

**A REPORT ON - ATTENDANCE AND TEMPERATURE CAPTURING DEVICE**

**A REPORT  
ON  
ATTENDANCE MARKING SYSTEM AND TEMPERATURE MEASUREMENT OF  
EMPLOYEES OF ADANI POWER**

**BY**

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2018B5A80923P  
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**AT  
Adani Power, Ahmedabad at Udupi**



A Practice School-I Station of

**BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI**

**(June,2020)**



**BITS Pilani**  
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AMARTYA PANDEY  
SHREY AGGARWAL

## A REPORT ON - ATTENDANCE AND TEMPERATURE CAPTURING DEVICE

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE PILANI (RAJASTHAN)  
Practice School Division

Station - Adani Power, Ahmedabad

Centre - Udupi

Duration – 6 weeks

Date of Start – 18<sup>th</sup> May, 2020Date of Submission - 24<sup>th</sup> June 2020**Title of the Project:** ATTENDANCE MARKING SYSTEM AND TEMPERATURE MEASUREMENT OF EMPLOYEES OF ADANI POWER

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**Key Words:** ATTENDANCE MARKING, TEMPERATURE, ARDUINO, RFID, IR SENSOR, COVID-19.**Project Areas:** ELECTRONICS, ROBOTICS, POWERPLANT**Abstract:**

THIS PROJECT REPORT SHEDS LIGHT UPON THE THIS SYSTEM NOT ONLY RECORDS THE ATTENDANCE OF THE EMPLOYEES USING THE RFID CARDS BUT ALSO CHECKS THEIR TEMPERATURE USING IR SENSORS UPON ARRIVAL. OUR PROJECT USES RFID (RADIO FREQUENCY IDENTIFICATION) TECHNOLOGY TO MAKE A NOTE OF EVERY EMPLOYEE ENTERING THE WORKPLACE AND ALSO TO CALCULATE THE TIME HE/SHE RESIDES IN THE WORKPLACE. IN THIS PROPOSED SYSTEM, EVERY EMPLOYEE IS ALLOTTED WITH AN RFID TAG. THE PROCESS OF ATTENDANCE CAN BE DONE BY PLACING THE CARD NEAR THE RFID READER. EVERY RFID TAG HAS A UNIQUE NUMBER SO WHENEVER EMPLOYEE WILL SCAN HIS/HER CARD THE RFID TAG NUMBER WILL BE SENT TO THE DATABASE AND THAT UNIQUE TAG NUMBER WILL BE THE IDENTITY OF EVERY SINGLE EMPLOYEE. THE NEED TO BE ABLE TO MEASURE THE TEMPERATURE OF PERSON WITHOUT PHYSICAL CONTACT AROSE ESPECIALLY DURING THESE TIMES. THIS NEED BROUGHT THE MEASUREMENT OF TEMPERATURE USING INFRARED SENSORS ALSO KNOWN AS INFRARED THERMOMETERS. OUR SYSTEM FLASHES RED LIGHT WHEN THE TEMPERATURE OF THE EMPLOYEE IS GREATER THAN 100 DEGREE F AND SENDS A MESSAGE TO THE CONCERNED AUTHORITIES ABOUT ANY POSSIBILITY OF THE PERSON SUFFERING FROM THE VIRUS. IF THE PERSON IS PERFECTLY NORMAL OUR SYSTEM FLASHES A GREEN LIGHT. THEN, THE PERSON IS ALLOWED TO ENTER THE PREMISES.

*Amartya Pandey**Shrey Aggarwal*Signature(s) of Student(s)  
Date 24/06/2020Signature of PS Faculty  
Date 24/06/2020

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## **5. INTRODUCTION**

The project is an attempt to mark the attendance of the employees using the RFID technology as well as measuring the temperature of the employee using the Infrared Thermometer so that it could be used in the unfortunate pandemic of COVID-19. This document is a report for the project Implementation of capturing the attendance and temperature of the employees of Adani Power

In this project, we have used RFID reader (MRC-522 RFID), RFID tags, Arduino UNO R3, Infrared Temperature Sensor (MLX90614 IR TEMPERATURE SENSOR) and a GSM Module (SIM800L GSM MODULE). The term RFID (radio frequency identification) is one type of electronic device includes a small antenna and a chip. This device is used to transmit the information like persons, animals, books or any stuff between reader and RFID tag using radio frequency electromagnetic fields. This device uses the RFID scanner integrated with Arduino to capture the attendance of an employee and store it along with the persons credentials into the database. Every employee is issued a passive RFID tag integrated into their company ID card, which when brought near the sensor can be scanned.

The need to be able to measure the temperature of person without physical contact arose especially during these times. This need brought the measurement of temperature using infrared sensors also known as Infrared thermometers. This device uses the IR scanner integrated with Arduino to sense the body temperature and store it along with the person's credentials into the database. The device scans the temperature of the employee and records it in the database. It flashes a green signal if the temperature is normal or else a red signal indicating high temperature than usual. It also sends the output to the Arduino which is programmed to send an SMS to the Security-in charge. This project uses this module to send an alert in form of SMS along with the employee's credentials and the temperature. This notifies the "Security-in-charge" that a particular employee has a high body temperature. This can help in monitoring the employee's health and controlling the spread of a pandemic such as COVID-19. It specifically helps in those organizations where "Work from Home" facility is not an option.

## **6.COMPONENTS USED IN MAKING THIS DEVICE**

We have used the following electronic components while making this device. To make it cost-effective we have mostly used the generic parts. We have tried to make use of as much open-source based components as possible:

### **6.1 ARDUINO BOARD**

It is an open-source electronics platform based on easy-to-use hardware and software. It is a microcontroller board which is used as a base for thousands of electronics projects. It is based on a programming language called 'Wiring' and is compatible with most of the programming languages like C, C++, python etc. It has a wide range of applications ranging from turning on/off an LED bulb to controlling complicated circuits used in control and automation of industries.

#### **6.1.1 Uses of Arduino**

- DIY projects for beginners.
- Development projects which have code-based control.
- Development of embedded systems and automation technologies.
- In Automobile Industries to track progress of a vehicle under assembly in an assembly line.

### **6.2 RFID- Radio Frequency Identification**

The term RFID (radio frequency identification) is one type of electronic device includes a small antenna and a chip. This device is used to transmit the information like persons, animals, books or any stuff between reader and RFID tag using radio frequency electromagnetic fields. It is capable of



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carrying 2k bytes of data. There are different kinds of RFID systems in the market, which consist of an antenna, a transponder, and a transceiver. Some types of tags can be located close to the RFID reader and some tags can be located far from the reader. The operating frequency ranges of these devices mainly include low, mid and high ranges. The low-frequency range is from 30kHz to 500kHz, mid-frequency range is from 900kHz to 1500kHz and high-frequency range is 2.4kHz to 2.5kHz.

RFID (radio frequency identification) is designed to serve as the Purpose of barcode scanner or a magnetic strip on the back of the ATM card. It creates a unique identifier for that object and just as a bar code or magnetic strip it must be scanned to get the information RFID must be scanned to retrieve the information.

### 6.2.1 How Does RFID Work?

RFID belongs to a group of technologies referred to as Automatic Identification and Data Capture (AIDC). AIDC methods automatically identify objects, collect data about them, and enter those data directly into computer systems with little or no human intervention. RFID methods utilize radio waves to accomplish this. At a simple level, RFID systems consist of three components: an RFID tag or smart label, an RFID reader, and an antenna. RFID tags contain an integrated circuit and an antenna, which is used to transmit data to the RFID reader (also called an interrogator). The reader then converts the radio waves to a more usable form of data. Information collected from the tags is then transferred through a communications interface to a host computer system, where the data can be stored in a database and analysed later.

## 6.2.2 Types of tags-

### 1. Active RFID-

- Active RFID tags have their own transmitter and power source (usually a battery) onboard with the tag
- They read ranges that can extend up to 100 m.
- They are usually larger and more expensive than their passive counterparts

### 2. Passive RFID-

- The tag-reader and reader antenna send a signal to the tag, and that signal is used to power on the tag and reflect energy back to the reader.
- They read ranges are shorter than with active tags and are limited by the power of the radio signal reflected back to the reader.
- They are usually smaller, less expensive, and more flexible than active tags.

### 3. Battery Assisted Passive RFID-

- BAP systems, or semi-passive RFID systems, incorporate a power source into a passive tag configuration.
- The power source helps ensure that all of the captured energy from the reader can be used to reflect the signal, which improves read distance and data transfer rates.
- Unlike active RFID transponders, Hybrid (BAP) tags do not have their own transmitters.

### 6.2.3 Uses of RFID-

- In Supermarkets to prevent shoplifting.
- To monitor livestock and pets.
- To capture attendance of employees and students.
- In Automobile Industry to track progress through assembly line.

### 6.3 Infrared Temperature Sensors or IR THERMOMETERS:

An infrared thermometer is a thermometer which infers temperature from a portion of the thermal radiation sometimes called black-body radiation emitted by the object being measured. They are sometimes called laser thermometers as a laser is used to help aim the thermometer, or non-contact thermometers or temperature guns, to describe the device's ability to measure temperature from a distance. By knowing the amount of infrared energy emitted by the object and its emissivity, the object's temperature can often be determined within a certain range of its actual temperature. Infrared thermometers are a subset of devices known as "thermal radiation thermometers".

Sometimes, especially near ambient temperatures, readings may be subject to error due to the reflection of radiation from a hotter body—even the person holding the instrument — rather than radiated by the object being measured, and to an incorrectly assumed emissivity.

The design essentially consists of a lens to focus the infrared thermal radiation on to a detector, which converts the radiant power to an electrical signal that can be displayed in units of temperature after being compensated for ambient temperature. This permits temperature measurement from a distance without contact with the object to be measured. A non-contact infrared thermometer is useful for

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measuring temperature under circumstances where thermocouples or other probe-type sensors cannot be used or do not produce accurate data for a variety of reasons.

### 6.3.1 Uses of IR Thermometer

- It is primarily used in healthcare industry as thermometers.
- It is better than the conventional Mercury based thermometers as no skin contact is required to sense the temperature.
- This no-contact mode of operation makes this sensor/thermometer very useful in pandemic caused by communicable diseases like COVID-19 which can spread through contact.

## 6.4 GSM MODULE

This is an extension of an Arduino microcontroller board. It enables the board to send and receive calls and SMS. A Subscriber Identity Module (SIM) card is required in addition to the board. This project uses this module to send an alert in form of SMS along with the employee's credentials. This notifies the "Security-in-charge" that a particular employee has a high body temperature. This can help in monitoring the employee's health and controlling the spread of a pandemic such as COVID-19.

### 6.5 The device also uses some minor components like-

- Breadboards
- LED lights
- Jumper Cables
- USB Cables etc.

## 7. CIRCUIT DIAGRAMS

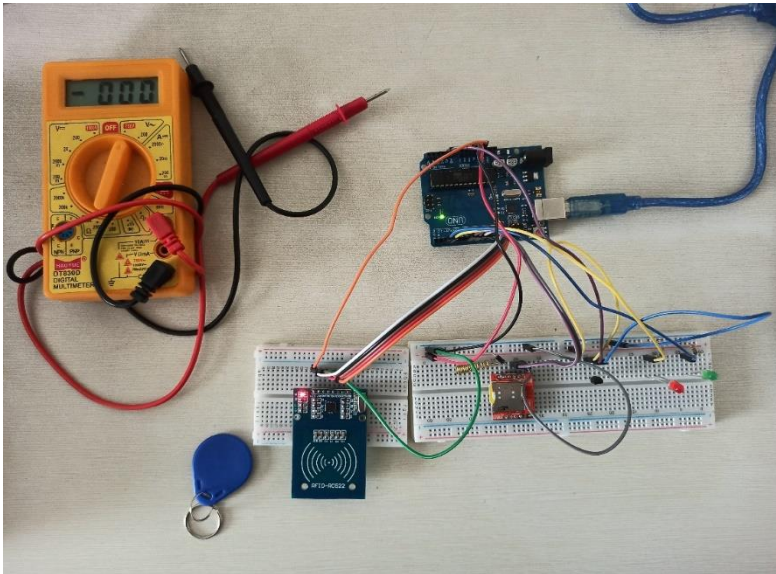


Figure 1 Circuit with Arduino Uno, RFID module and Gsm Module

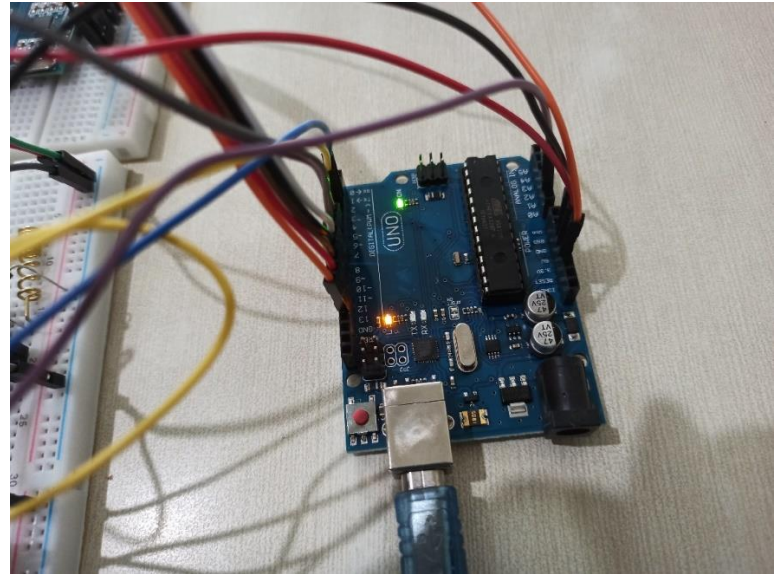


Figure 2 Serial port connections in Arduino Uno

### 7.1 SIM800L GSM MODULE

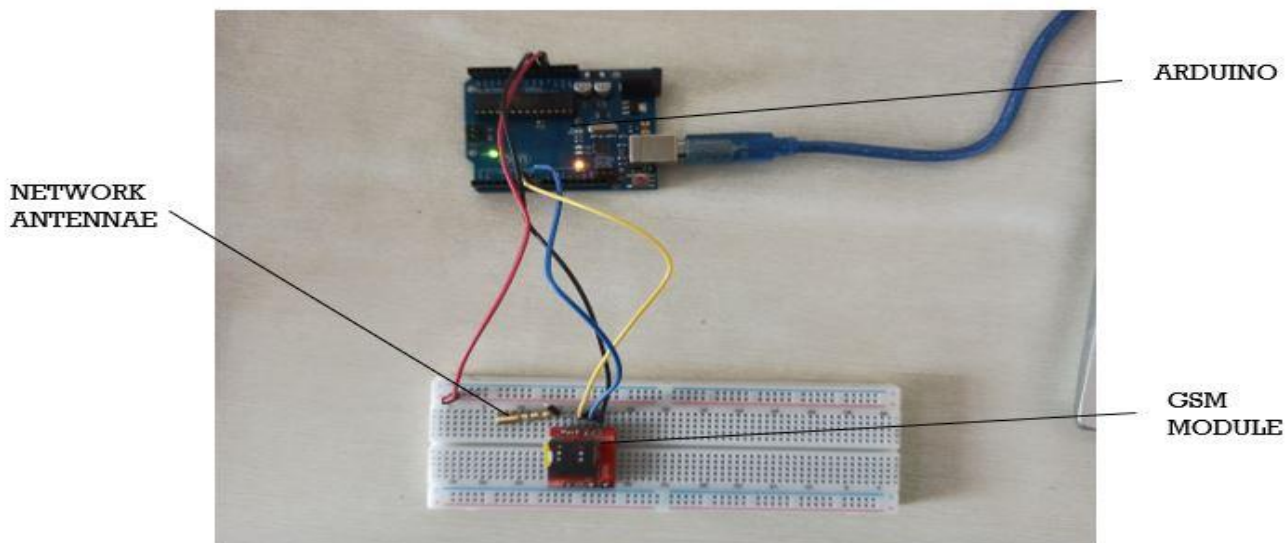


Figure 3 SIM800L connections with Board



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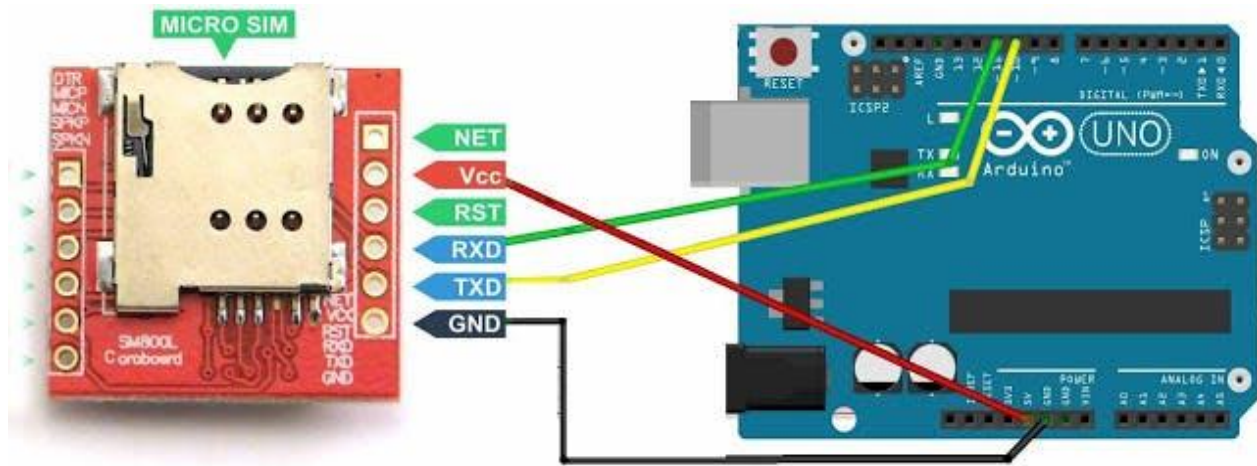


Figure 4 Connections with GSM

VCC - Voltage line for GSM module (5 V from Arduino)

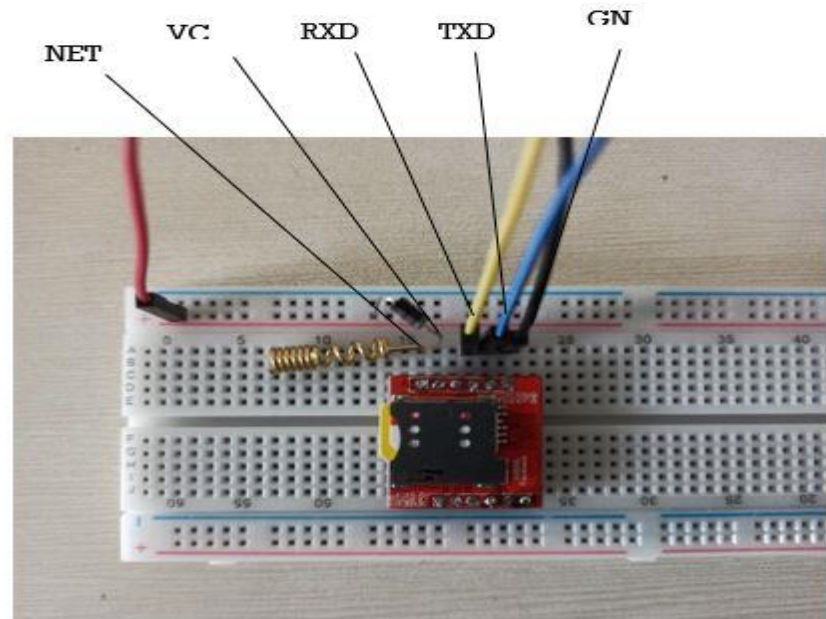
GND - Ground(GND from Arduino)

RXD - Receiving data from Arduino (connected to digital pin 7)

TXD - Transmitting data to Arduino (connected to digital pin 8)

NET - Network Pin

RST- reset the module



## 7.2 MFRC-522RFID MODULE

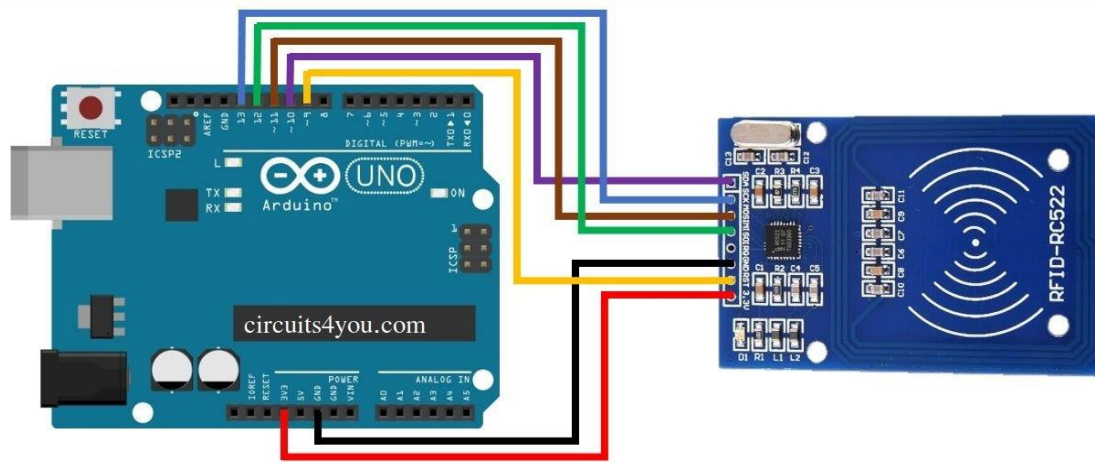


Figure 5 RFID Module connections

VCC - Voltage line for RFID module (3.3 V from Arduino)

GND - Ground(GND from Arduino)

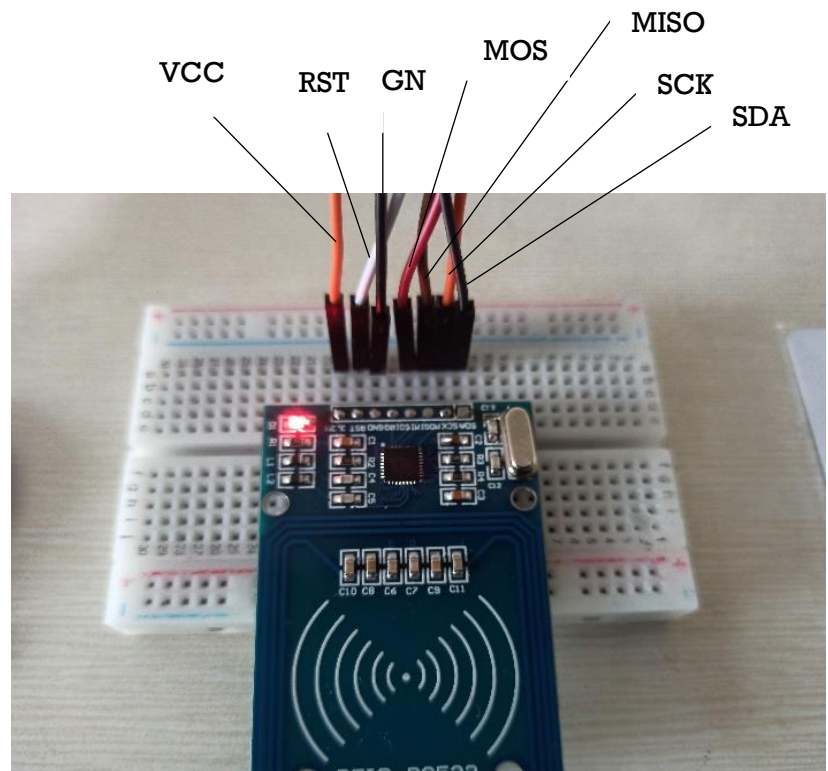
SDA- Serial Data Transmission between Arduino And RFID module (connected to digital pin 10)

SCK- Serial clock for synchronous data transmission (connected to digital pin 13)

MOSI – Master Out Slave In (connected to digital pin 12)

MOSI – Master In Slave Out (connected to digital pin 11)

RST- reset the module(connected to digital pin 9)



## 7.3 MLX90614 INFRARED TEMPERATURE SENSOR

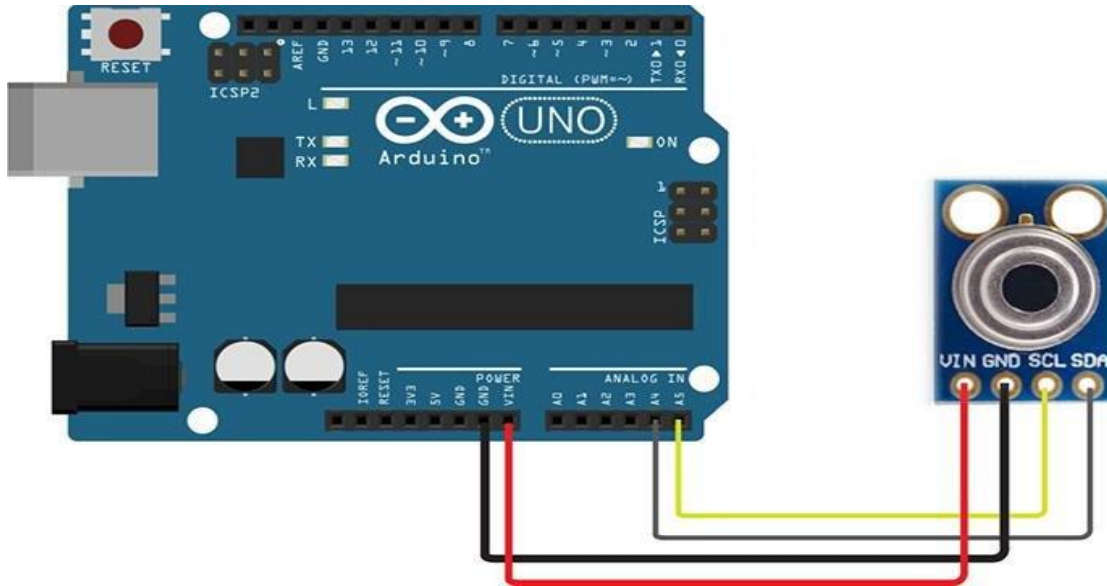


Figure 6 IR Module with Arduino

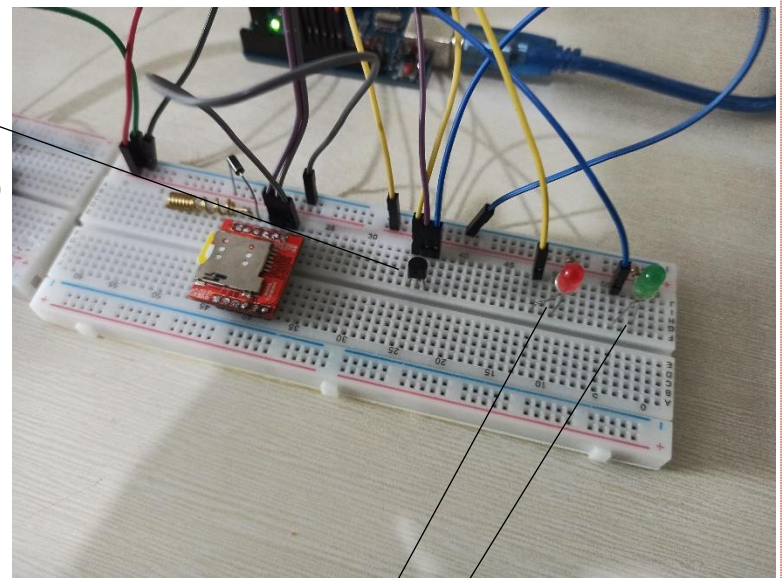
VCC/VIN - Voltage line (5 V from Arduino)

GND - Ground (GND from Arduino)

SDA- Serial Data Transmission between Arduino and sensor (connected to digital pin A5)

SCK- Serial clock for synchronous data transmission (connected to digital pin A4)

IR SENSOR  
(For Demonstration)



LED



## **8. TECHNICAL SPECIFICATIONS:**

COMPONENT	SPECIFICATION
Microprocessor	Arduino Uno R3
RFID sensor	MFRC 522
RFID Tag	Passive Tag - 13.6 kHz
GSM Module	SIM800L (with antenna)
Memory	32 kB
Operating Temperature	-5°C to 55°C
Body Temperature Scan Range	35°C to 42°C
Accuracy	+/- 0.25 F/C
RFID Scan Interval	2 Seconds
Time of Operation	6 Seconds
Feedback	Green and Red LEDs
Breadboard	300 Pin
Power	5V Adaptor
GSM Connection	2G/3G
Serial Connection	USB A(PC) to USB B (Serial Port)
Weight	0.3 KG
Water Resistant	No

TABLE 1 : Technical Specifications

## **9. FEATURES OF THIS DEVICE:**

- ❖ Quick, organized, and automated screening process.
- ❖ No contact scanning.
- ❖ Highly accurate infrared scanner which monitors body temperature.
- ❖ Easy-to-install system can be mounted near most entrances.
- ❖ Provides various notification options so organizations can decide how to respond to positive detections.
- ❖ High temperature notifications help to mitigate infection spread and instill confidence in workforce and customers.

## **10. APPLICATIONS OF THIS DEVICE:**

This device can be used in the following areas:

- ❖ **Schools and Colleges** - Every student is issued a card which is used for scanning and capturing attendance before he/she enters the school premises.
- ❖ **Offices and other workplaces**- Every employee is issued a card which is used for scanning and capturing attendance before he/she enters the office premises.
- ❖ **Public Libraries**: The library card could be integrated with an RFID tag to have record of temperature, entry and exit time of a user. This can aid a lot in contact tracing of infected people.
- ❖ **Hotels and lodges**: Visitors are issued a card upon check-in which they keep during the stay and must scan it every time they return to the hotel. The same card can also be used as the key to his room, making it a Smart Key-Card. He must surrender the keycard upon check-out.
- ❖ **Apartment entry gate**- Every person residing in an apartment can be issued a card which upon their exit can be swiped and temperature could be scanned.
- ❖ **Metro or other public transport cards**: The public transport cards could be integrated with this device which can really help a lot in contact tracing.

## **11. Further innovations and extensions:**

**This device can be further configured to be used for the following purposes:**

- ❖ **Mask detectors:** A mask detector could be added to ensure that only the employees wearing masks are granted entry. It would work on a simple facial recognition program to detect just the masks and not faces.
- ❖ **Facial recognition:** It can easily be integrated with AI based facial recognition systems and send temperature data as a cloud API to existing security systems.
- ❖ **Iris recognition:** After this pandemic ends this product can be further equipped with Iris or other Biometric detectors like fingerprint scanner to increase security.
- ❖ **Automated door:** It can be integrated with several types of motors digital relay ON/OFF via Modbus and serial port. Upon scanning the RFID card and temperature scanning, the door can be automatically opened with the help of aforementioned motors to increase automation.
- ❖ **Buzzers and Audible announcements:** It can be integrated with buzzers or announcement systems which can sound in case a person is detected with high body temperature.
- ❖ **Smartwatch and other wearables:** Instead of temperature scanning at the entry gate, the employees could be issued a wearable device which has to be worn at office hours. This will help in continuously monitoring the employee's health status.

## **12. CONCLUSION**

The objective of this device is to efficiently capture and store attendance and body temperature of an employee entering Adani Power Plant.

RFID tags will be embedded in the ID cards of each employee which will contain the essential information about the person. RFID scanner will scan the tag to read a specific Employee ID Number (EIN) and will match it with its existing database of employees. If it matches with the existing records, the person is welcomed into the building, else it displays “Unauthorized Access”. It will mark the entering and exiting time of the employee as well. This will mark the attendance and then the IR thermometer (which is placed near the forehead of the employee by the security-in-charge) will scan the body temperature and store it along with the attendance.

If the temperature is higher than a certain limit (here, 100 F), the device will flash a red signal and automatically send an SMS to the concerned person whose contact no. is fed into the device. If it is in the normal range, it will flash a green signal. The need for such a device arose when a pandemic called COVID-19 halted the world.

This device will try to make safe disease-free working environment for the employees, and they will be able to concentrate on their work with worrying about getting infected.

With this project we are trying to bring a cost-effective system which can help the organisations to monitor health of their employees and protect them from getting infected at the same time. This will enable the employees to work in a minimized risk environment so that they will be able to concentrate on their work and utilize their full potential.

**“WITH THIS DEVICE WE ARE TRYING TO MAKE WORK A SAFER PLACE FOR INDUSTRIES THAT DO NOT HAVE THE PRIVILEGE OF WORK-FROM-HOME SYSTEM”**

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## **14. GLOSSARY**

**Arduino** -Arduino is an open-source electronics platform based on easy-to-use hardware and software.

**Beacons** - These tags continuously transmit the signal every 3 to 5 seconds

**Breadboards**- A breadboard is used to build and test circuits quickly before finalizing any circuit design. The breadboard has many holes into which circuit components like ICs and resistors can be inserted.

**Electromagnetic fields**-An electromagnetic field (also EM field) is a classical (i.e. non-quantum) field produced by moving electric charges.

**Emissivity**-Emissivity is the measure of an object's ability to emit infrared energy. Emitted energy indicates the temperature of the object. Emissivity can have a value from 0 (shiny mirror) to 1.0 (blackbody).

**Frequency**-Frequency is the number of occurrences of a repeating event per unit of time.

**Infrared** - (of electromagnetic radiation) having a wavelength just greater than that of the red end of the visible light spectrum but less than that of microwaves. Infrared radiation has a wavelength from about 800 nm to 1 mm and is emitted particularly by heated objects.

**LF**- Low Frequency(125-134kHz)

**Microcontroller** -A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip.

**Radiant power**-In radiometry, radiant flux or radiant power is the radiant energy emitted, reflected, transmitted or received, per unit time, and spectral flux or spectral power is the radiant flux per unit frequency or wavelength, depending on whether the spectrum is taken as a function of frequency or of wavelength. The SI unit of radiant flux is the watt (W), that is the joule per second (J/s) in SI base units

**Transceiver**-A transceiver is a combination transmitter/receiver in a single package. The term applies to wireless communications devices such as cellular telephones, cordless telephone sets, handheld two-way radios, and mobile two-way radios.

**Transponder**-A transponder is a wireless communications, monitoring, or control device that picks up and automatically responds to an incoming signal. This term is a contraction of the terms - transmitter and responder.

**VHF**- Ultra High Frequency (865-960MHz)

**Zombie tags**- A tag in a deactivated state so that the tag cannot be read once it is out of the store. The tag is reactivated when it enters the store again. Such tags are called as zombie tags.