# RFID BASED DOOR SECURITY SYSTEM

**BACHELOR OF TECHNOLOGY**

**IN**

**INFORMATION AND COMMUNICATION TECHNOLOGY**

**SEMESTER 4 2ICT405: APPLICATION DEVELOPMENT**


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**INSTITUTE OF COMPUTER TECHNOLOGY GANPAT UNIVERSITY**

# CERTIFICATE

TO WHOM SO EVER IT MAY CONCERN THIS IS TO CERTIFY THAT **AKASH PARMAR, PARTH RAVALIYA** OF **B.TECH SEMESTER IV** (INFORMATION AND COMMUNICATION TECHNOLOGY) HAS COMPLETED HIS ONE FULL SEMESTER ON PROJECT WORK TITLED **"RFID BASED DOOR SECURITY SYSTEM"** SATISFACTORILY IN PARTIAL FULLFILMENT OF REQUIRMENT OF BACHELOR OF TECHNOLOGY DEGREE OF INSTITUTE OF COMPUTER TECHNOLOGY , GANPAT UNIVERSITY, KHERVA IN THE YEAR 2023.

BHUMIT PATEL (2ICT405)

SUBJECT CO-ORDINATOR

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INSTITUTE OF COMPUTER TECHNOLOGY

# ABSTRACT

Access control is the process of verifying a user's claimed identity and giving or denying the access. The proposed project is a secure access control system to control the entry of various items through a door or a passage using RFID technology. At the very simplest level, Radio Frequency Identification (RFID) technologies allow the transmission of a unique serial number wirelessly, using radio waves. The two key parts of the system that are needed to do this are the RFID 'tag' and the 'reader'; attaching an RFID tag to a physical object allows the object to be 'seen' and monitored by existing computer networks. The main applications of RFID technology includes, automated libraries, vehicle toll collection, asset location and tracking etc., which are currently too high to justify widespread deployment across supply chains due to concems over the potential for infringing the privacy of consumers who purchase RFID+agged products. The cost criteria associated with implementation of the RFID system is expected to be overcome by near future itself. The flexibility of our proposed access control system makes itself suitable for various applications.

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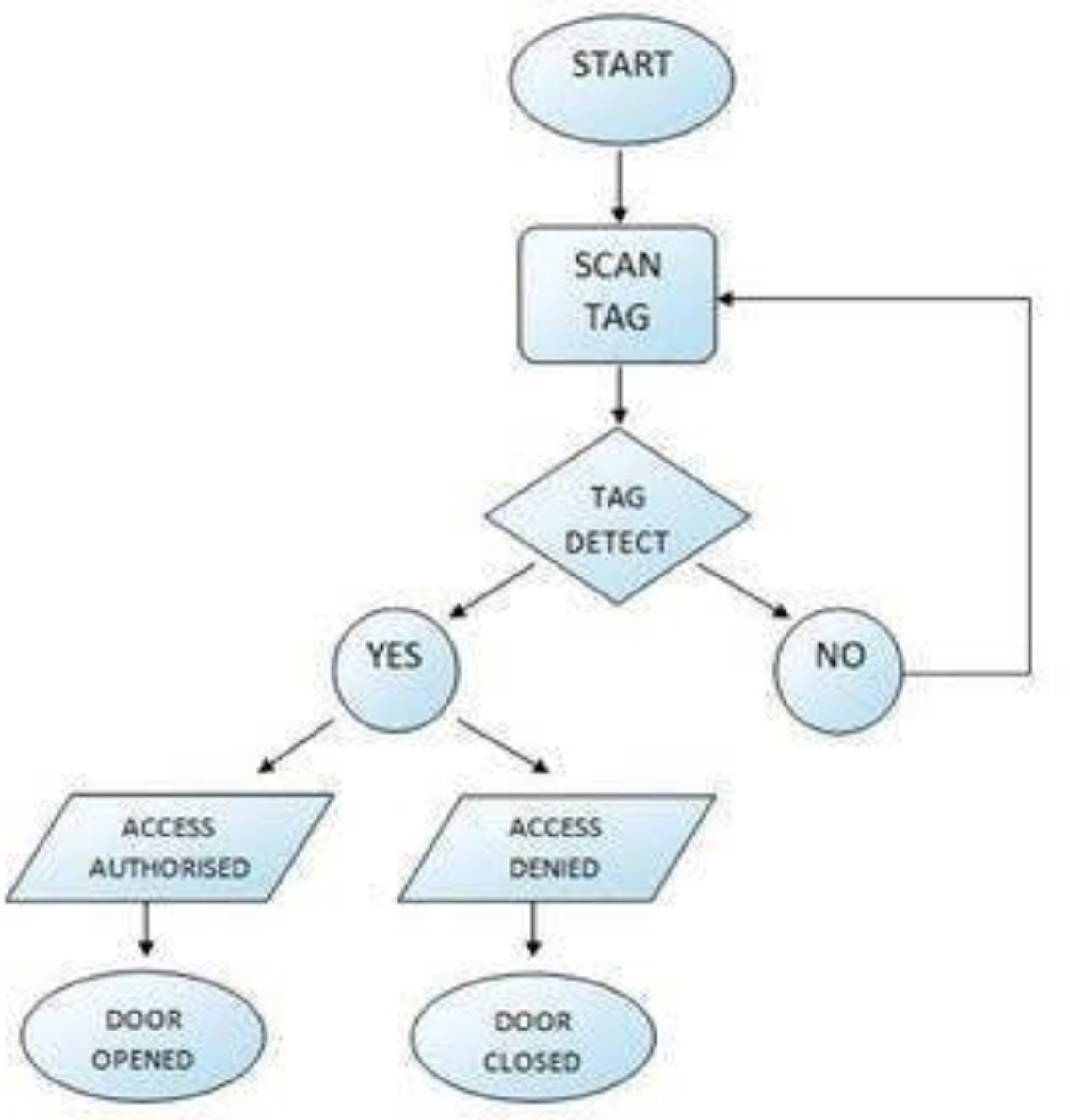
# CHAPTER – 1

# INTRODUCTION

## 1.1: FLOW CHART OF THE PROJECT



# 1.2: MATERIAL USED

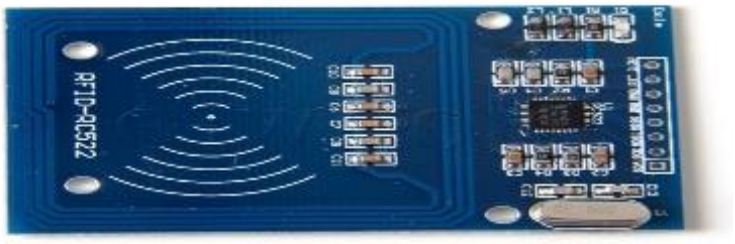
| COMPONENTS | PICTURES |
|---|---|
| Arduino uno |  |
| RC522 RFID Module |  |
| RFID Card Or Key Fob Tag |  |
| 9-12 V Power Supply |  |
| 1 Channel Relay Module |  |
| Selenoid lock |  |
| Jumper Wires |  |

# 1.3: 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 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is 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 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. The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to newer releases. The ATmega328 on the board comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer. While the UNO communicates using the original STK500 protocol, it differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

# 1.4 : RC522 RFID Module

This RC522 RFID Card Reader Module 13.56MHz is a low-cost MFRC522 based RFID Reader Module is easy to use and can be used in a wide range of applications. The MFRC522 is a highly integrated reader/writer IC for contactless communication at 13.56 MHz. RC522 is the highly integrated RFID card reader which works on non-contact 13.56mhz communication, is designed by NXP as low power consumption, low cost and compact size read and write chip, is the best choice in the development of smart meters and portable hand-held devices. MF RC522 use the advanced modulation system, fully integrated at 13.56MHz with all kinds of positive non-contact communication protocols. Support 14443A compatible answer signal. DSP deal with ISO14443A frames and error correction. Furthermore, it also supports rapid CRYPTO1 encryption to validate Mifare series products. MFRC522 support Mifare series higher speed non-contact communication, duplex communication speed up to 424 kb/s. As a new family member in 13.56MHz RFID family, MF RC522 has many similarities to MF RC5200 and MF RC530 and also has more new features. This module can fit directly in handheld devices for mass production. The module uses the 3.3V power supply and can communicate directly with any CPU board by connecting through SPI protocol, which ensures reliable work, high reading distance.



# 1.5 : RFID Card Or Key Fob Tag

RFID Tag Keyfob used for sensing and identifying tagged people and objects for access control, automation, and a whole range of different applications. Its operating on a frequency of 13.56MHz, these tokens are all pre-programmed with unique ID numbers to communicate wirelessly with RFID Readers. It can attach to vehicles or items, keyrings to keep track of the location via an array of readers in the office, warehouse or home. Additionally, the process of matching tags to readers is also very simple as well, as all you have to do is tell the RFID Reader that you are adding a token, and then hold the token nearby. Then, when the token passes by the reader, the system can identify and log the ID number and time, or can even open up doors or other access ways automatically.This basic RFID tag works in the 13.56MHz RF range . It is not re-programmable. This high frequency key fob RFID tag is a very popular solution for access control application, event management and for applications where keys need to be tracked.

# 1.6 : 9-12 V Power Supply

Power supply is a reference to the source of electrical power. Most electronic circuits require a DC power supply. Chances are you have one at home already, and can use it for physical computing projects.The most common operating voltages for microcontrollers and digital processors are 5V and 3.3V. You can find power supplies in many voltages, but 5V and 12V are common. To convert 12V to 5V or 3.3V, you'd need a voltage regulator.

# 1.7 : 1 Channel Relay Module

The Single Channel Relay Module is a convenient board which can be used to control high voltage, high current load such as motor, solenoid valves, lamps and AC load. It is designed to interface with microcontroller such as Arduino, NodeMCU, etc. The relay's terminal (COM, NO and NC) is being brought out with screw terminal. It also comes with a LED to indicate the status of relay. The relay is the device that opens or closes the contacts to switch ON/OFF other appliances operating at high voltages. It is also used in safety circuits where it detects the undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area through ON or OFF.

**COM:** Common Pin.

**NO:** Normally Open – There is no contact between the common pin and the normally open pin. So, when you trigger the relay, it connects to the COM pin and power is provided to the load.

**NC:** Normally Closed – There is contact between the common pin and the normally closed pin. There is always connection between the COM and NC pins, even when the relay is turned off. When you trigger the relay, the circuit is opened and there is no supply provided to the load.

# 1.8 : Selenoid lock

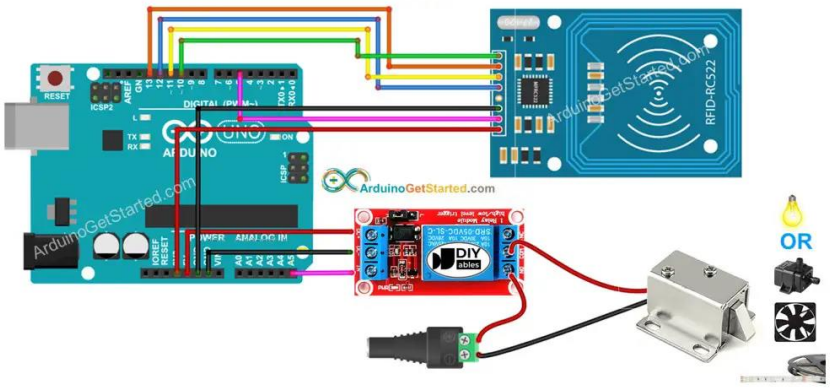
The solenoid lock denotes a latch for electrical locking and unlocking. It is available in unlocking in the power-on mode type, and locking and keeping in the power-on mode type, which can be used selectively for situations. The power-on unlocking type enables unlocking only while the solenoid is powered on. A door with this type is locked and not opened in case of power failure or wire disconnection, ensuring excellent safety. This type is used mainly for places requiring crime prevention. The power-on locking type can lock a door while the solenoid is powered on. If the power is disconnected, the door is unlocked. This type unlocks the door in case of wire disconnection due to a fire or accident, and it is used for emergency exits through which fire-fighting activity or evacuation should preferentially be made rather than safety for crime prevention. The keeping type performs two operations, locking and unlocking by applying a positive or negative pulse voltage to the solenoid, and keeps the no-power state in each position. This type features energy saving because it is unnecessary to always power the solenoid on. For the continuous rating and the intermittent rating, the continuous rating is designed to be able to feed a rated voltage power continuously for hours without exceeding a specified temperature rise limit, and the intermittent rating is designed to be able to feed a specified voltage only for a specified time duration without exceeding a specified temperature rise limit.

# 1.9 : Jumper Wires

A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards. By attaching a jumper wire on the circuit, it can be short-circuited and short-cut (jump) to the electric circuit. By placing the jumper wire on the circuit, it becomes possible to control the electricity, stop the operation of the circuit, and operate a circuit that does not operate with ordinary wiring. Also, when specification change or design change is necessary on the printed circuit board, reinforcement of the defective part, partial stop of the unnecessary function, and change of the circuit configuration of the unnecessary output part by attaching or detaching the jumper wire can do.

# CHAPTER – 2

## System Introduction And Functioning



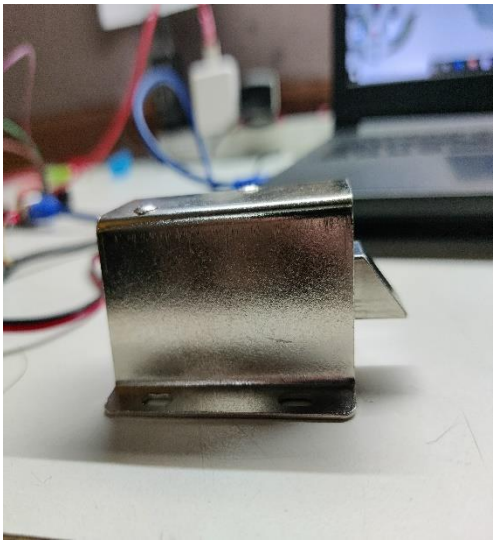


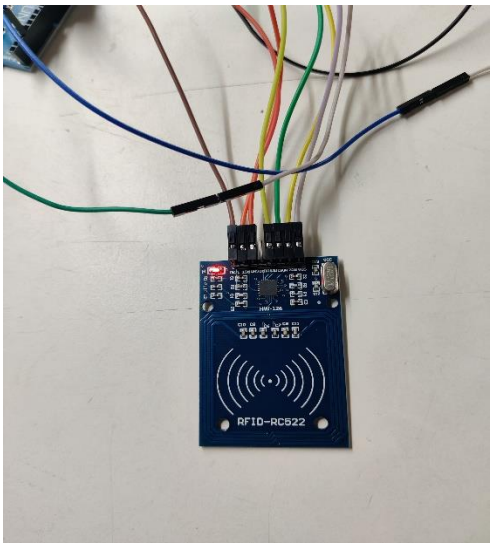
**The working concept of the RFID door lock :**

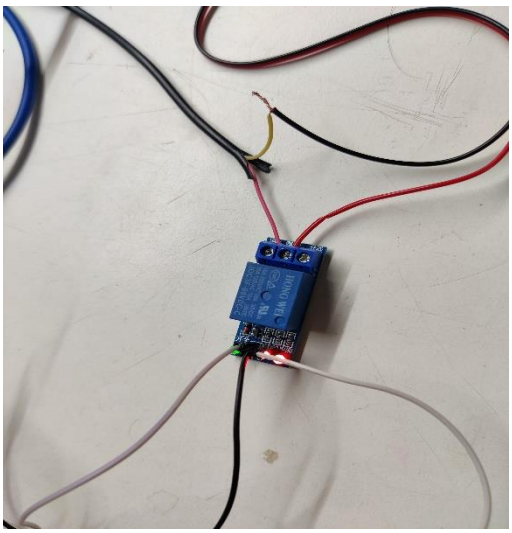
At a rudimentary level, RFID systems consist of three main components: an RFID tag or smart label, an RFID reader, and an antenna. RFID tags contain an IC and an antenna, which are used to transmit data to the RFID reader (also called an interrogator). Each RFID tag has its key. So when the RFID tag has been scanned by the reader, it tries to find whether the key of the tag matches the authorized key. If the key matches, then it can be assigned a specific function. This has to be done via changes in the code in Arduino IDE. So once the key matches, the RFID reader sends the signal to the Arduino board. The board in turn sends another signal to the SG90 micro servo. The micro servo is attached to the door handle in such a way that whenever the servo rotates the door opens.

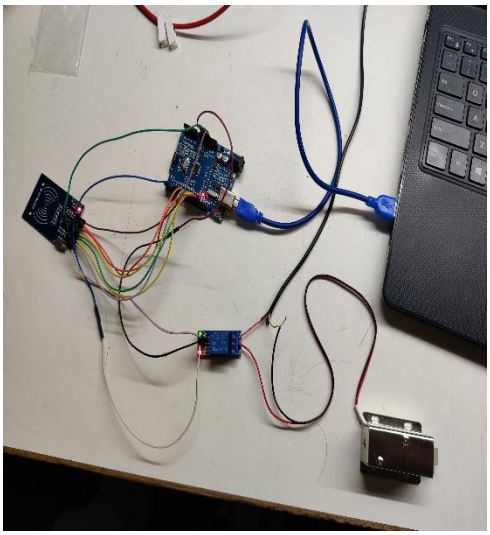
# CHAPTER 3

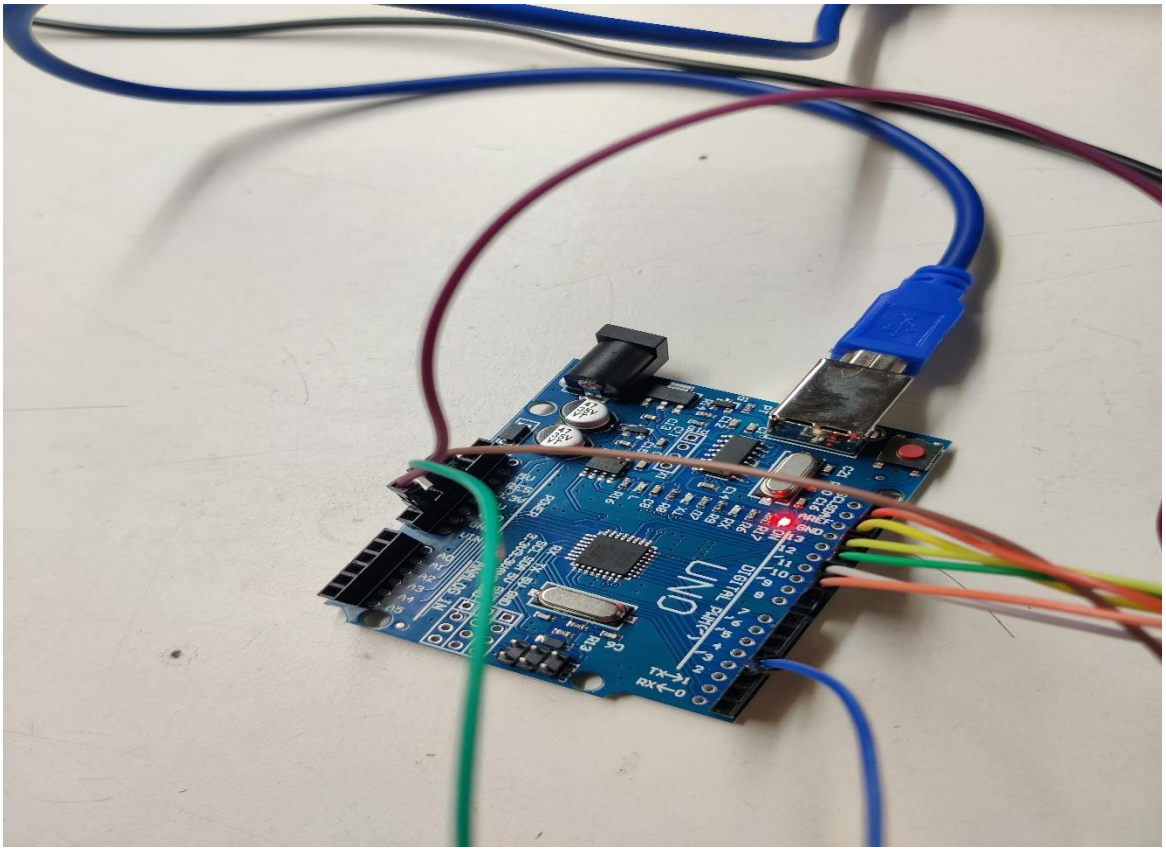
## Results

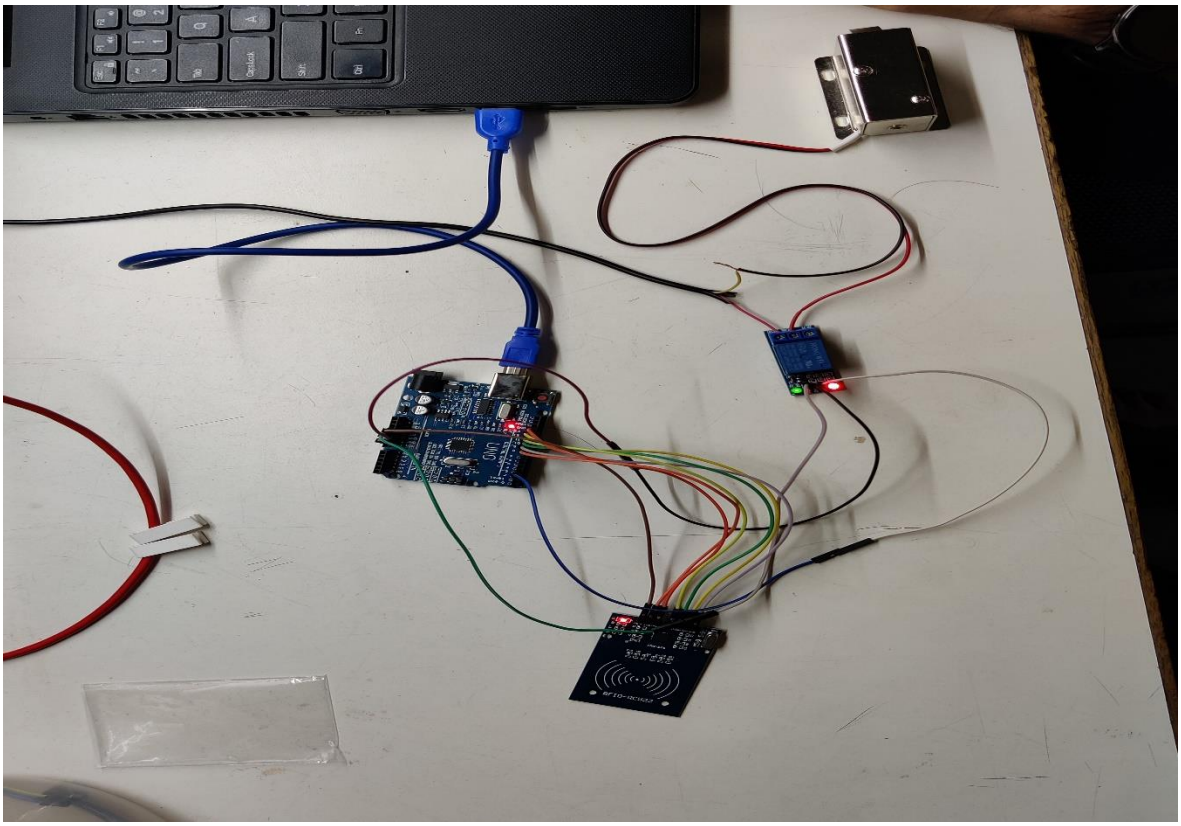







UNO



# CHAPTER 4

## Conclusion

The RFID Door Lock is a very cheap and affordable design that allows convenience and security for users. The design is relatively small and easy enough to install with jus a couple of screws. The relay supplies the solenoid lock with the power supply if the tag read matches with the saved tag in the microcontroller. If the tags do not match then the buzzer is activated in the third attempt. In this way the user is allowed or denied access. A single 9V power source along with a voltage regulator and an inverting amplifier can be used to provide power to both the microcontroller and the solenoid lock. We have used an extemal power sounce of 12V to provide power to the solenoid lock due to time constaints.

# CHAPTER 5

## Appendix

## Code :

```
#include <SPI.h>
#include <MFRC522.h>
#define RST_PIN 9   // Reset pin for the RFID sensor
#define SS_PIN 10   // Slave Select pin for the RFID sensor
#define relay 3
#define led 2
MFRC522 mfrc522(SS_PIN, RST_PIN);  // Create an instance of the RFID sensor
void setup() {
  Serial.begin(9600);   // Initialize serial communication
  pinMode(relay,OUTPUT);
  pinMode(led,OUTPUT);
  SPI.begin();          // Initialize SPI communication
  mfrc522.PCD_Init();   // Initialize the RFID sensor
  Serial.println("Ready to scan RFID cards!");
}
void loop() {
```

```
  // Scan for RFID cards
  if (mfrc522.PICC_IsNewCardPresent() && mfrc522.PICC_ReadCardSerial()) {
    // Get the UID of the card
    String uid = "";
    for (byte i = 0; i < mfrc522.uid.size; i++) {
      uid += String(mfrc522.uid.uidByte[i], HEX);
    }
    Serial.println("RFID Card UID: " + uid)
    // Compare the UID with the allowed UID(s)
    if (uid == "2e6ea662") { // Replace "ABCD1234" with the UID of your
allowed card(s)
      Serial.println("Access granted!");
      digitalWrite(relay,1);
      // Unlock the door
      delay(2000); // Wait for 1 second
      digitalWrite(relay,0);
    } else {
      Serial.println("Access denied!"); // Display access denied message
      digitalWrite(relay,0);  }
    mfrc522.PICC_HaltA(); // Halt PICC
    mfrc522.PCD_StopCrypto1(); // Stop encryption on PCD
  }
}
```

# Chapter 6

# Reference

1) YouTube : https://youtu.be/9fGbT-sn6r8

2) https://www.flyrobo.in/blog/rfid-door-lock