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# GROUP 5

## WORKSHOP PROJECT

# TEMPERATURE DETECTOR

## (A MINI-PROJECT REPORT)

SUBMITTED TO

DEPARTMENT OF

**ELECTRONICS AND COMMUNICATION ENGINEERING**

(INSTITUTE OF TECHNOLOGY)

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## BONAFIDE CERTIFICATE

This is to certify that the mini project report entitled **COVID-19 HUMAN TEMPERATURE DETECTOR AT DOORSTEP** is a bonafide record of the mini project done by:

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during the academic year 2021-2022 towards the partial fulfillment of the requirement of the award of **Bachelor Of Technology** degree in **Electronics and Communication Engineering** of **Guru Ghasidas Vishwavidyalaya, Bilaspur (Chhattisgarh).**

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# ACKNOWLEDGEMENT

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We give all honour and praise to GOD ALMIGHTY who gave as wisdom and guided us during the entire course of our project.

We express our heartfelt gratitude towards our project coordinators **Mr. CHANDAN TAMRAKAR** and **Mr. ANIL SONI**, electronics and communication engineering, for granting us permission to work on this mini project.

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# INTRODUCTION

Corona virus disease (COVID-19) is an irresistible infection caused by a newfound Corona virus. A great many people tainted with the COVID-19 infection will encounter mellow to direct respiratory ailment and recoup without requiring exceptional treatment. More seasoned individuals and people with fundamental clinical issues like cardiovascular infection, diabetes, ongoing respiratory ailment, and malignant growth are sure to create genuine ailment. The most ideal approach to forestall and hinder transmission is to be all around educated about the COVID-19 infection, the illness it causes and the way it spreads. Shield yourself as well as other people from disease by washing your hands or utilizing a liquor-based rub regularly, not contacting your face and wearing a veil. The first three parts need to be governed by ourselves but it can either urge people or motivate them to check their body temperature, the proposed project implementation has attempted to safe people by checking their body temperature at entry level, which are essential for their own and other's safety.

This project presents the overall design of human temperature detection. This system is designed to assist and provide support in order to fulfill the needs of temperature measurement. In this project, we acquaint a moderate arrangement pointing with increment COVID-19 indoor wellbeing, covering contactless temperature detecting. This project is a simple project which can be used as a thermometer. It consists of very little parts which is cheap and reliable.

The project is a temperature sensor made with an Arduino UNO and LM35 sensor and a few other components. The working of the project starts with the LM35 sensor that senses the change in temperature of the surrounding, and uses that temperature difference to produce a voltage signal which is processed by the Arduino and provide an alarm if the temperature crosses the limit.

# AIM

The main aim of the project is to detect the temperature of human below a certain level, if it crosses it, automatic alarm system got awakened.

# PRINCIPLE

COVID-19 HUMAN TEMPERATURE DETECTOR works on the principle of detecting the human temperature. This detecting of temperature is done with the help of Arduino, buzzer and temperature sensor.

# MATERIAL REQUIRED

| | NAME | QUANTITY | COMPONENT |
|---|---|---|---|
| 1) | U1 | 1 | Arduino UNO R3 |
| 2) | U2 | 1 | Temperature sensor (TMP36) |
| 3) | D1 | 1 | Blue LED |
| 4) | D2 | 1 | Green LED |
| 5) | D3 | 1 | Red LED |
| 6) | PIEZO1 | 1 | Piezo |
| 7) | R1<br>R2<br>R3 | 3 | 100Ω Resistor |

# COMPONENT DESCRIPTION

## ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features an ATmega16U2 programmed as a USB-to-serial converter. This auxiliary microcontroller has its own USB boot loader, which allows advanced users to reprogram it.

The Arduino has a large support community and an extensive set of support libraries and hardware add-on “shields” making it a great introductory platform for embedded electronics.



The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program. The Arduino has an extensive

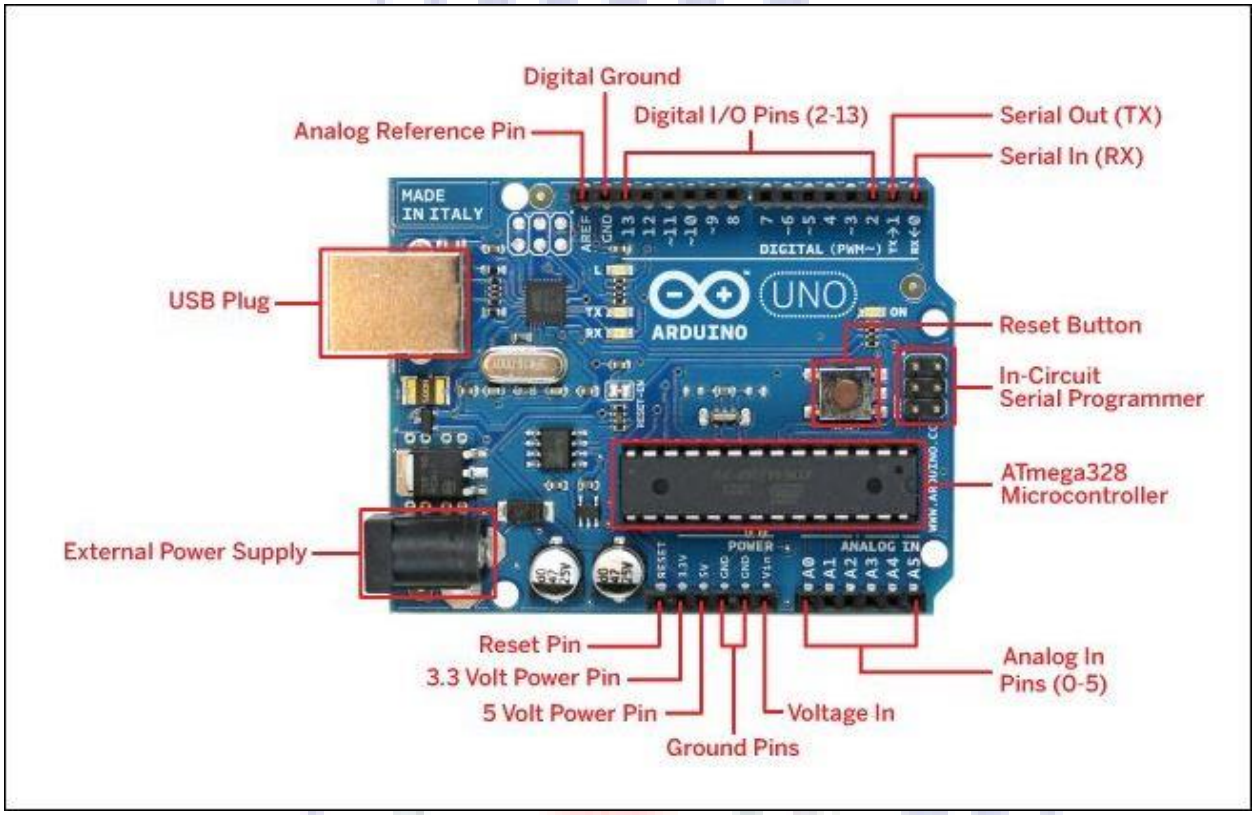
support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno.

## SPECIFICATIONS:

- It is an ATmega328P based Microcontroller
- The Operating Voltage of the Arduino is 5V
- The recommended input voltage ranges from 7V to 12V
- The input voltage (limit) is 6V to 20V
- Digital input and output pins-14
- Digital input & output pins (PWM)-6
- Analog input pins are 6
- DC Current for each I/O Pin is 20 mA
- DC Current used for 3.3V Pin is 50 mA
- Flash Memory -32 KB, and 0.5 KB memory is used by the boot loader
- SRAM is 2 KB
- EEPROM is 1 KB
- The speed of the CLK is 16 MHz
- In Built LED
- Length and width of the Arduino are 68.6 mm X 53.4 mm
- The weight of the Arduino board is 25 g

## ARDUINI UNO R3 PIN DIAGRAM:

The **Arduino Uno R3 pin diagram** is shown below. It comprises 14-digit I/O pins. From these pins, 6-pins can be utilized like PWM outputs. This board includes 14 digital input/output pins, Analog inputs-6, a USB connection, quartz crystal-16 MHz, a power jack, a USB connection, resonator-16Mhz, a power jack, an ICSP header an RST button.




## Power Supply

The power supply of the Arduino can be done with the help of an exterior power supply otherwise USB connection. The exterior power supply (6 to 20 volts) mainly includes a battery or an AC to DC adapter. The connection of an adapter can be done by plugging a center-positive plug (2.1mm) into the power jack on the board. The battery terminals can be placed in the pins of Vin as well as GND. The power pins of an Arduino board include the following.

**Vin**
The input voltage or Vin to the Arduino while it is using an exterior power supply opposite to volts from the connection of USB or else RPS (regulated power supply). By using this pin, one can supply the voltage.

**5 Volts**
The RPS can be used to give the power supply to the microcontroller as well as components which are used on the Arduino board. This can approach from the input voltage through a regulator.

**3.3V**
A 3.3 supply voltage can be generated with the onboard regulator, and the highest draw current will be 50 mA.

**GND**
GND (ground) pins

## Memory

The memory of an ATmega328 microcontroller includes 32 KB and 0.5 KB memory is utilized for the Boot loader), and also it includes SRAM-2 KB as well as EEPROM-1KB.

## Input and Output

We know that an Arduino Uno R3 includes 14-digital pins which can be used as an input otherwise output by using the functions like pin Mode (), digital Read(), and digital Write(). These pins can operate with 5V, and every digital pin can give or receive 20mA, & includes a 20k to 50k ohm pull up resistor. The maximum current on any pin is 40mA which cannot surpass for avoiding the microcontroller from the damage. Additionally, some of the pins of an Arduino include specific functions.

### Serial Pins
The serial pins of an Arduino board are TX (1) and RX (0) pins and these pins can be used to transfer the TTL serial data. The connection of these pins can be done with the equivalent pins of the ATmega8 U2 USB to TTL chip.

### External Interrupt Pins
The external interrupt pins of the board are 2 & 3, and these pins can be arranged to activate an interrupt on a rising otherwise falling edge, a low-value otherwise a modify in value

### PWM Pins
The PWM pins of an Arduino are 3, 5, 6, 9, 10, & 11, and give an output of an 8-bit PWM with the function analogWrite ().

### SPI (Serial Peripheral Interface) Pins
The SPI pins are 10, 11, 12, 13 namely SS, MOSI, MISO, SCK, and these will maintain the SPI communication with the help of the SPI library.

### LED Pin
An arguing board is inbuilt with a LED using digital pin-13. Whenever the digital pin is high, the LED will glow otherwise it will not glow.

### TWI (2-Wire Interface) Pins
The TWI pins are SDA or A4, & SCL or A5, which can support the communication of TWI with the help of Wire library.

### AREF (Analog Reference) Pin
An analog reference pin is the reference voltage to the inputs of analog inputs using the function like analog Reference ().

### Reset (RST) Pin
This pin brings a low line for resetting the microcontroller, and it is very useful for using an RST button toward shields which can block the one over the Arduino R3 board.

## Communication

The communication protocols of an Arduino Uno include SPI, I2C, and UART serial communication.

### UART
An Arduino Uno uses the two functions like the transmitter digital pin1 and the receiver digital pin0. These pins are mainly used in UART TTL serial communication.

### I2C
An Arduino UNO board employs SDA pin otherwise A4 pin & A5 pin otherwise SCL pin is used for I2C communication with wire library. In this, both the SCL and SDA are CLK signal and data signal.

### SPI Pins
The SPI communication includes MOSI, MISO, and SCK.

## MOSI (Pin11)

This is the master out slave in the pin, used to transmit the data to the devices

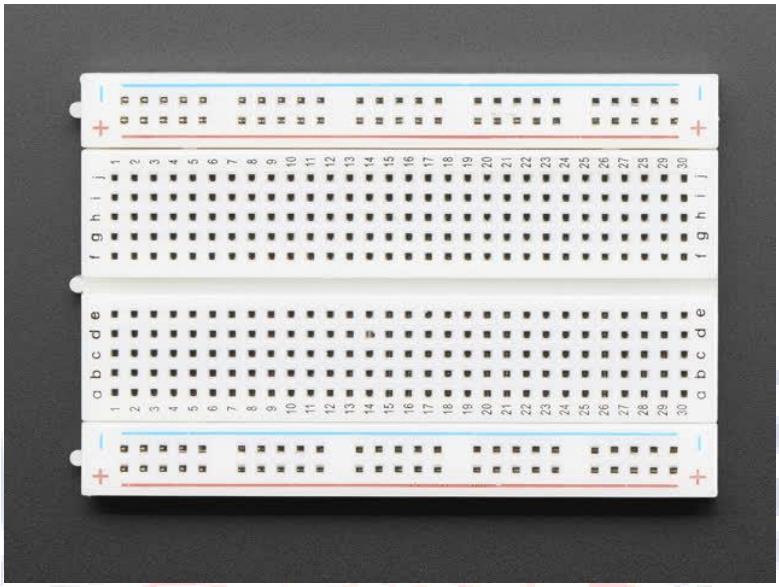
## MISO (Pin12)

This pin is a serial CLK, and the CLK pulse will synchronize the transmission of which is produced by the master.

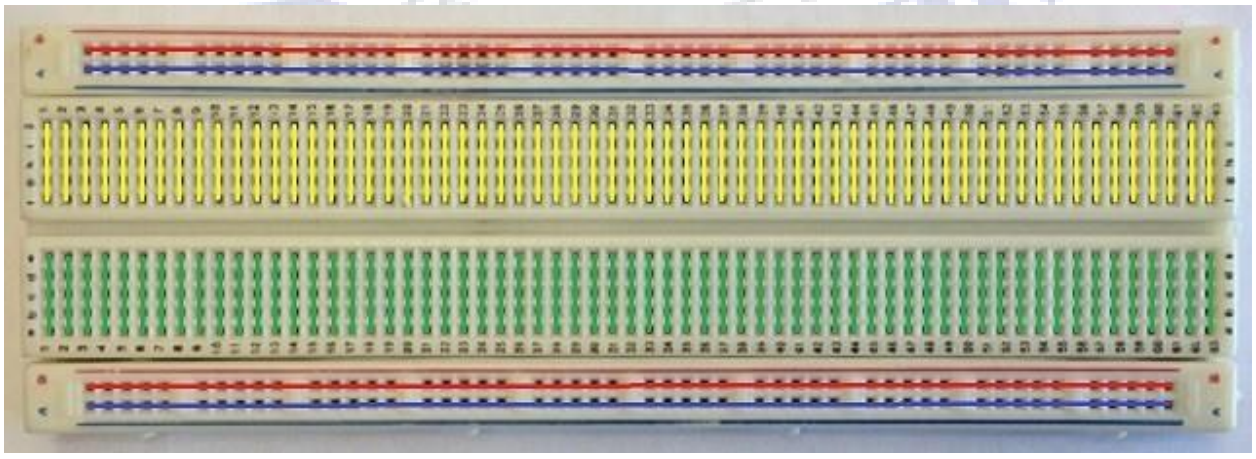
## SCK (Pin13)

The CLK pulse synchronizes data transmission that is generated by the master. Equivalent pins with the SPI library is employed for the communication of SPI. ICSP (in-circuit serial programming) headers can be utilized for programming AT mega microcontroller directly with the boot loader.

# BREADBOARD

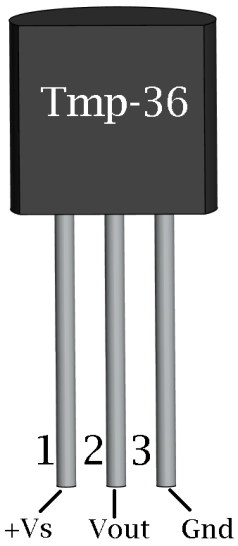


**Breadboard** is a plastic board with a bunch of tiny holes and is used for building and testing circuits. It has holes on them which are connected internally in a particular pattern as shown in the below picture. The holes which are connected through green line represents they are connected internally. The Red line indicates Power, which is normally connected to the power rail. The Blue line indicates Ground, which is normally connected to the ground of the circuit. IC's like Decade Counter can be placed in the middle breadboard to share the 1st eight pins to the yellow line and the 2nd eight pins to the green lines.



# TMP36 TEMPERATURE SENSOR

TMP36 is a temperature sensor chip which generates an analog voltage at the output which is linearly proportional to the Celsius temperature. Then convert this voltage into temperature based on a 10 mV/°C scale factor. It has a shutdown capability which limits the output current to less than 0.5 µA. It provides a supply current of up to 50 µA.


## PIN CONFIGURATION

| Pin No. | Pin Name | Description |
|---|---|---|
| 1 | +Vs | Positive supply pin |
| 2 | Vout | Output voltage pin |
| 3 | Gnd | Ground pin |

## FEATURES

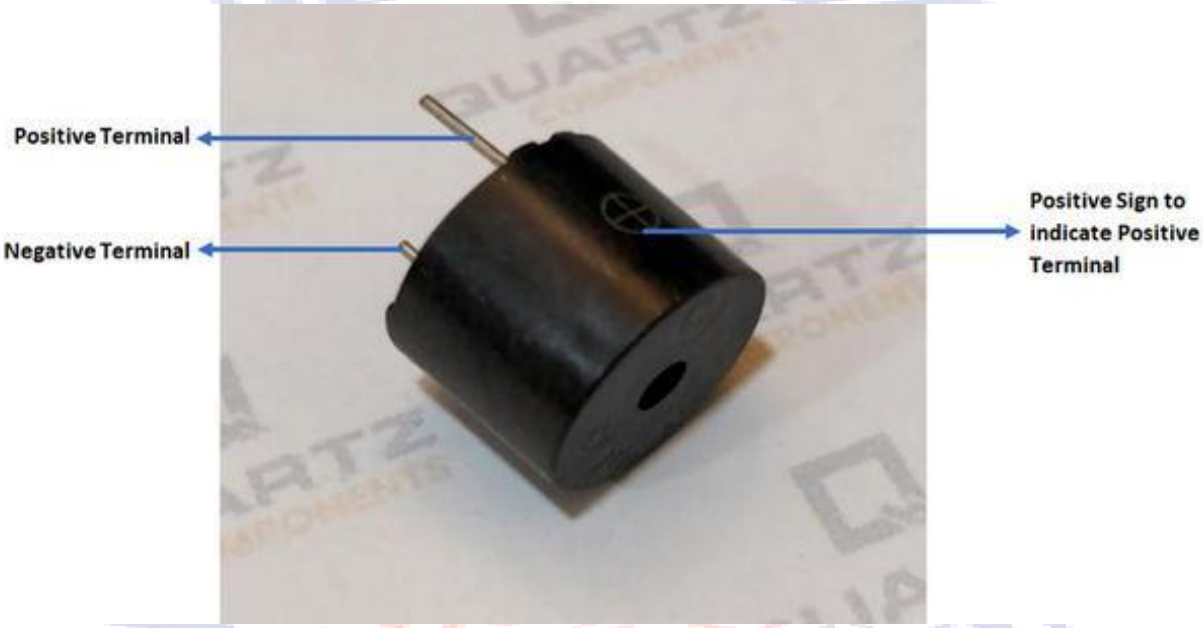
- Operate on low voltage
- 10 mV/°C scale factor
- ±2°C Temperature accuracy
- ±0.5°C linearity
- External Calibration not required
- Stable with large capacitive loads
- Specified −40°C to +125°C, operation to +150°C
- Less than 50 µA quiescent current
- Auto Shutdown current 0.5 µA max
- Low self-heating Qualified for automotive applications

## TECHNICAL SPECIFICATION

- Supply Voltage: 2.7 V to 5.5 V
- Supply Current up to 50uA
- Ramp-Up Rate 3°C/sec
- Ramp-Down Rate −6°C/sec
- Offset Voltage: 0.5V
- Output voltage at 25°C: 750mV
- Device turning ON time: 0.5ms
- Operating Temperature Range: −55°C to +150°C
- Storage Temperature Range: −65°C to +160°C
- Package Available: TO-92; SOIC_N; SOT-23

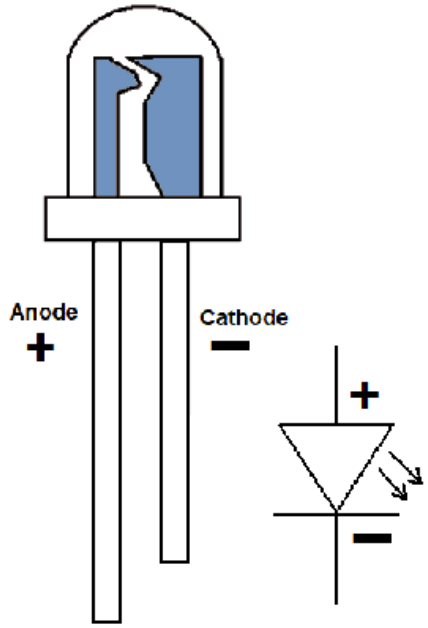
# PIEZO BUZZERS

Piezo buzzers are simple devices that can generate basic beeps and tones. They work by using a piezo crystal, a special material that changes shape when voltage is applied to it. If the crystal pushes against a diaphragm, like a tiny speaker cone, it can generate a pressure wave which the human ear picks up as sound. Simple change the frequency of the voltage sent to the piezo and it will start generating sounds by changing shape very quickly.




- Negative pin needs to be connected to ground (0v).
- Positive pin receives the control signal from Arduino.

# LIGHT EMITTING DIODE (LED)




The Light Emitting Diode or LED has polarity i.e.it has a positive and negative pin. The pin which is long is the positive pin (anode) and the pin which is short is the negative pin (cathode) as shown in the above LED pinout.

# CONSTRUCTION OF TEMPERATURE DETECTOR

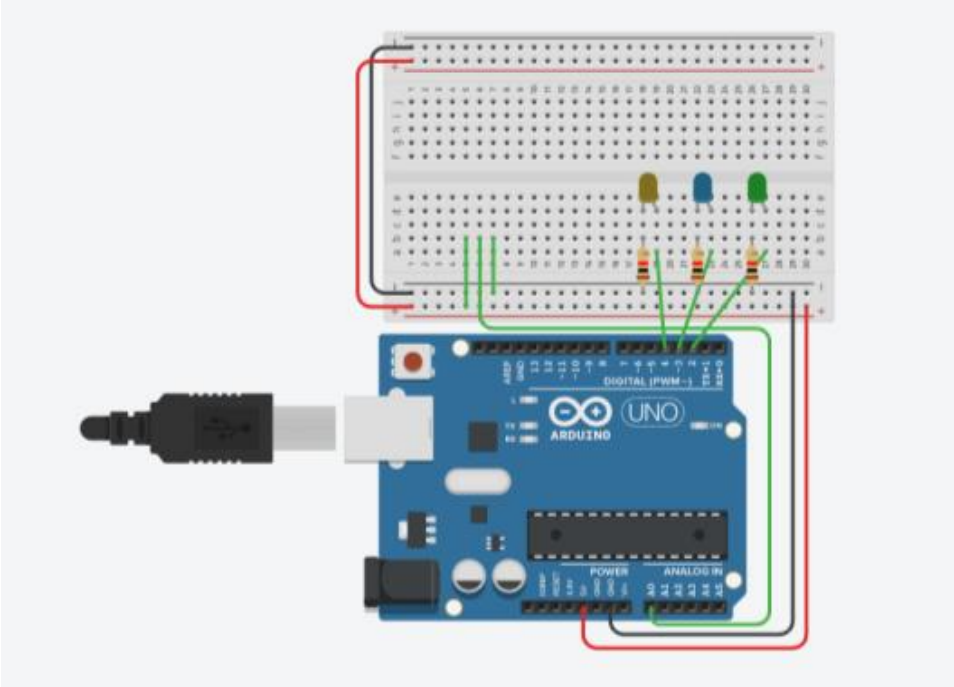
## STEP 1: BUILD THE LED CIRCUIT

Start by wiring up your Arduino and breadboard with power and ground next to the example circuit, and then add the three LEDs to the breadboard. Drag an Arduino Uno and breadboard from the components panel to the work plane.

Connect the 5 volt and ground pins on the Arduino to the power (+) and ground (-) rails on the breadboard with wires.

Drag three LEDs on the breadboard in row E, spaced 2 breadboard sockets apart.

Use a 220 Ohm resistor to connect each LED's cathode (left leg) to the ground rail (black) of the breadboard. Connect the LED anodes (right, longer legs) to digital pins 4, 3, and 2 on the Arduino. The LED anode (+) is the terminal that current flows into. The cathode (-) is the terminal that current flows from. This connects to the ground rail.



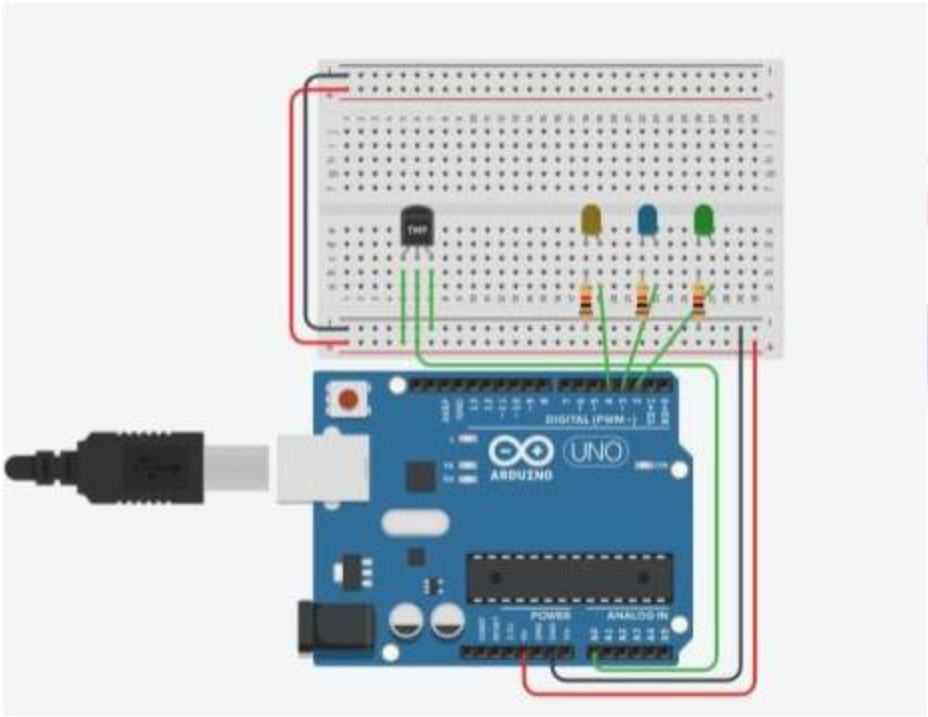
## STEP 2: ADD TEMPERATURE SENSOR

A temperature sensor creates a changing voltage signal depending on the temperature it senses. It has three pins: one that connects to ground, another which connects to 5 volts, and a third that outputs a variable voltage to your Arduino.

TMP36 is convenient because its output voltage is directly proportional to temperature in degrees Celsius.

Place the temperature sensor (TMP36) on the breadboard with the rounded part facing away from the Arduino, as shown in the below figure. Place the temperature sensor on the breadboard in row E, as shown below.

Wire up the temperature sensor so the left pin connects to the 5V voltage rail, the center pin connects to A0 on the Arduino, and the right pin connects to the GND rail.



## STEP 3: INTERFACE PIEZO WITH ARDUINO

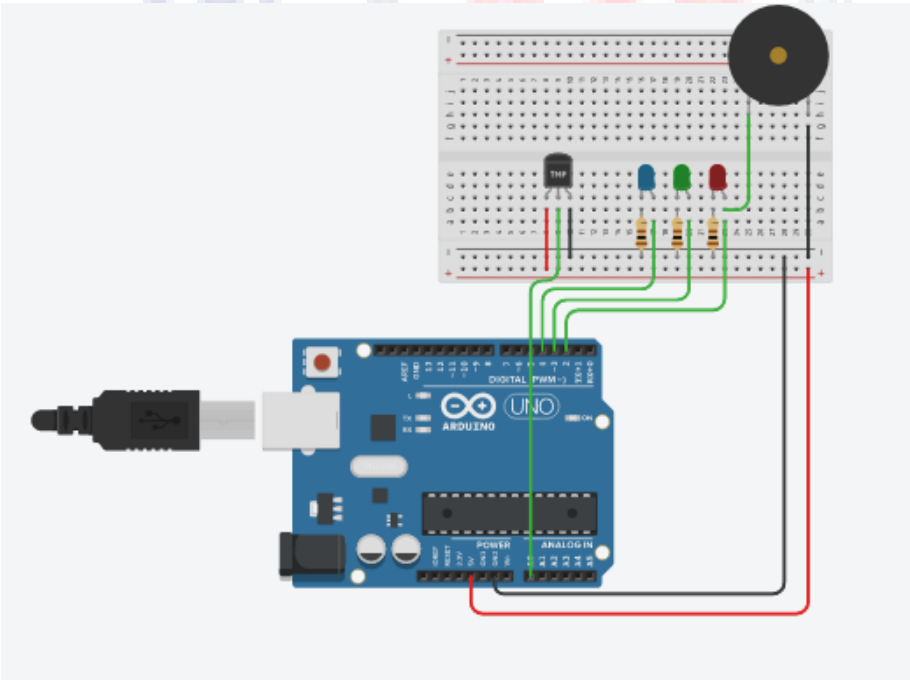
Place your PIR sensor on the breadboard and connect it with Arduino with the following Connections:

1. GND pin (PIR) --> GND rail (Breadboard),

2. Power Pin (PIR) --> +5v rail (Breadboard),

3. Signal Pin (PIR) --> Digital pin 2 (Arduino).

After interfacing all the components your circuit has been completed for Covid-19 Human Temperature Detector



## STEP 4: BLOCK CODE

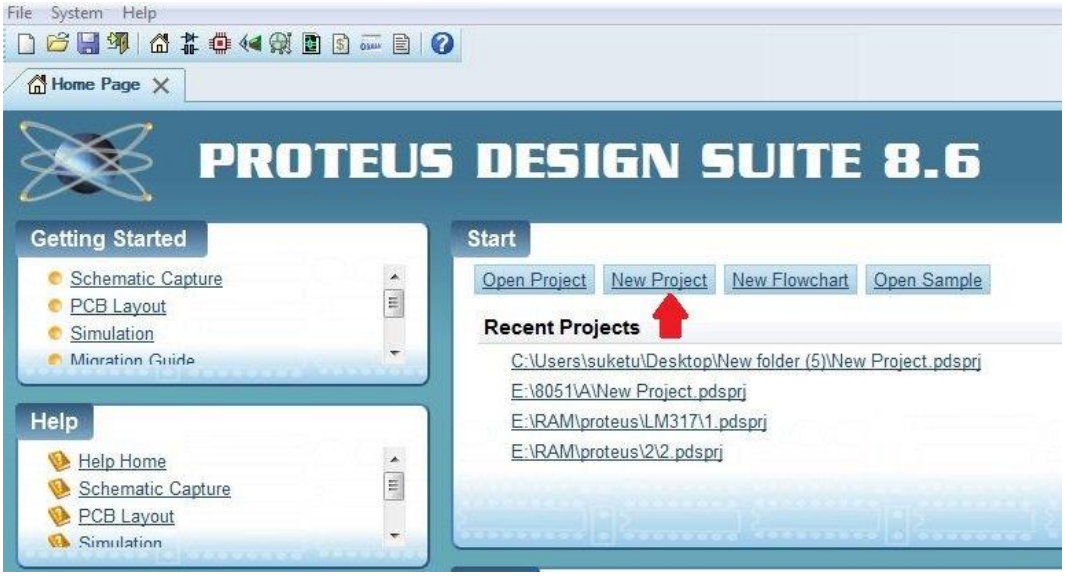
```
int sensorPin = A0;

int sensorInput;

double temp;
```

```
void setup()
{
  pinMode(A0, INPUT);
  Serial.begin(9600);  //data transfer rate bits/sec
  pinMode(2, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(4, OUTPUT);
}

void loop()
{
  sensorInput = analogRead(A0);
  temp = (double)sensorInput / 1024; // find % of input reading
  temp = temp * 5;
  temp = temp - 0.5;
  temp = temp * 100;

        if (temp < 0)
        {
          digitalWrite(2, LOW);
          digitalWrite(3, LOW);
          digitalWrite(4, HIGH);
        }
```

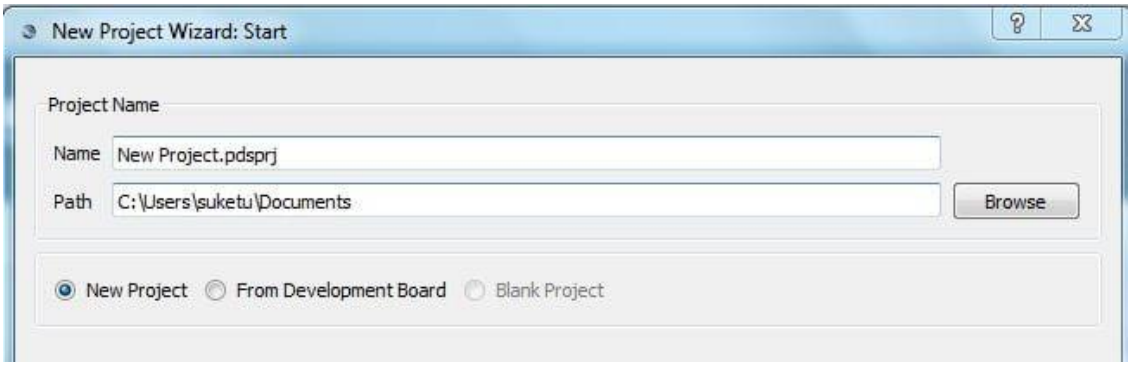
```
        if (temp <=60 && temp >= 0)
        {
          digitalWrite(2, LOW);
          digitalWrite(3, HIGH);
          digitalWrite(4, LOW);
        }

        if (temp > 60)
        {
          digitalWrite(3, LOW);
          digitalWrite(4, LOW);
          delay(500);
          digitalWrite(2, HIGH);
          delay(500);
          digitalWrite(2, LOW);
        }

  Serial.print("Current Temperature: ");
  Serial.print(temp);
  Serial.println(" C");
}
```

# VIRTUAL CONSTRUCTION AND SIMULATION USING PROTEUS SOFTWARE

1. In Proteus, create a new project.

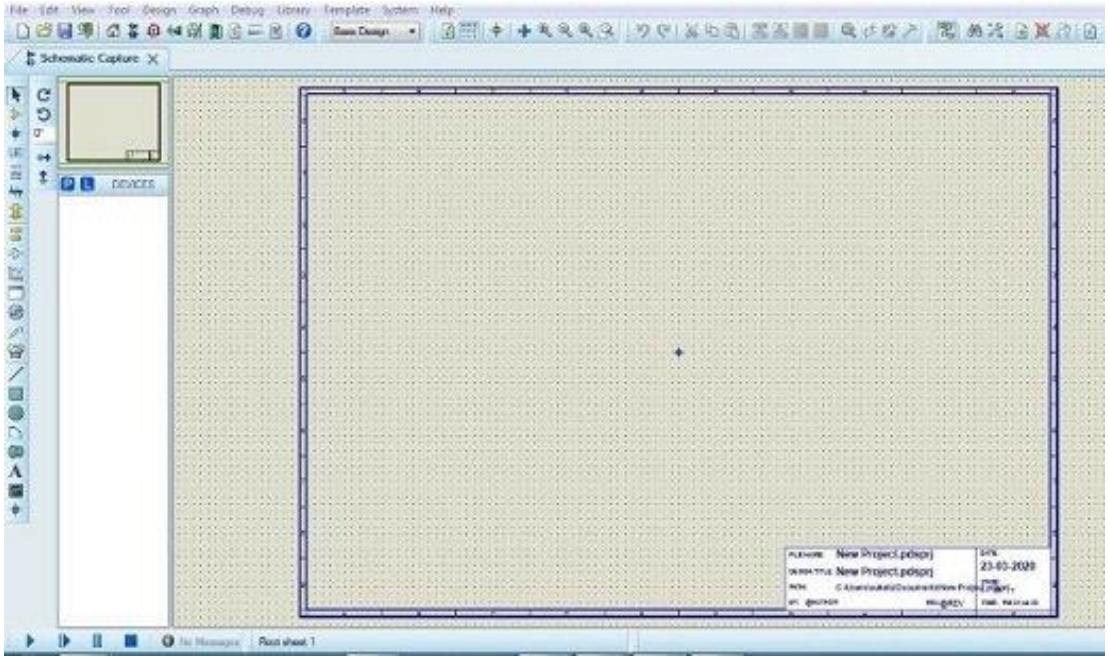



2. Decide where you would like to save your project.

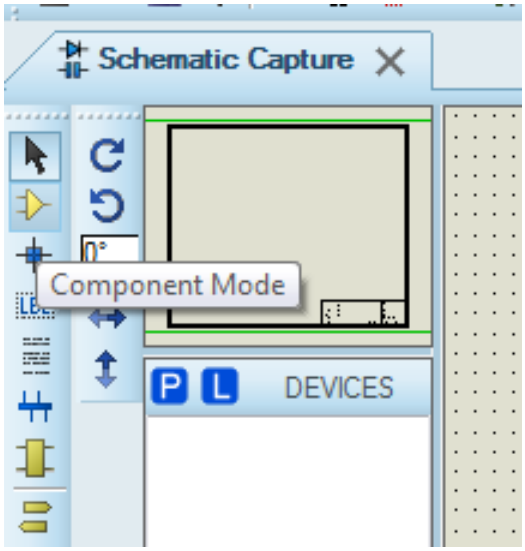



Click Next once you are done and select the appropriate page layout according to your needs.

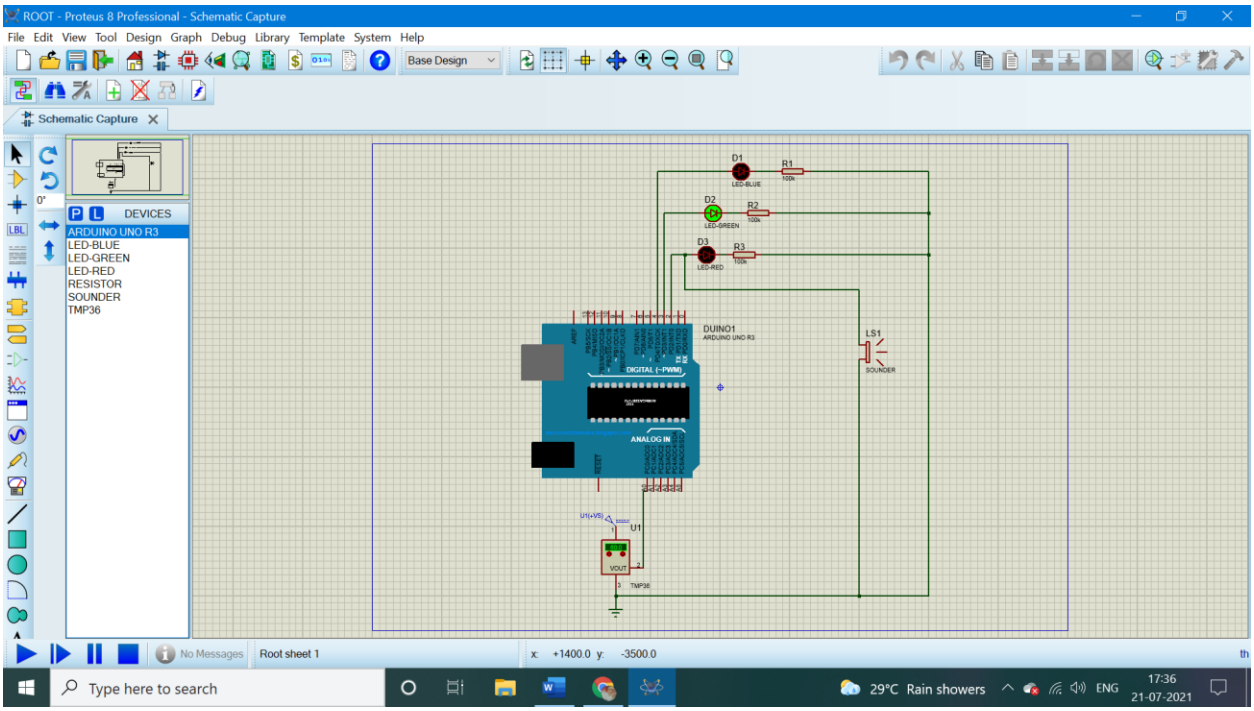
3. After finishing the settings, you will land on the empty workspace. Here, you can place components from the library.



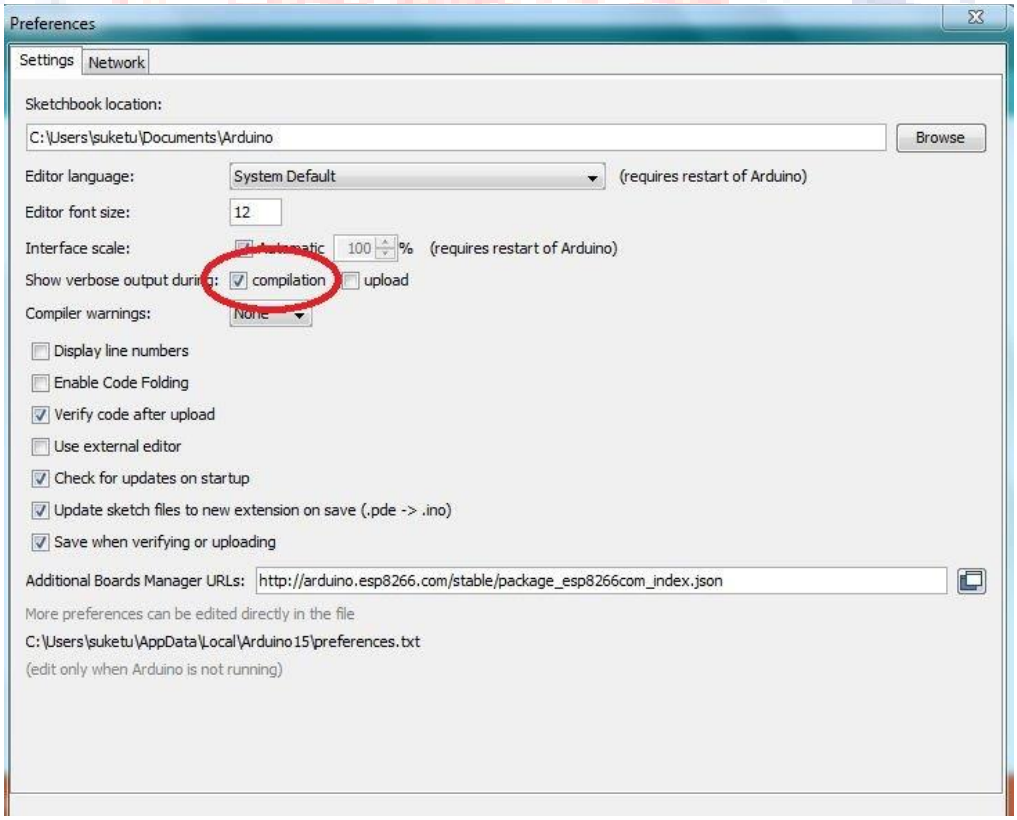
4. Click P, which will cause a list of components to pop up. Here, you can find all types of components and footprints for simulation.



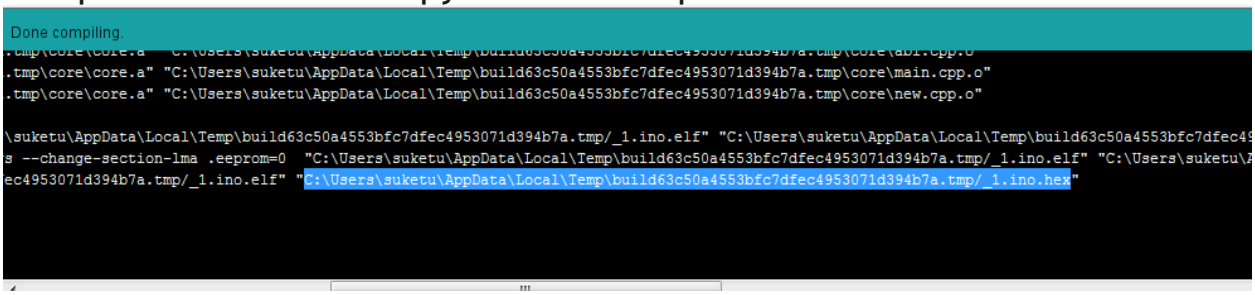

5. After selecting the library and clicking OK, click the spot on the workspace where you would like to drop the component. By this process we will complete our below given circuit.



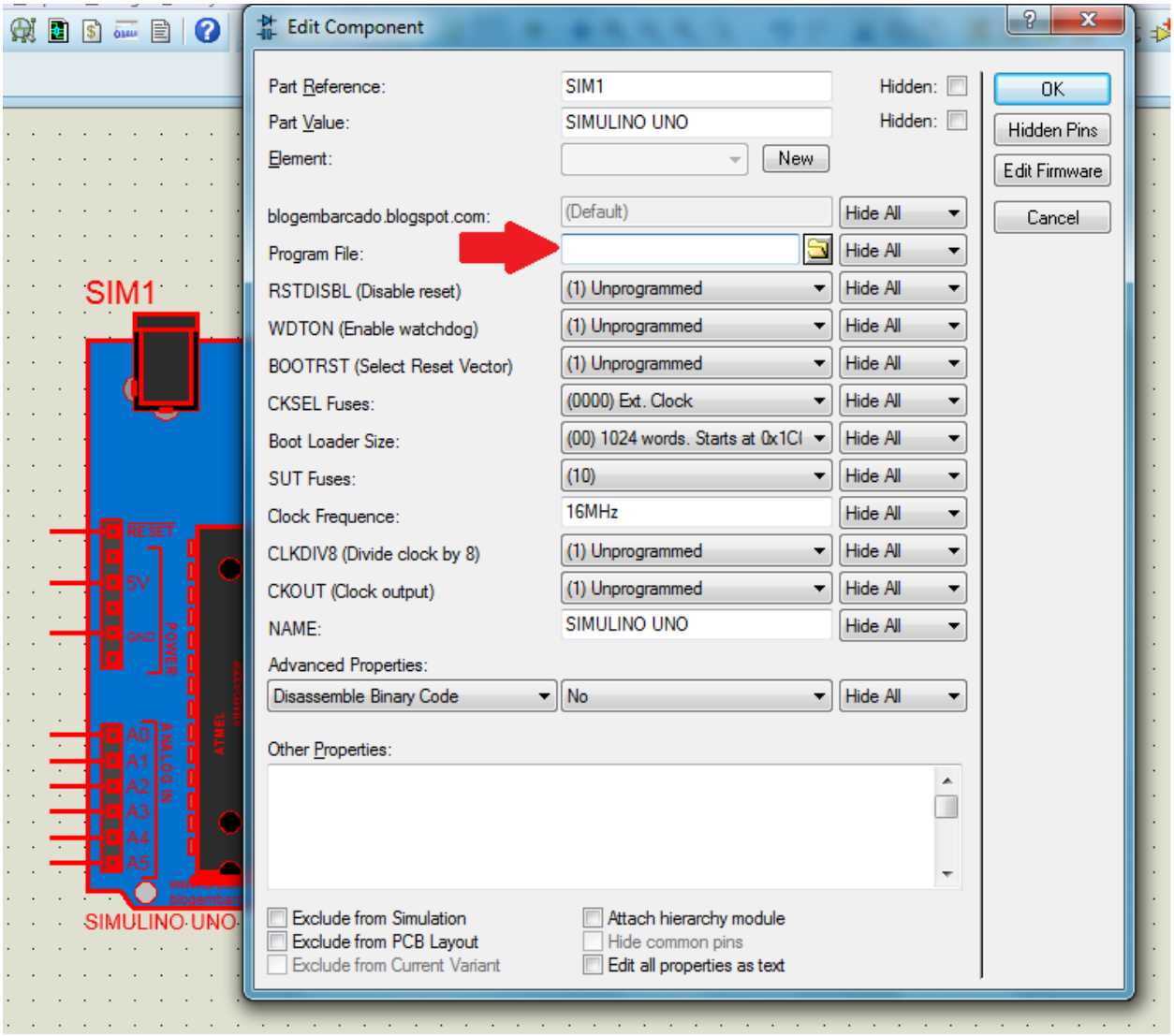

6. Once you are done making the connections, open your code in Arduino IDE.Check whether the compilation option is checked to generate the hex file. It can be found from **File —> Preferences.**



7. Compile the code and copy the hex file-path.

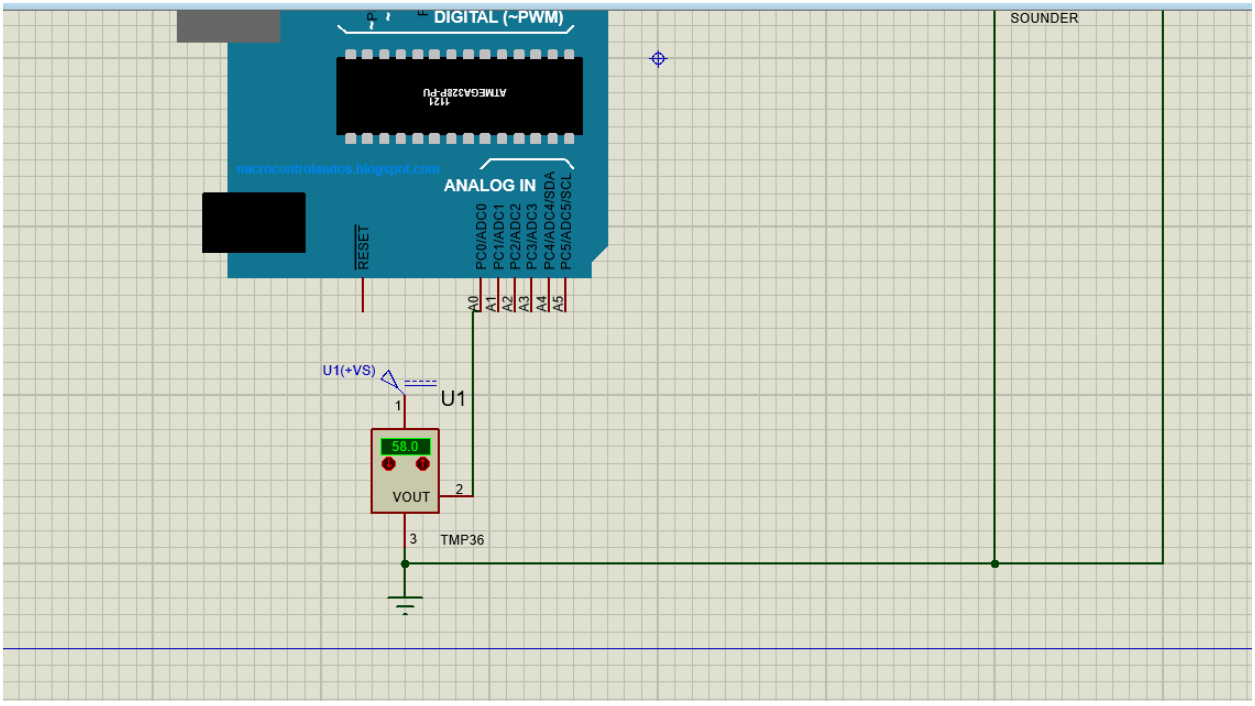



8. Double click on the Arduino board to insert the hex file of code.




9. After inserting a hex file, you can start the simulation by pressing the play key.

10. Adjust temperature from ‘+’ and ‘-’ sign of TMP36.

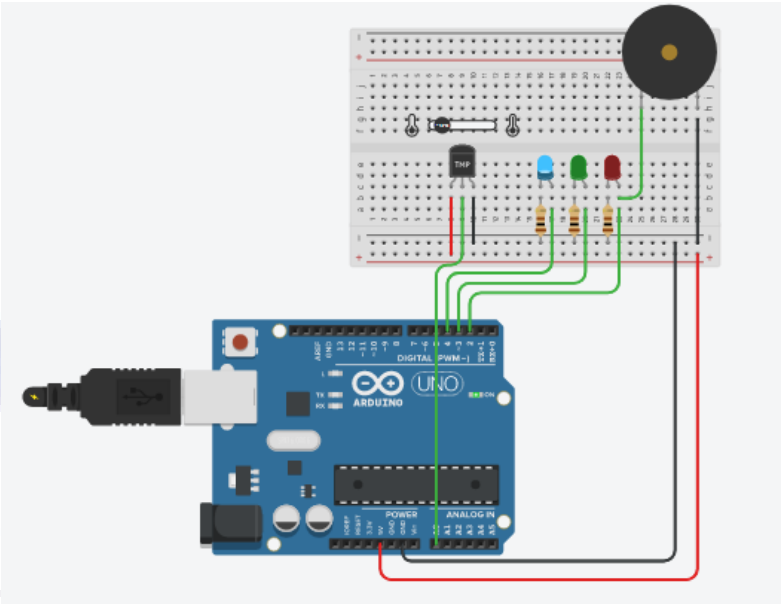



# WORKING

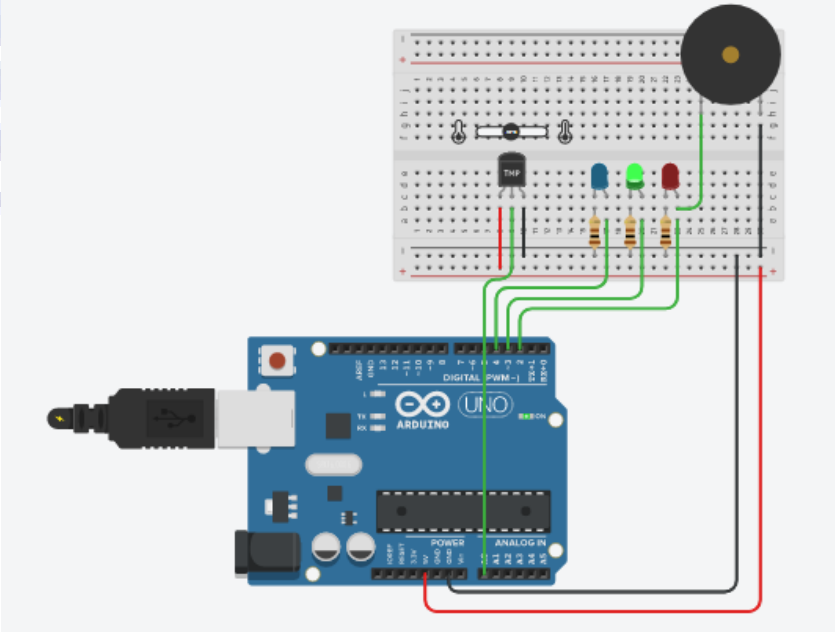
HUMAN TEMPERATURE DETECTOR is built with Arduino Uno, a TMP36 temperature sensor which is used for checking the temperature and alarming as required. The TMP36 sensor uses the property of diodes; as a diode changes temperature the voltage changes with it at a known rate. The sensor measures the small change and outputs an analog voltage between 0 and 1.75VDC based on it. When sensor detects temperature above a certain specified level it’s pop-ups with the help of buzzer and an alarming sound is tuned.

# OBSERVATIONS

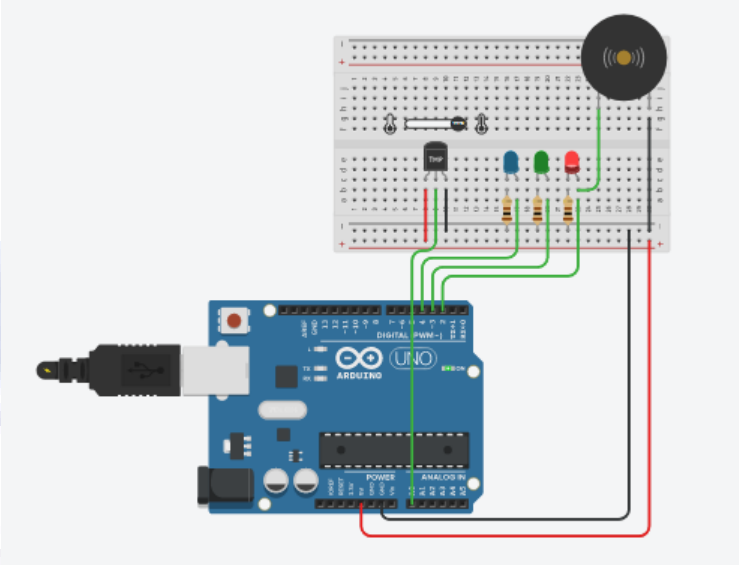
CASE 1: When sensor temperature detects temperature less than 20°C, blue LED will glow.




CASE 2: When sensor temperature detects temperature less than 38°C, green LED will glow signifying OK body temperature.



CASE 3: When sensor temperature detects temperature above 38°C, red LED will glow with buzzer beep sound, signifying Danger body temperature.



# ADVANTAGES

The TMP36 temperature sensor is an easy way to measure temperature using an Arduino. The sensor can measure a fairly wide range of temperature (-50°C to 125°C), is fairly precise (0.1°C resolution), and is very low cost, making it a popular choice. Hence making HUMAN TEMPERATURE DETECTOR, a popular choice.

# PRECAUTIONS

The TMP36 temperature sensor is not weatherproof, so it will need to be shielded from direct exposure to the elements.