Build your own Raspberry Pi RFID ACS

(Access Control System)

**Equipments:**

1. Raspberry Pi
2. Raspbian OS Installed SD Card
3. RFID RC522 Module
4. 16X2 LCD with Header Pins
5. 10k Ohm Potentiometer
6. Breadboard
7. Jumper Wires

**Preparing Raspbian for our RFID ACS:**

1..To start, we will first ensure that everything is up to date on our Raspbian Installation by running the following two commands on the Raspberry Pi.

**sudo apt-get update**

**sudo apt-get upgrade**

2.. We will now install all the packages. Let’s begin by installing **build-essential**, **git**, **python3-dev**, **python3-pip**, and **python3-smbus** by running the command below.

**sudo apt-get install build-essential git python3-dev python3-pip python3-smbus**

**Building the 16X2 LCD Display Circuit:**

1..For this connection make sure that you have the following ready to go.

1. 8 pieces of Male to Male Jumper Wire
2. 8 pieces of Male to Female Jumper Wire
3. 16X2 LCD Display
4. 10k Ohm Potentiometer
5. Breadboard

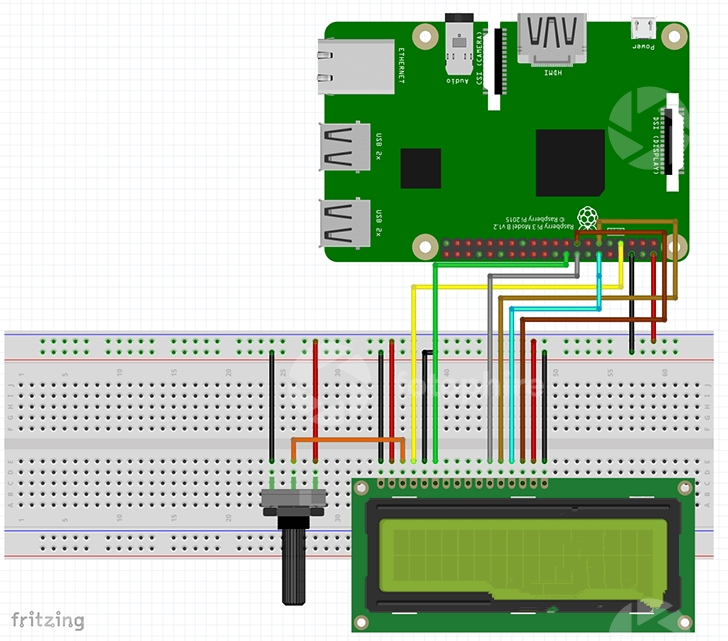
2.. Connecting the LCD to our Raspberry Pi is a pretty simple process. I have included the physical pin number for each connection that you need to make.

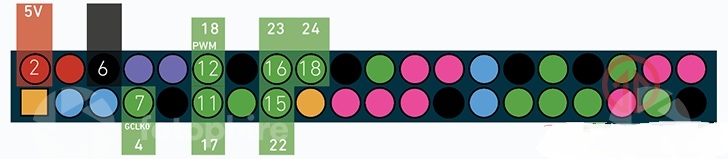
To begin with, let’s connect up our various components with the breadboard.

* **5V** (Physical Pin 2) to breadboard **positive** rail
* **Ground** (Physical Pin 6) to breadboard **ground** rail
* Place the **16×2 LCD Display** into the **right side** of the **breadboard**
* Place the **potentiometer** into the **left side** of the **breadboard** next to the **LCD Display**.
* Connect the **left pin** of the **potentiometer** to the **ground rail**
* Connect the **right pin** of the **potentiometer** to the **positive rail**

3.. Now begin connecting the LCD display to your Raspberry Pi.

* **Pin 1** of **LCD** (Ground) to breadboard **ground** rail
* **Pin 2** of **LCD** (VCC / 5V) to breadboard **positive** rail
* **Pin 3** of **LCD** (V0) to **middle wire** of the **potentiometer**
* **Pin 4** of **LCD** (RS) to **GPIO4** (Physical Pin 7)
* **Pin 5** of **LCD** (RW) to breadboard **ground** rail
* **Pin 6** of **LCD** (EN) to **GPIO24** (Physical Pin 18)
* **Pin 11** of **LCD** (D4) to **GPIO23** (Physical Pin 16)
* **Pin 12** of **LCD** (D5) to **GPIO17** (Physical Pin 11)
* **Pin 13** of **LCD** (D6) to **GPIO18** (Physical Pin 12)
* **Pin 14** of **LCD** (D7) to **GPIO22** (Physical Pin 15)
* **Pin 15** of **LCD** (LED +) to breadboard **positive** rail
* **Pin 16** of **LCD** (LED -) to breadboard **ground** rail





### Testing the 16×2 LCD Display:

**1.** Now that the circuit has been set up let’s go ahead and test it to ensure that everything was wired correctly.

To start, go ahead and clone the [Adafruit CharLCD library](https://github.com/pimylifeup/Adafruit_Python_CharLCD" \t "_blank) that we will be utilizing for this project. To clone the library to your Raspberry Pi run the following command on it.

**https://github.com/manassundar/Access-Control-System-Using-Pi-and-RFID.git**

**2.**Now with the library cloned to our Raspberry Pi, we need to run the setup script. This script will install the library so that any Python scripts can utilize it.

Run the following two commands to move into the newly cloned directory and run the **setup.py** script.

**cd ./Adafruit\_Python\_CharLCD**

**sudo python3 setup.py install**

**3.** With the library installed to the Raspberry Pi, we need to go ahead and edit an example file. We need to do this to test the circuit as we are using different pins to what the example utilizes.

Begin editing the file by running the following command.

**nano ~/Adafruit\_Python\_CharLCD/examples/char\_lcd.py**

**4.** In this file, find the “**# Raspberry Pi pin configuration**:” section and change it so that the values match what we have below.

**# Raspberry Pi pin configuration:**

**lcd\_rs = 4**

**lcd\_en = 24**

**lcd\_d4 = 23**

**lcd\_d5 = 17**

**lcd\_d6 = 18**

**lcd\_d7 = 22**

Once the changes are made, save the file by pressing **CTRL + X** then **Y** and then **ENTER**.

**5.** Now before we go ahead and run our new modified example we will need to install the [Raspberry Pi’s GPIO](https://pimylifeup.com/raspberry-pi-gpio/) Python library.

To install the required library run the following command.

**sudo pip3 install RPi.GPIO**

**6.** To test that everything is working lets now run that python script by running the command below. If everything is working as it should, you should now see text displayed across your LCD.

**python3 ~/Adafruit\_Python\_CharLCD/examples/char\_lcd.py**

**Building the RFID RC522 Reader Circuit:**

**1.** Now that you have set up the 16×2 LCD Display we will now move onto adding the RFID reader into this circuit.

For this section on wiring the RFID RC522 to the circuit, you will require the following pieces of equipment ready.

* 8 piece of Male to Male Breadboard Wire
* 6 pieces of Male to Female Breadboard Wire
* RFID RC522 Read/Writer
* Breadboard

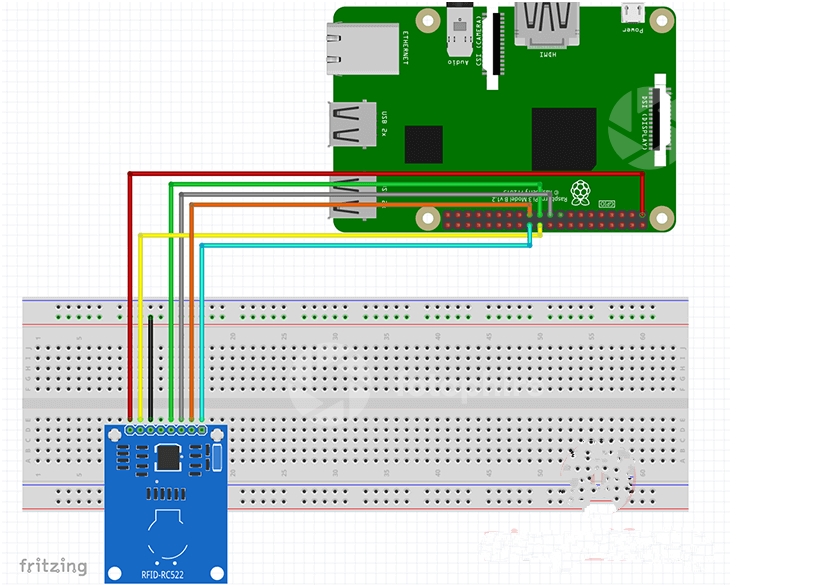
**2.** Once you have everything that you need for the RFID circuit we can then proceed on to wiring everything up, this will be slightly more complicated thanks to the LCD circuit being already set up.

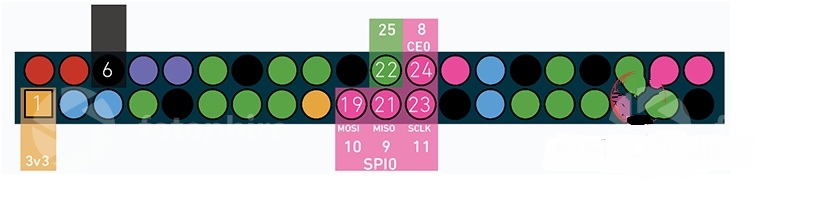
Please note that this circuit diagram is assuming that you have followed the steps in the previous section for the LCD Display. If you are not utilizing the LCD, make sure you connect **Physical Pin 6** on the Raspberry Pi to the **ground rail** on the breadboard.

Follow the diagrams and steps below to wire the RFID circuit up to the Raspberry Pi.

* **SDA** connects to **GPIO8** (Physical Pin 24)
* **SCK** connects to **GPIO11** (Physical Pin 23)
* **MOSI** connects to **GPIO10** (Physical Pin 19)
* **MISO** connects to **GPIO9** (Physical Pin 21)
* **GND** connects to Breadboard**Ground Rail**.
* **RST** connects to GPIO25 (Physical Pin 22)
* **3.3v** connects to **3v3** (Physical Pin 1)

**RC522 RFID Attendance System Wiring Diagrams**





### Enabling the SPI interface:

**1.** With the RFID now wired to our Raspberry Pi, we will need to go into the **raspi-config** tool to enable the SPI interface. This interface is required so that we can communicate with the RC522 module.

To do this, you need to first launch the raspi-config tool by running the following command.

**sudo raspi-config**

**2.** Upon running the command, you will see with a screen showing various options that you can configure.

For now, we are only interested in activating the SPI interface. On this screen use your **arrow keys** to go down and select “**5 Interfacing Options**” and press **ENTER**.

**3.** On the next screen, you will want to use your **arrow keys** to select the “**P4 SPI**” option, once selected press **ENTER**.

**4.** You will now need to confirm if you want to enable the **SPI Interface.** To this, you will want to use your **arrow keys** to select “**Yes**” and then press **ENTER** once it’s selected.

**5.** The SPI Interface should now be successfully enabled, and you should now see the text “**The SPI interface is enabled**” appear on the screen.

Now before the SPI interface is fully enabled, we will need to restart the Raspberry Pi. We can achieve this by going back to the terminal by pressing **ENTER** and then **ESC**.

Enter the following command to restart the Raspberry Pi.

**sudo reboot**

**6.** Once the Raspberry Pi has finished rebooting, you can verify that the SPI interface has been enabled by running the following command.

This command will retrieve the list of enabled kernel modules and grab anything from that list that contains the text “**spi**“.

**lsmod | grep spi**

If you see the text “**spi\_bcm2835**” appear in the command line, then you are now ready to proceed to test that the circuit is working correctly. Once that is done we can set up our RFID powered attendance system.

### Testing the RFID RC522:

**1.**Let’s now install the [spidev library](https://pypi.org/project/spidev/" \t "_blank) to our Raspberry Pi by using the following “pip” command. We rely on the spidev library to interact with the RFID reader interface.

**sudo pip3 install spidev**

**2.** Now that we have installed the spidev library to our Raspberry Pi we need to proceed to download the **MFRC522 library** by using the “pip” command.

This library is what will handle the grunt work for our RFID access system.

**sudo pip3 install mfrc522**

**3.** Now that we have both the MFRC522 library and the spidev library installed to our Raspberry Pi let’s go ahead and make a directory to keep our test script.

**mkdir ~/pi-rfid**

**4.** Now we will need to write a short script to test that our RC522 is, in fact, able to read RFID cards and that everything is wired correctly.

First, let’s open up our new script by running the following command, this will create a file called “**read.py**” in our recently created directory.

**nano ~/pi-rfid/Read.py**

**5.** Enter the following lines of code into this file.

**#!/usr/bin/env python**

**import RPi.GPIO as GPIO**

**from mfrc522 import SimpleMFRC522**

**reader = SimpleMFRC522()**

**try:**

**id, text = reader.read()**

**print(id)**

**print(text)**

**finally:**

**GPIO.cleanup()**

Once done, save the file by pressing **CTRL + X** then **Y** and **ENTER**.

**6.** Now test the RFID RC522 by running the following script and tapping your RFID chip on the reader.

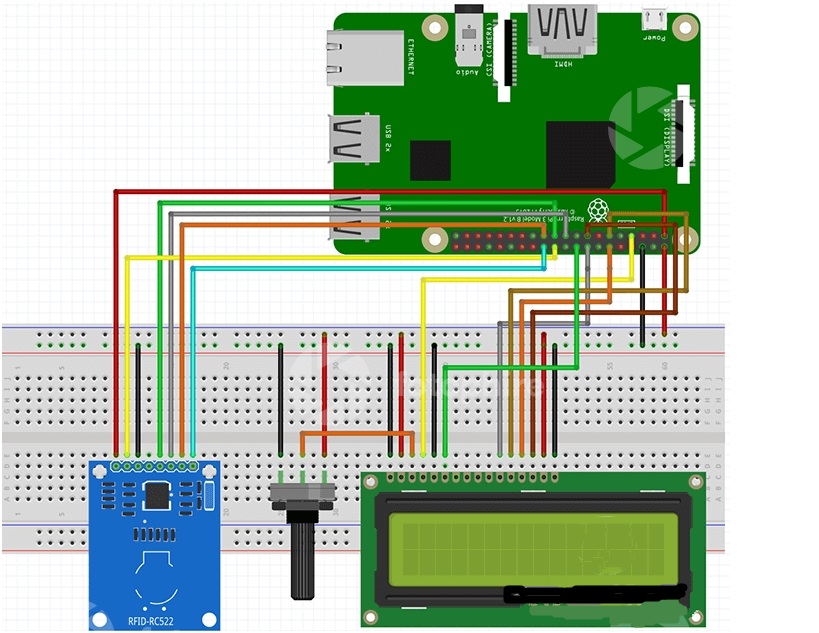
**python3 ~/pi-rfid/read.py**

**The Full Raspberry Pi RFID ACS Circuit:**

**1.** With both circuits now setup, double check that everything is working correctly. Test by running the test scripts that we quickly put together in a previous couple of sections.

If you are having issues, you can compare your final circuit to the diagrams below. These diagrams are designed to give you an idea of how the final circuit should look.

**RFID ACS Circuit Schematic**

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**RFID ACS GPIO Pins Utilized**



**Preparing the RFID Access System Database:**

**1.** Now before we go ahead and program our RFID attendance system, we must first prepare and set up the MYSQL database. This database is where we will be keeping track of each RFID cards acess and who owns that RFID card.

Our RFID ACS will walk you through most of the basics but the extra guide will teach you how to setup useful tools like PHPMyAdmin.

Begin by installing MYSQL to your Raspberry Pi by running the following command on your Pi.

**sudo apt-get install mysql-server –y**

**2.** Next, we will need to run the “**secure installation**” script that comes packaged with MYSQL. This script will run you through some processes on making your MYSQL server more secure.

Run this script by running the following command within the terminal on the Raspberry Pi.

**sudo mysql\_secure\_installation**

When prompted make sure that you set a new password for the root MYSQL server. Additionally, you should answer “**y**” to most prompts such as disabling root login access to your MYSQL server.

**3.** Now let’s load up into the MYSQL command-line tool by running the following command. You will be prompted to enter the password you set in the previous step.

**sudo mysql -u root –p**

**4.** Let’s begin by creating a database where we will be storing all of the data that we will be utilizing for our RFID access system.

We will be naming this database, “**Employee**“. To create this database, run the following command.

**CREATE DATABASE Employee;**

**5.** With our database created, let’s now create a user called “**EmpAdmin**” we will utilize this user in our Python scripts to read from our newly created database.

Make sure you set the password for this to something unique and hard to guess. For our example, we will be just using “**PropusInfotech**” as the password.

**CREATE USER 'EmpAdmin'@'localhost' IDENTIFIED BY 'PropusInfotech';**

**6.** Now that we have created our user we need to give it the rights to access our “**Employee**” database.

We can do this by running the following command. This command will give our “**EmpAdmin**” user full privileges on any table within our database.

**GRANT ALL PRIVILEGES ON Employee.\* TO 'EmpAdmin'@'localhost';**

**7.** Before we create our tables, we need to utilize the “**use**” command so that we are directly interacting with the “**Employee**” database. Begin interacting with the database by running the following command.

**use Employee;**

**8.** Now that we are dealing directly with the database that we want to utilize we can now start creating the tables where all our data will be stored.

Running the following two commands will create the tables that we will rely on for storing data. We will explain the fields in these tables after we have created them.

**create table empRecords(**

**id INT UNSIGNED NOT NULL AUTO\_INCREMENT UNIQUE,**

**user\_id INT UNSIGNED NOT NULL,**

**clock\_in TIMESTAMP NOT NULL DEFAULT CURRENT\_TIMESTAMP,**

**PRIMARY KEY ( id )**

**);**

**create table empDetails(**

**id INT UNSIGNED NOT NULL AUTO\_INCREMENT UNIQUE,**

**rfid\_uid VARCHAR(255) NOT NULL,**

**name VARCHAR(255) NOT NULL,**

**created TIMESTAMP NOT NULL DEFAULT CURRENT\_TIMESTAMP,**

**PRIMARY KEY ( id )**

**);**

You can leave the MYSQL tool by entering **exit;**

Now that we have created the tables let’s take a look at the data we will be storing and how we will be using it in our script.

For the **empRecords** table, we are holding three pieces of data for each recorded RFID tap.

* **id** – This is an **integer** that is used to keep track of the current row and increases automatically.
* **user\_id** – This is an **integer**, and we utilize this to tie access with a Employee in our **empDetails** table that has the same **id**.
* **clock\_in** – This variable stores a SQL **timestamp**. This timestamp is used to track when the employee taps their RFID card onto the RFID reader.

For the **empDetails** table, we are holding four pieces of data for each employee that we added.

* **id** – This is an **integer** that is used to keep track of the current Employee and increases automatically.
* **rfid\_uid** – This variable is used to store the UID that is captured when an RFID card is tapped on the RFID reader.
* **name** – This variable stores the name of the person who owns the RFID card.
* **created** – We use this variable to keep track of when the employee was created.

**Recording a Employee in the Security System:**

**1.** Before we get writing our Security system scripts, we need first to install the Python “**MYSQL Connector**” using pip.

Install the connector library by running the following command on your Pi.

**sudo pip3 install mysql-connector-python**

**2.** Let’s now create a folder to keep everything for this project.

**mkdir ~/employee**

**3.** Time to start writing our first Python script for our access system. This first script will allow you to create a employee based on a tapped RFID card.

Upon tapping the RFID card, the Python script will ask you to enter a username to register this card to a person.

Start writing the first part of our attendance system by running the following command.

**nano ~/employee/save\_emp.py**

**4.** Into this new file write the following lines of code. We will explain what each section of code does as we go and why we are utilizing that code.

**#!/usr/bin/env python**

We add this line so that the operating system knows that this file should execute using Python.

**import time**

We import the **time library** so that we can put the script to sleep, so things don’t occur instantly.

**import RPi.GPIO as GPIO**

We require the **GPIO library** so that we can run the cleanup function when the script ends.

**from mfrc522 import SimpleMFRC522**

The SimpleMFRC522 library is used to make it easy to talk with our RFID reader.

**import mysql.connector**

We utilize the **MySQL connector** so that we can talk with the database that we set up earlier.

**import Adafruit\_CharLCD as LCD**

Finally, we load in the Adafruit library for talking with LCDs. This library simplifies the process of communicating with our 16×2 display significantly.

**db = mysql.connector.connect(**

**host="localhost",**

**user="EmpAdmin",**

**passwd="PropusInfotech",**

**database="Employee"**

**)**

In this section of the code, we create our connection to our MYSQL server. For this function, we pass in all the information required to make the connection such as the host, user, database name and the password.

The object created by the connector is stored in the **db** variable so that we can interact with the database easily.

Make sure when entering this code that you replace the password with the one you set earlier in this guide for the “**EmpAdmin**” SQL user.

**cursor = db.cursor()**

Here we instantiate a copy of the cursor object from our database connection. We utilize this object to interact with the database and to execute SQL queries.

**reader = SimpleMFRC522()**

Now we prepare the SimpleMFRC522 library by instantiating it to our reader object. This library will allow us to easily talk with the RC522 later in the script to read input from the reader.

**lcd = LCD.Adafruit\_CharLCD(4, 24, 23, 17, 18, 22, 16, 2, 4);**

Our final setup line, this line prepares the CharLCD library for dealing with out 16×2 display. For this function, we pass in all the required pin numbers, amount of rows and more.

**try:**

**while True:**

**lcd.clear()**

**lcd.message('Place Card to\nregister')**

**id, text = reader.read()**

This block of code is the start of our employee creation logic. We will be wrapping the entirety of our logic first in a ‘**try:’** statement, we will explain why later on in this guide.

We also wrap our logic in a while True loop. This loop will ensure that the code below will run indefinitely so that the end employee can register multiple users in succession.

Next, we clear the LCD on every loop to ensure we are dealing with a clean display before writing “Place card to register” to the screen. This text prompts the user to place their RFID card onto the reader.

Finally, we utilize our SimpleMFRC522 library to read input in from our reader. This function will wait until a employee places their RFID reader before it returns both the id of the card and the text stored on it.

**cursor.execute("SELECT id FROM empDetails WHERE rfid\_uid="+str(id))**

**cursor.fetchone()**

In this section, we use the cursor to execute our first bit of SQL. In this SQL statement we are simply searching our “empDetails” table to see if any rows have a matching RFID UID to the ID we retrieved when reading the RFID card.

To grab the data that we retrieved we utilize another function from the cursor object, specifically the fetchone() function. This function will grab one row from the returned results.

**if cursor.rowcount >= 1:**

**lcd.clear()**

**lcd.message("Overwrite\nexisting user?")**

**overwrite = input("Overwite (Y/N)? ")**

**if overwrite[0] == 'Y' or overwrite[0] == 'y':**

**lcd.clear()**

**lcd.message("Overwriting user.")**

**time.sleep(1)**

**sql\_insert = "UPDATE users SET name = %s WHERE rfid\_uid=%s"**

**else:**

**continue;**

**else:**

**sql\_insert = "INSERT INTO empDetails (name, rfid\_uid) VALUES (%s, %s)"**

We start in this section by checking how many rows were returned by our last SQL call.

If the SQL call returns any rows, we need to prompt the employee whether they want to overwrite the already existing employee.

Inside the if statement we proceed to clear the LCD screen and display the message “**Overwrite existing employee?**” and provide a prompt in the command line for the user to respond either Y to overwrite or anything else to cancel.

Once the **input** function has received the input, we then check to see if the first character of the returned data is equal to ‘**Y**‘ or ‘**y**‘.

If the first character does equal what we expect we then clear the LCD again. Next we display a message “**Overwriting employee**” for one second.

Lastly, we build the SQL query to update the existing entry with the new name that we specify in the next step. We do this process instead of deleting the old entry and re-adding it.

If the employee responds anything but ‘**Y**‘ and ‘**y**‘ to the input function we then skip back to the start of the loop by using “**continue**“.

If this was not a duplicate entry, we build a different SQL query to create a new entry in our “**empDetails**” table. This new entry will contain the new name that we specify in the next block of code and the RFID ID that we obtained when the employee tapped their card.

**lcd.clear()**

**lcd.message('Enter new name')**

**new\_name = input("Name: ")**

**cursor.execute(sql\_insert, (new\_name, id))**

**db.commit()**

**lcd.clear()**

**lcd.message("Emp " + new\_name + "\nSaved")**

**time.sleep(2)**

**finally:**

**GPIO.cleanup()**

Our final segment of code is quite simple and wraps everything up. We start by clearing the LCD again and prompting the user on the LCD that they need to enter a new name.

Meanwhile on the console, the text “**Name:** ” should appear as we utilize **input** to await the employee’s input.

Once a employee has input a name into the console and pressed enter we then proceed to utilize the cursor object to execute the query that we formed in the previous section of code.

We also create a tuple that’s passed into the execute function. This tuple contains the new name and the RFID card’s id. Both these values will automatically pass into our query strings on execution.

Finally, we commit the changes to the database by calling the **db** object with the **.commit()** function. If we don’t call this function, our **INSERT** and **UPDATE** queries will not occur.

We end our main code logic by clearing the LCD again and displaying a message that the new employee has saved. We run a quick 2-second sleep to give the employee enough time to see the message before we restart the loop.

Lastly, we have our **finally:** statement, this is the other part of our **try:** statement. This bit of code ensures that no matter what happens we will run the **GPIO.cleanup** function.

**6.** Hopefully, at this point, you will have finished writing the script into the file.

However, if you would like to check over and ensure that everything is correct, then you can find the full version of the code below.

Once you are happy with everything, save the file by pressing **CTRL + X** then **Y** and finally **ENTER**.

**#!/usr/bin/env python**

**import time**

**import RPi.GPIO as GPIO**

**from mfrc522 import SimpleMFRC522**

**import mysql.connector**

**import Adafruit\_CharLCD as LCD**

**db = mysql.connector.connect(**

**host="localhost",**

**user="EmpAdmin",**

**passwd="PropusInfotech",**

**database="Employee"**

**)**

**cursor = db.cursor()**

**reader = SimpleMFRC522()**

**lcd = LCD.Adafruit\_CharLCD(4, 24, 23, 17, 18, 22, 16, 2, 4);**

**try:**

**while True:**

**lcd.clear()**

**lcd.message('Place Card to\nregister')**

**id, text = reader.read()**

**cursor.execute("SELECT id FROM empDetails WHERE rfid\_uid="+str(id))**

**cursor.fetchone()**

**if cursor.rowcount >= 1:**

**lcd.clear()**

**lcd.message("Overwrite\nexisting emp?")**

**overwrite = input("Overwite (Y/N)? ")**

**if overwrite[0] == 'Y' or overwrite[0] == 'y':**

**lcd.clear()**

**lcd.message("Overwriting emp.")**

**time.sleep(1)**

**sql\_insert = "UPDATE empDetails SET name = %s WHERE rfid\_uid=%s"**

**else:**

**continue;**

**else:**

**sql\_insert = "INSERT INTO empDetails (name, rfid\_uid) VALUES (%s, %s)"**

**lcd.clear()**

**lcd.message('Enter new name')**

**new\_name = input("Name: ")**

**cursor.execute(sql\_insert, (new\_name, id))**

**db.commit()**

**lcd.clear()**

**lcd.message("Emp " + new\_name + "\nSaved")**

**time.sleep(2)**

**finally:**

**GPIO.cleanup()**

**7.** With our **save\_emp** script saved let’s go ahead and take it for a whirl to ensure that everything is operating as it should be and there are no mistakes from copying the code.

Run the script by running the following command.

**python3 ~/employee/save\_emp.py**

**8.** Tap your RFID card and see if everything is working as intended if it’s not double check your code and wiring. If you see “**Emp Saved**” then everything should be working.

**Recording Attendance:**

**1.** Now that we have written our **save\_emp** script and ensured that it is working correctly let’s move onto our **check\_emp** script.

This script will run in an infinite loop checking for any taps from an RFID chip. When someone taps their RFID chip, we will check that chip’s ID in the database.

If it finds a employee, we set a welcome message and insert an entry into our empRecords table that will have the current date and time.

Let’s start the process of writing the script by using the following command.

**nano ~/employee/check\_emp.py**

**2.** Enter the following lines of code. We will explain each new section of code as we go, you will be familiar with some of this as we utilized it within the save\_emp script in the previous section.

**#!/usr/bin/env python**

**import time**

**import RPi.GPIO as GPIO**

**from mfrc522 import SimpleMFRC522**

**import mysql.connector**

**import Adafruit\_CharLCD as LCD**

**db = mysql.connector.connect(**

**host="localhost",**

**user="EmpAdmin",**

**passwd="PropusInfotech",**

**database="Employee"**

**)**

**cursor = db.cursor()**

**reader = SimpleMFRC522()**

**lcd = LCD.Adafruit\_CharLCD(4, 24, 23, 17, 18, 22, 16, 2, 4);**

**try:**

**while True:**

The main thing that you need to remember is to replace your database password that is specified next to “**passwd**” as by default it is our example password, “**PropusInfotech**“.

**lcd.clear()**

**lcd.message('Place Card to\nrecord emp Details')**

**id, text = reader.read()**

In this block of code, we clear the LCD screen and display a message to prompt the user to place their card to record attendance. We then wait for a response from the RFID reader.

**cursor.execute("SELECT id, name FROM empDetails WHERE rfid\_uid="+str(id))**

**result = cursor.fetchone()**

**lcd.clear()**

Here we execute our first bit of SQL. This SQL statement grabs both the “**id**” and “**name**” from our “**empDetails**” table where the employee has the same **RFID ID** as the card that was tapped on the reader.

We then grab the row that is returned by the SQL query and store its result into our “**result**” variable for later use.

Finally, we clear the LCD screen so that it’s ready to print a new message to in our next section of code.

**cursor.execute("SELECT id, name FROM empDetails WHERE rfid\_uid="+str(id))**

**result = cursor.fetchone()**

**lcd.clear()**

In this section, we first check to see if the last SQL request returned any rows. If it returned 0, then we display a message to the 16×2 display that the “**Emp does not exist.**”

If we do have a row, we then proceed to display a message welcoming the employee. We use their name that was retrieved from the database as **result[1]**.

Afterward, we make an SQL statement to insert a row into our empRecords table. We need to pass in the employee’s id that we retrieved from our previous SQL call and is stored in **result[0]**.

Finally, we commit changes to the database.

**time.sleep(2)**

**finally:**

**GPIO.cleanup()**

Our final section of code is straightforward. We put the script to sleep for two seconds to give the employee time to read the message we display on the 16×2 display and to remove the RFID card.

The “**finally:**” statement ensures that we clean up the GPIO once the script has finished.

**3.** Once you have finished entering all the code, you can check it against the full version that is right below.

The main thing to pay attention to when entering all the code is to ensure all the indentations are the same. Two spaces should separate each level.

Once you are happy that everything is correct, save the file by pressing **CTRL + X** then **Y** and finally **ENTER**.

**#!/usr/bin/env python**

**import time**

**import RPi.GPIO as GPIO**

**from mfrc522 import SimpleMFRC522**

**import mysql.connector**

**import Adafruit\_CharLCD as LCD**

**db = mysql.connector.connect(**

**host="localhost",**

**user="EmpAdmin",**

**passwd="PropusInfotech",**

**database="Employee"**

**)**

**cursor = db.cursor()**

**reader = SimpleMFRC522()**

**lcd = LCD.Adafruit\_CharLCD(4, 24, 23, 17, 18, 22, 16, 2, 4);**

**try:**

**while True:**

**lcd.clear()**

**lcd.message('Place Card to\nRecord Details')**

**id, text = reader.read()**

**cursor.execute("Select id, name FROM empDetails WHERE rfid\_uid="+str(id))**

**result = cursor.fetchone()**

**lcd.clear()**

**if cursor.rowcount >= 1:**

**lcd.message("Welcome " + result[1])**

**cursor.execute("INSERT INTO empRecords (user\_id) VALUES (%s)", (result[0],) )**

**db.commit()**

**else:**

**lcd.message("Emp does not\nexist.")**

**time.sleep(2)**

**finally:**

**GPIO.cleanup()**

**4.** With our script saved let’s go ahead and quickly run through it to check that everything is working as it should be.

Run the script by entering the following command and follow the prompts displayed on the 16×2 display.

**python3 ~/employee/check\_emp.py**

If you run into any errors, make sure you double check all the code has been entered correctly.

**Checking the Database:**

**1.** Now that we have written and tested both our save\_emp script and our check\_emp script lets go ahead and take a look at our database to see the new entries.

Fire up the MYSQL command line tool by running the following command. You will be prompted to enter the password that you entered for the root user before continuing.

**sudo mysql -u root –p**

**2.** Once you have connected into the MYSQL command line, we need to utilize the “**use**” command. We need to use this command so that we can interact our “**Employee**” database.

Run the following command to interact with the “**Employee**” database.

**use Employee;**

**3.** Now that we are directly interacting with our “Employee” database let’s start by checking out all the users that have been created by our script.

We can do this by running a simple **SELECT** SQL call that specifies our “**empDetails**” table. The asterisk (**\***) used in the query below means that we want to grab all columns.

Type in the following command to grab all the users available in the “**empDetails**”

table.

**SELECT \* FROM empDetails;**

From this command, you should see all the employee rfid\_uid , name, added date time, who needs to access.

**4.** Now that we have checked the “**empDetails**” table let’s go ahead and take a look at our “**empRecords**” table. Just like the previous query we made we are just selecting all columns from the “**empRecords**” table.

Enter the following command to grab all the data.

**SELECT \* FROM empRecords;**

From this command you should see employee access records with rfid\_uid and time. You can reference the “user\_id” back to the “empDetails” table “id” to see which employee clocked in.

You can leave the MYSQL tool by entering **exit;**