# Smart Door Control using RFID

## Introduction:

Our project aims to develop an RFID-based door lock system, leveraging RFID technology for enhanced security and convenience in access control. With the increasing demand for efficient and reliable access control systems, RFID-based solutions offer an optimal blend of accessibility and security.

## Setup:

The physical setup consists of a door (one way opening only), equipped with an electronic lock mechanism controlled by an RFID reader. Users can gain access by presenting authorized RFID cards or tags to the reader. The system is designed to authenticate users based on unique RFID identifiers stored in a database.

Before getting into the software section, remember to configure the Raspberry Pi for the RFID Operations as follows:

- Open Terminal in Raspberry Pi
- Type *sudo raspi-config*
- Select **"5 Interfacing Options"**
- Select **"P4 SPI"** and click **<Yes>** and **<Ok>**
- Restart by typing *sudo reboot*
- After reboot, type *lsmod | grep spi*
- If *spi_bcm2835* is present, then we've setup the SPI
- Type *sudo apt-get update* and then type *sudo apt-get upgrade*
- Type *sudo apt-get install python3-dev python3-pip*
- After this, type *sudo pip3 install spidev*
- For the library, install as *sudo pip3 install mfrc522*

In the python codes, remember to import the library's function as:

**from mfrc522 import SimpleMFRC522**

## Software Usage:

We developed the program for our RFID-based door lock system using Raspberry Pi Python Coding. The program manages user authentication, and control of the electronic lock mechanism, along with control of LEDs and Buzzer for indication. It communicates with the RFID reader to read RFID tags and verify user credentials. This Programming part involves the usage of the mfrc522 library in python to read/write the RFID cards. This Library is used for the Reading and Writing operations on the RFID card using the RC522 module.

## Hardware Usage:

Our hardware setup comprises several key components-

- RC522 RFID Reader/Writer Module: Responsible for reading RFID tags/cards.

- 12V Solenoid Lock: Controls the physical locking and unlocking of the door.

- Raspberry Pi: Acts as the brain of the system, coordinating communication between hardware components and executing control logic.

- 5V Relay: Electronic Switch that controls high voltage devices using signals form Microcontroller.

- MC38 Magnetic Door Sensor: Tells the status of the door whether its open or not.

- Power supply: Provides the necessary electrical power to the system.

- RFID tags/cards: Assigned to authorized users for access.

- LEDs and Buzzer: Acts as a status indicator for the operations.

- GRY LED Module: Acting as a diode to avoid Relay Back-Current + Indicator.

# Circuitry:

The circuitry of our RFID-based door lock system is relatively straightforward. The RFID reader is connected to the RPi, which processes the RFID data and triggers the electronic lock mechanism accordingly. Power is supplied to all components through the power supply unit. Additionally, LEDs or other indicators may be integrated to provide feedback on system status. The Circuit Image is given below:
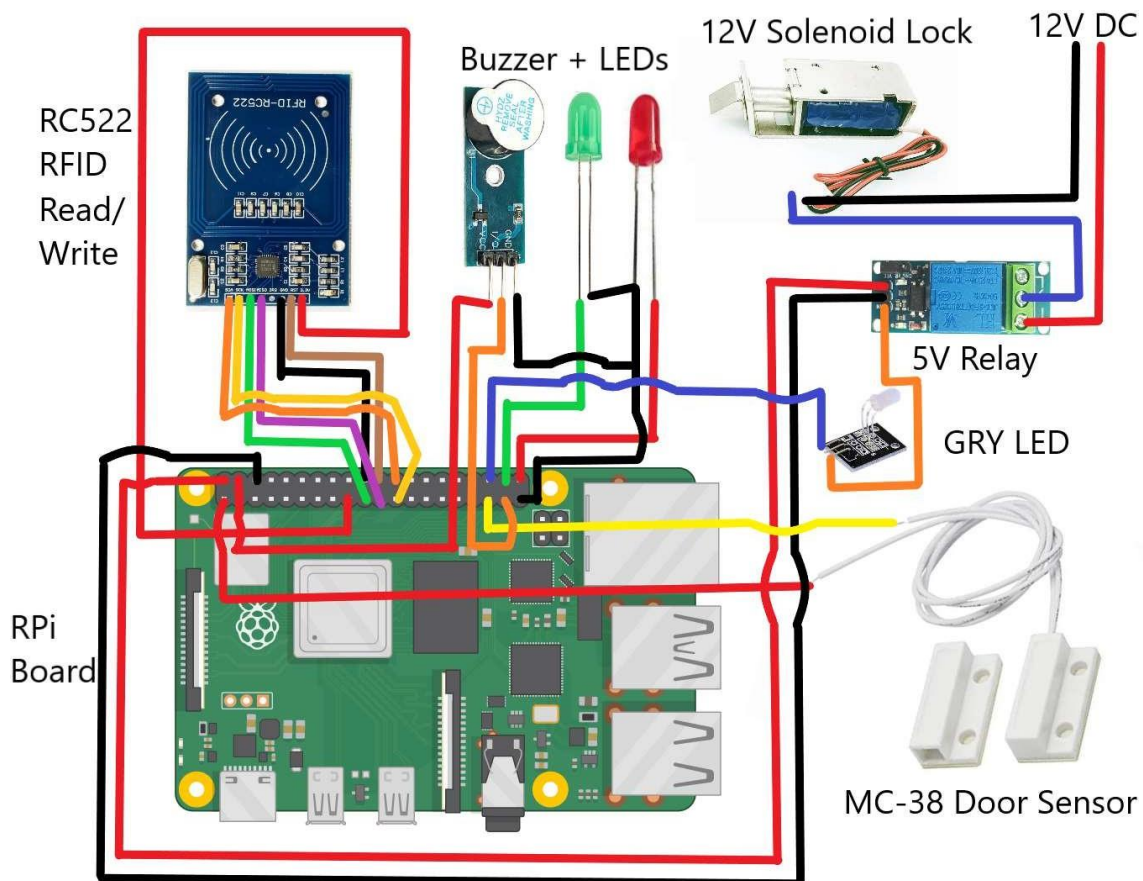


# Connections:

Connection of the pins of the components with the pins of Raspberry Pi/other Components is given in the next page:

A) RC522 and Raspberry Pi (RPi):

| Raspberry Pi GPIO Pin | RC522 Pin |
|---|---|
| 17 (3v3) | 3v3 |
| 22 | RST |
| 20 (Ground) | GND |
| 21 (MISO) | MISO |
| 19 (MOSI) | MOSI |
| 23 (SCK) | SCK |
| 24 (SDA) | SDA |

B) 5V Relay and RPi/Others:

| RPi Pin/Other | 5V Relay |
|---|---|
| Adapter +ve | NO Port |
| Lock +ve | COM Port |
| 2 (5v) | VCC |
| 6 (GND) | GND |
| GRY LED Y pin | In1 |

C) Solenoid Lock-Relay-Adapter connection:

| Relay/Adapter | Lock/Relay |
|---|---|
| Adapter -ve | Lock -ve |
| Relay COM Port | Lock +ve |
| Adapter +ve | Relay NO Port |

D) Other Connections with RPi:

| RPi Pin | Component |
|---|---|
| 40 | Red LED +ve |
| 38 | Green LED +ve |
| 37 | Buzzer Out Pin |
| 35 | Door Sensor Pin1 |
| 4 (5v) | Buzzer +ve Pin |
| 1 (3v3) | Door Sensor Pin2 |
| 39 (GND) | LEDs -ve, and Buzzer -ve Pin |
| 36 | GRY LED G Pin |