
  }
  flag = 0;
}
```