

# RFID Based Smart Attendance System

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# 1 Document Version History

S.No	Version	Notes
1	1.0	First Version
2	1.1	Updated Project Description
3	1.2	Contact Information Added
4	1.3	LCD Pin Details Added

Table 1: Document Version History

# 2 Project Description

Objective of the project is to design a Smart Attendance System based on RFID technology. There are numerous applications for such a system including fast and secure attendance in schools, colleges, offices and institutions. Such a system can also be used for tagging goods, commodities and livestock. One recently popular application of RFID technology is FASTags being deployed nationwide in India for fast and automated payments at toll plazas.

Scope and focus of this project is to design and implement a Smart Attendance System based on RFID technology for real time monitoring and attendance of teachers at a local school.

# 3 Bill of Materials

Below is a list of components, materials and tools required for the project

1. Arduino Uno Rev3 Board
2. RFID Reader/Writer RC522 Module and RFID tags
3. SD Card Reading/Writing Module for Arduino
4. RTC Module DS3231 and 3V Coin Cell
5. LCD Display 16x2 Module

6. Power Supply using AC-to-DC Adapter with output voltage in the range 7-12V .
7. Breadboard, Buzzer, RGB LED, Resistors - 1x 1.5kOhm, Connecting Wires - male-to-male, male-to-female

## **4 Module Level Functionality**

### **4.1 Arduino Uno Rev3 Board**

This is the main board containing the microcontroller responsible for system level logic and control flow and interfacing with all the other modules like RFID, RTC and SD card modules

### **4.2 RFID Reader/Writer Module**

This module is responsible for handling all the RFID communications - sensing and detecting the correct RFID tag in its vicinity and reporting the tag identification number to Arduino. Also, used for writing and reading user information like user name to/from the RFID tag.

### **4.3 SD Card Reading Writing Module**

Arduino Uno board has limited EEPROM memory (1KB) and this is insufficient for storing all the attendance data. Therefore, a SD Card is required for data storage. SD Card module provides a nice interface for Arduino Uno to read/write data from/to a SD Card. Another benefit of an SD Card is that data can be easily viewed and archived later on a computer or laptop.

### **4.4 RTC Module**

RTC Module provides a real time clock for logging time information. This is required since there is no RTC clock available on Arduino Uno and time information is very important for an attendance system

## 4.5 LCD Display Module

LCD Display module provides useful information and feedback to the user. Table 2 provides information on LCD pins.

LCD Pin	Functionality/Connection
1 (VSS)	Connect to Ground
2 (VCC)	Connect to Power
3 (VEE)	Contrast Adjustment Pin (Connect to Potentiometer)
4 (RS)	Register Select Pin (Connect to Microcontroller)
5 (R/W)	Read/Write Modes (Connect to Ground for write mode)
6 (E)	Enable Pin (Connect to Microcontroller)
7-10 (DB0-DB3)	Data Pins (No connect for 4 bit mode)
11-14 (DB4-DB7)	Data Pins (Connect to Microcontroller)
15 (LED+)	Connect to 5V through a resistor ( 560ohms)
16 (LED-)	Connect to Ground

Table 2: LCD Module Pin Details

## 4.6 Buzzers and LEDs

These components are added for a better user interface and feedback. Buzzer produces a short beep on successfull reading of the RFID tag. Single RGB LED is used - Green colour is displayed when the system is powered-on and working normally. Red Colour is displayed in case of any system failure like SD card not working, unsuccessful initialisation of modules, etc.

## 5 High Level System Interface Diagram

Figure 1 shows a high level system interface diagram.

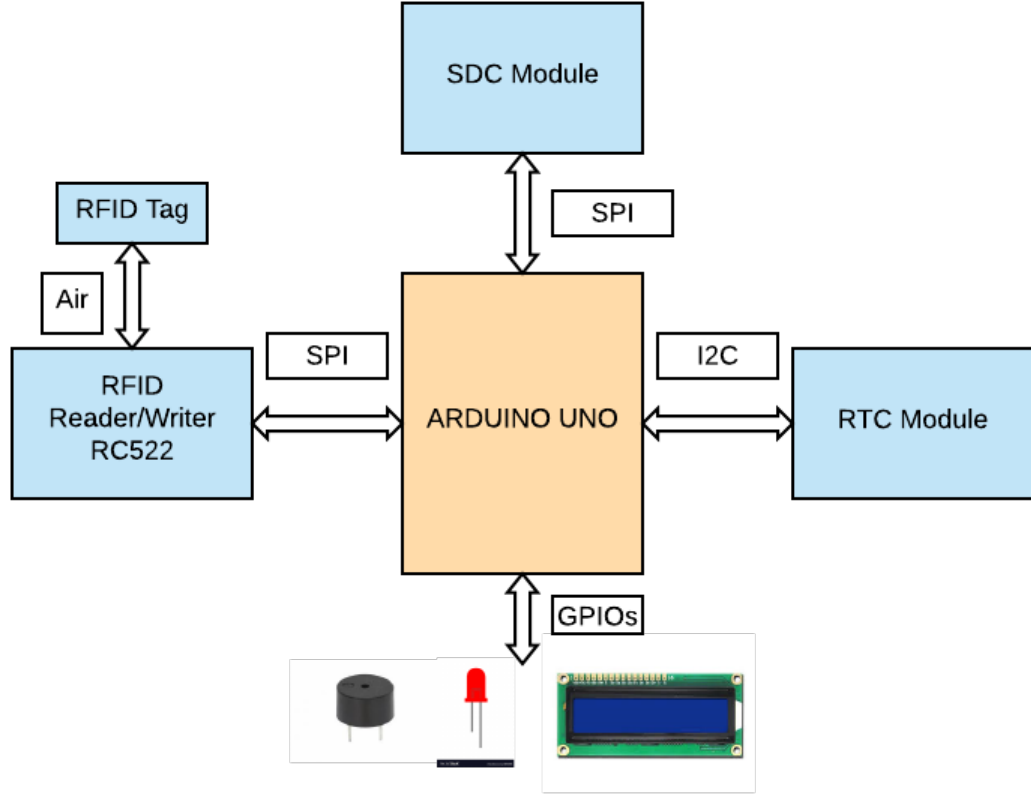


Figure 1: High Level System Interface Diagram

## 6 Pin Connectivity

Table 3 documents the pin connectivity of Arduino with different peripherals. RTC refers to Real Time Module, SDC refers to SD Card Module, RFID refers to RF Reader/Writer Module and LCD refers to LCD module in the table.

## 7 Project Demo and Snapshots

Figure 2 shows a snapshot of the working prototype.

S.No	Arduino	RTC	SDC	RFID	LCD
1	A4	SDA			
2	A5	SCL			
3	10		CS		
4	11		MOSI	MOSI	
5	12		MISO	MISO	
6	13		SCK	SCK	
7	8			SDA	
8	9			RST	
9	2				RS
10	3				Enable
11	4				D4
12	5				D5
13	6				D6
14	7				D7

Table 3: Pin Connectivity of Arduino with different peripherals

## 8 Important Notes and Learnings

Important notes and learnings from the project are captured in this section.

1. Initially SD Card Module was not getting initialized properly. Possible reason is a high capacity 16GB micro sd card being used earlier. Later, a 1GB micro sd card was used and this problem was not seen. It could be that the current requirements for a 16GB sd card are higher than a 1GB card and so Arduino was not able to provide higher currents. It could also be that the voltage on the 5V pin dropped when a high current was drawn, say during sd card read/write cycles.
2. Initially RFID module was not working properly but was resolved by improving the solder connections to the pin connector which connects RFID module with Arduino.
3. A known bug in the present implementation is that if the micro-sd card is removed once the system is up and running, it goes undetected and subsequent RFID card tagging is displayed as successfull even though information is not logged onto the sd card. Ideally, SD.open() function

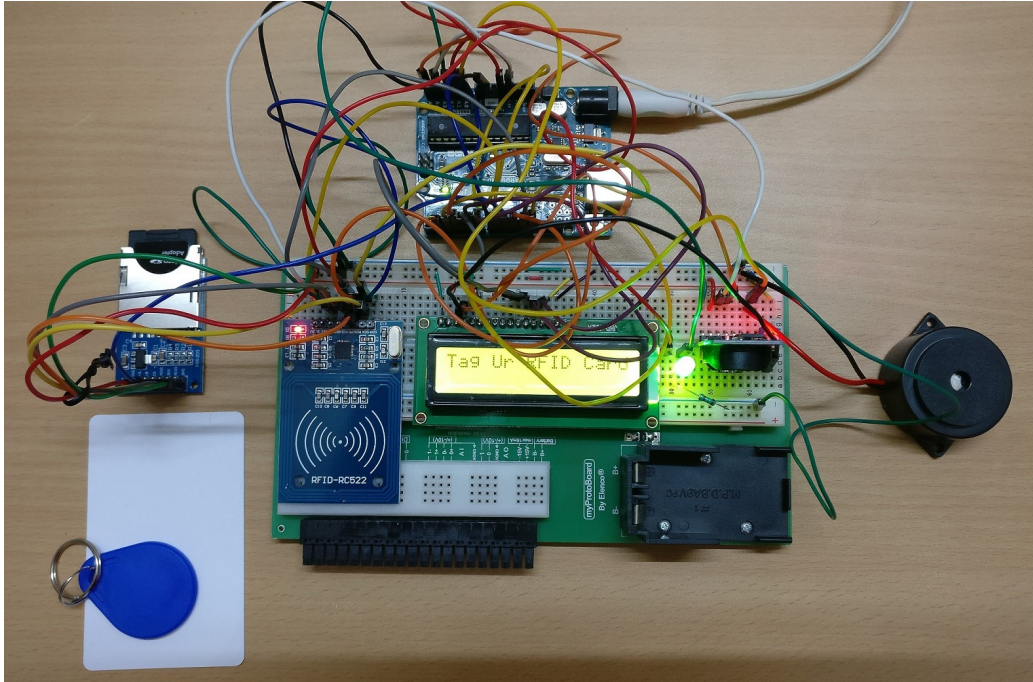


Figure 2: Snapshot of the working prototype

from Arduino's SD Card library should return a false value but instead a true value is being returned. This could be a possible bug in the SD card library.

## 9 Contact Information

If you have any questions or need help in building this project, please feel free to reach out by sending me an email at [vasu.gupta9@gmail.com](mailto:vasu.gupta9@gmail.com)