EMBEDDED SYSTEM REPORT
On

# "ROOM TEMPERATURE SENSOR"

Submitted in the fulfillment of the requirements
For the Degree of
Bachelor of Technology
In
Electronics & Telecommunication Engineering
By


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Under the guidance of
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Academic Year 2022-23


**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)**
**COLLEGE OF ENGINEERING, PUNE – 4110043**
**DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING**

# CERTIFICATE

Certified that the project report entitled, "**ROOM TEMPERATURE SENSOR"** is a bona fide work done by **Snehal Prusty, Utkarsh Singh and Archit Saini** in fulfillment of the requirements for the award of degree of Bachelor of Technology in Electronics & Telecommunication Engineering.

Date:

Prof. Pallavi Deshpande
Project Coordinator

# ACKNOWLEDGEMENT

We would like to extend our sincere gratitude to the Principal **Vidula Sohoni** , Head of Department Electronics & Telecommunication, **Prof. S. K. Oza**, for nurturing a congenial yet competitive environment, which motivates all the students not only to pursue goals but also to elevate the Humanitarian level.

Inspiration and guidance are invaluable in every aspect of life, which we have received from our respected project guide **Prof. Pallavi Deshpande,** who gave us his careful and ardent guidance because of which we are able to complete this project. More words won't suffice to express our gratitude to his untiring devotion. He undoubtedly belongs to the members of the artistic gallery who are masters in all aspects.

We would also like to thank all the faculty members who directly or indirectly helped us from time to time with their invaluable inputs.

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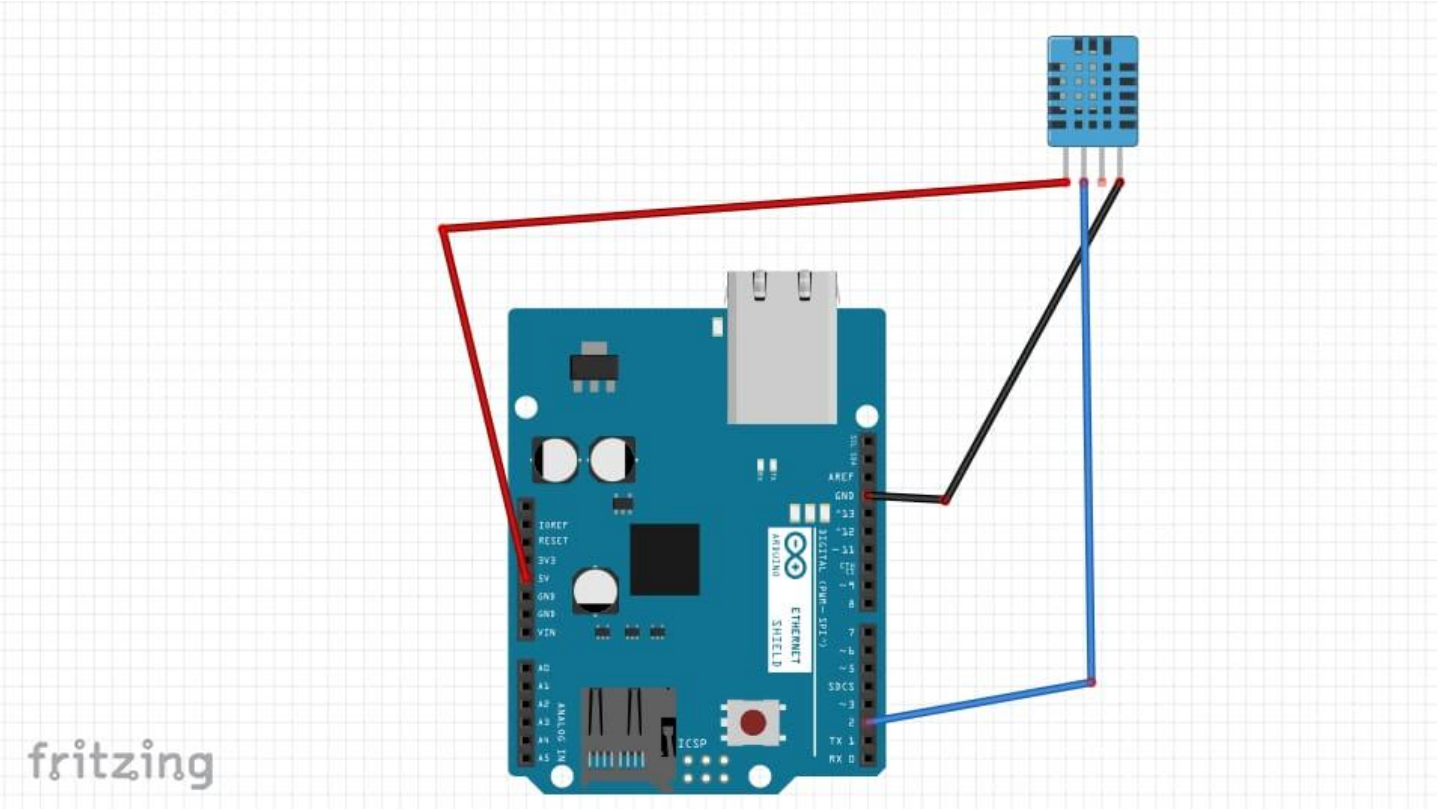
# ABSTRACT

A dht11 sensor is used  with arduino uno to sense temperature and humidity of the environment. It regularly sends the temperature update to the device connected to it .
It is a very useful device , as we know it is used in airports , railway stations to display the current temperature and humidity in the air .
This device use time gap of 250ms to display the next reading which makes it good.

We used

- Arduino Uno
- Dht11 Sensor
- Jumper wires (male to female)
- Arduino IDE
- Lan Cable



# INTRODUCTION

We all use temperature sensors in our daily lives, be it in the form of thermometers, domestic water heaters, microwaves, or refrigerators. Usually, temperature sensors have a wide range of applications, geotechnical monitoring field, being one of them.

Temperature sensors are a simple instrument that measures the degree of hotness or coolness and converts it into a readable unit. But, have you ever wondered how the temperature of the soil, boreholes, huge concrete dams or buildings is measured? Well, this is accomplished through some of the specialised temperature sensors.

Temperature sensors are designed to keep a regular check on concrete structures, bridges, railway tracks, soil, etc.

# What are the temperature sensors

A temperature sensor is a device, typically, a thermocouple or resistance temperature detector, that provides temperature measurement in a readable form through an electrical signal.

A thermometer is the most basic form of a temperature meter that is used to measure the degree of hotness and coolness.

Temperature meters are used in the geotechnical field to monitor concrete, structures, soil, water, bridges etc. for structural changes in them due to seasonal variations.

A thermocouple (T/C) is made from two dissimilar metals that generate an electrical voltage in direct proportion with the change in temperature. An RTD (Resistance Temperature Detector) is a variable resistor that changes its electrical resistance in direct proportion with the change in the temperature in a precise, repeatable and nearly linear manner.

# What do temperature sensors do

A temperature sensor is a device that is designed to measure the degree of hotness or coolness in an object. The working of a temperature meter depends upon the voltage across the diode. The temperature change is directly proportional to the diode's resistance. The cooler the temperature, lesser will be the resistance, and vice-versa.

The resistance across the diode is measured and converted into readable units of temperature (Fahrenheit, Celsius, Centigrade, etc.) and, displayed in numeric form over readout units. In geotechnical monitoring field, these temperature sensors are used to measure the internal temperature of structures like bridges, dams, buildings, power plants, etc.

# What is a temperature sensor used for?

Well, there are many types of temperature sensors, but, the most common way to categorise them is based upon the mode of connection which includes, contact and non-contact temperature sensors.

Contact sensors include thermocouples and thermistors because they are in direct contact with the object they are to measure. Whereas, the non-contact temperature sensors measure the thermal radiation released by the heat source. Such temperature meters are often used in hazardous environments like nuclear power plants or thermal power plants.

In geotechnical monitoring, temperature sensors measure the heat of hydration in mass concrete structures. They can also be used to monitor the migration of groundwater or seepage. One of the most common areas where they are used is while curing the concrete because it has to be relatively warm in order to set and cure properly. The seasonal variations cause structural expansion or contraction thereby, changing its overall volume.

# How does temperature sensor work?

The basic principle of working of the temperature sensors is the voltage across the diode terminals. If the voltage increases, the temperature also rises, followed by a voltage drop between the transistor terminals of base and emitter in a diode.

Besides this, Encardio Rite has a vibrating wire temperature sensor that works on the principle of stress change due to temperature change.

The vibrating wire temperature meter is designed on the principle that dissimilar metals have a different linear coefficient of expansion with temperature variation.

It primarily consists of a magnetic, high tensile strength stretched wire, the two ends of which are fixed to any dissimilar metal in a manner that any change in temperature directly affects the tension in the wire and, thus, its natural frequency of vibration.

The dissimilar metal, in the case of the Encardio Rite temperature meter, is aluminium (Aluminum has a larger coefficient of thermal expansion than steel.) As the temperature signal is converted into frequency, the same read-out unit which is used for other vibrating wire sensors can also be used for monitoring temperature also.

The change in temperature is sensed by the specially built Encardio Rite vibrating wire sensor and is converted to an electrical signal which is transmitted as a frequency to the read-out unit.

The frequency, which is proportional to the temperature and in turn to the tension 'σ' in the wire, can be determined as follows:

$$\mathbf{f = 1/2\ [\sigma g/\rho] / 2l\ Hz}$$

Where:

$\sigma$ = tension of the wire

g = acceleration due to gravity

$\rho$ = density of the wire

l = length of wire

# Advantages of Temperature Sensors

1. Temperature Sensors have some advantages in comparison with other practical instruments.

2. Temperature sensors are low-cost, precise, and extremely reliable in repeated experiments.

3. They are desirable for both embedded and surface mount applications.

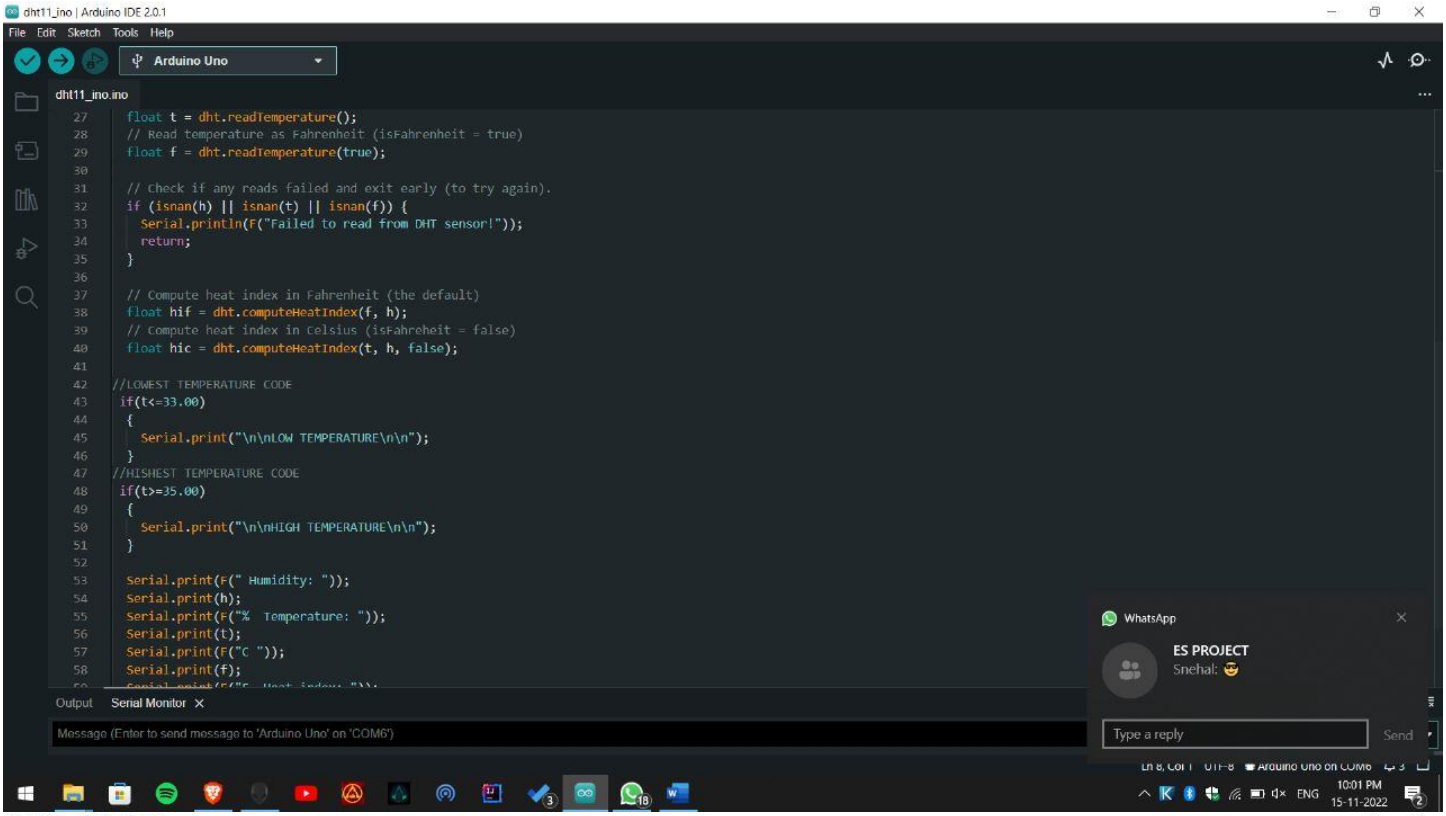
4. They have a faster response time because of the lower thermal mass.

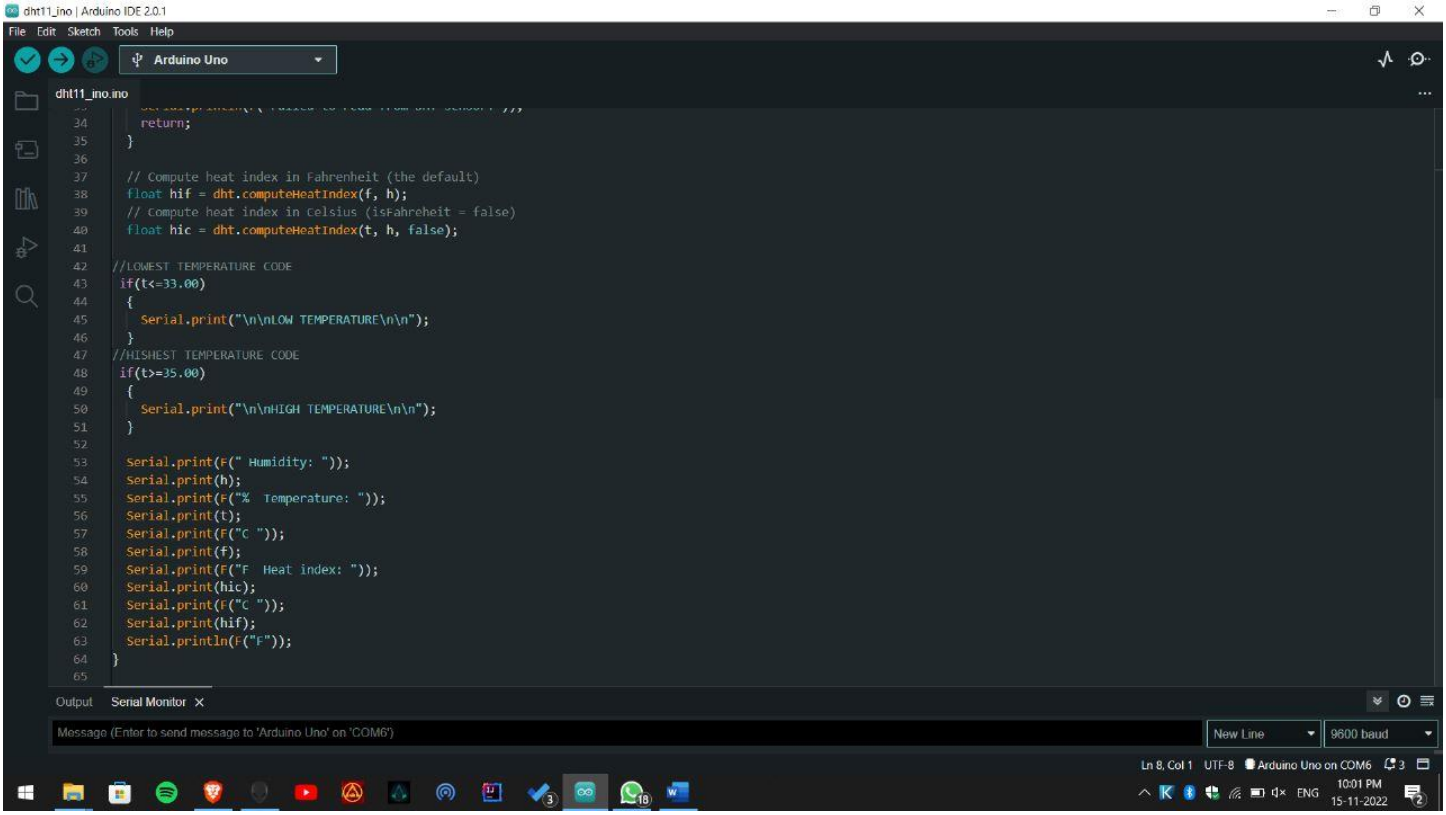
5. The vibrating wire type is normally full-interchangeable. It means that one indicator can be used for all sensors. It also has a particular technology for verifying long-term stability, simple and fast output.

6. They generally have an IP-68 rate by their weather-proof body.

7. They have some indicators that are suitable for direct temperature presentation. So, they can be used for remote detecting and data logging.

# CODE


dht11_ino | Arduino IDE 2.0.1
File Edit Sketch Tools Help
Arduino Uno
dht11_ino.ino
float t = dht.readTemperature();
// Read temperature as Fahrenheit (isFahrenheit = true)
float f = dht.readTemperature(true);
// Check if any reads failed and exit early (to try again).
if (isnan(h) || isnan(t) || isnan(f)) {
Serial.println(F("Failed to read from DHT sensor!"));
return;
}
// Compute heat index in Fahrenheit (the default)
float hif = dht.computeHeatIndex(f, h);
// Compute heat index in Celsius (isFahreheit = false)
float hic = dht.computeHeatIndex(t, h, false);
//LOWEST TEMPERATURE CODE
if(t<=33.00)
{
Serial.print("\n\nLOW TEMPERATURE\n\n");
}
//HISHEST TEMPERATURE CODE
if(t>=35.00)
{
Serial.print("\n\nHIGH TEMPERATURE\n\n");
}
Serial.print(F(" Humidity: "));
Serial.print(h);
Serial.print(F("% Temperature: "));
Serial.print(t);
Serial.print(F("C "));
Serial.print(f);
WhatsApp
ES PROJECT
Snehal:
Type a reply
Send
Output Serial Monitor
Message (Enter to send message to 'Arduino Uno' on 'COM6')
Ln 8, Col 1 UTF-8 Arduino Uno on COM6
ENG 10:01 PM 15-11-2022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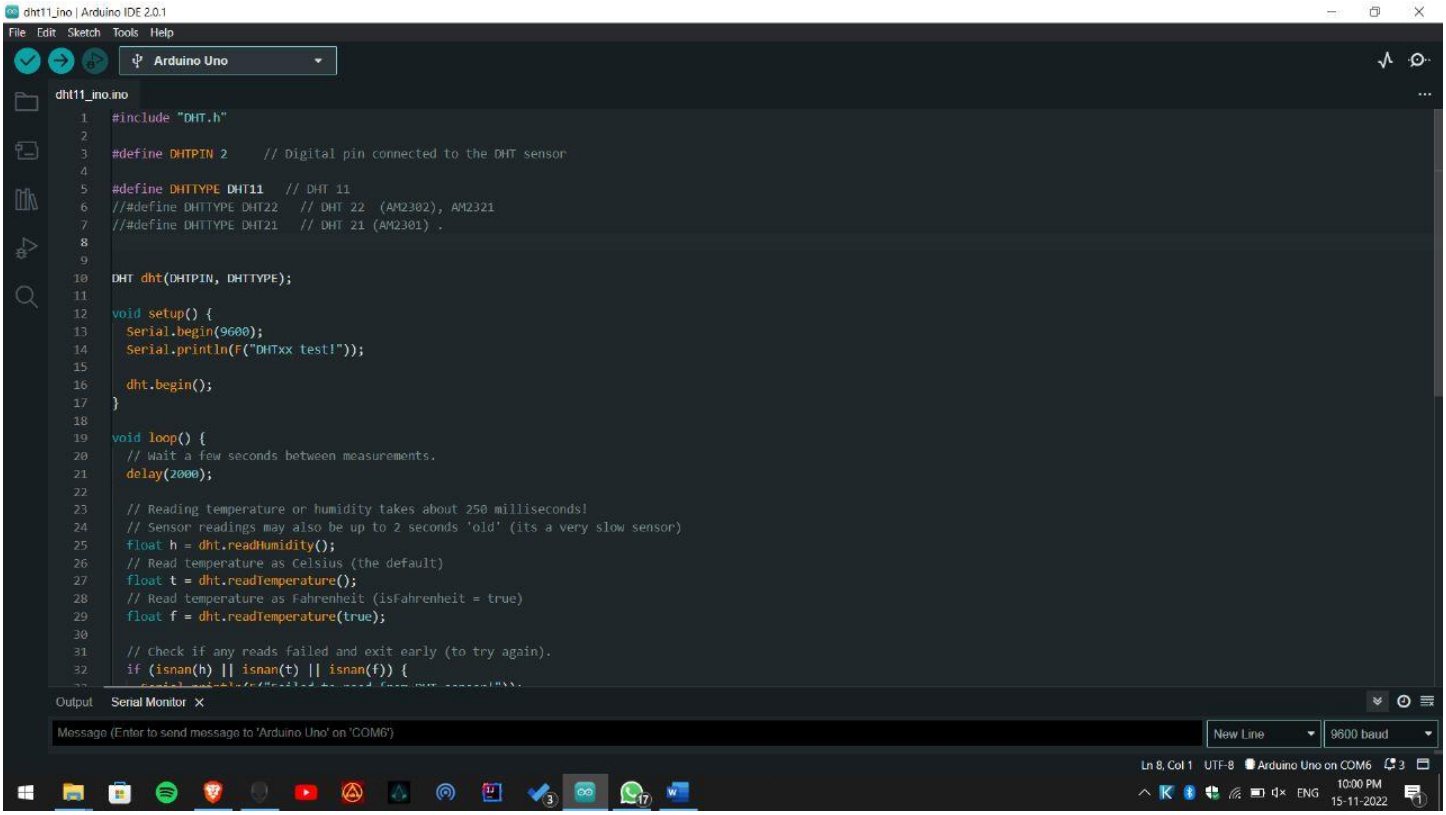
}
Serial.print(F(" Humidity: "));
Serial.print(h);
Serial.print(F("% Temperature: "));
Serial.print(t);
Serial.print(F("C "));
Serial.print(f);
Serial.print(F("F Heat index: "));
Serial.print(hic);
Serial.print(F("C "));
Serial.print(hif);
Serial.println(F("F"));
}
Output Serial Monitor
Message (Enter to send message to 'Arduino Uno' on 'COM6')
New Line
9600 baud
Ln 8, Col 1 UTF-8 Arduino Uno on COM6
ENG 10:01 PM 15-11-2022


dht11_ino | Arduino IDE 2.0.1
File Edit Sketch Tools Help
Arduino Uno
dht11_ino.ino
#include "DHT.h"
#define DHTPIN 2 // Digital pin connected to the DHT sensor
#define DHTTYPE DHT11 // DHT 11
//#define DHTTYPE DHT22 // DHT 22 (AM2302), AM2321
//#define DHTTYPE DHT21 // DHT 21 (AM2301) .
DHT dht(DHTPIN, DHTTYPE);
void setup() {
Serial.begin(9600);
Serial.println(F("DHTxx test!"));
dht.begin();
}
void loop() {
// Wait a few seconds between measurements.
delay(2000);
// Reading temperature or humidity takes about 250 milliseconds!
// Sensor readings may also be up to 2 seconds 'old' (its a very slow sensor)
float h = dht.readHumidity();
// Read temperature as Celsius (the default)
float t = dht.readTemperature();
// Read temperature as Fahrenheit (isFahrenheit = true)
float f = dht.readTemperature(true);
// Check if any reads failed and exit early (to try again).
if (isnan(h) || isnan(t) || isnan(f)) {
Output Serial Monitor
Message (Enter to send message to 'Arduino Uno' on 'COM6')
New Line
9600 baud
Ln 8, Col 1 UTF-8 Arduino Uno on COM6
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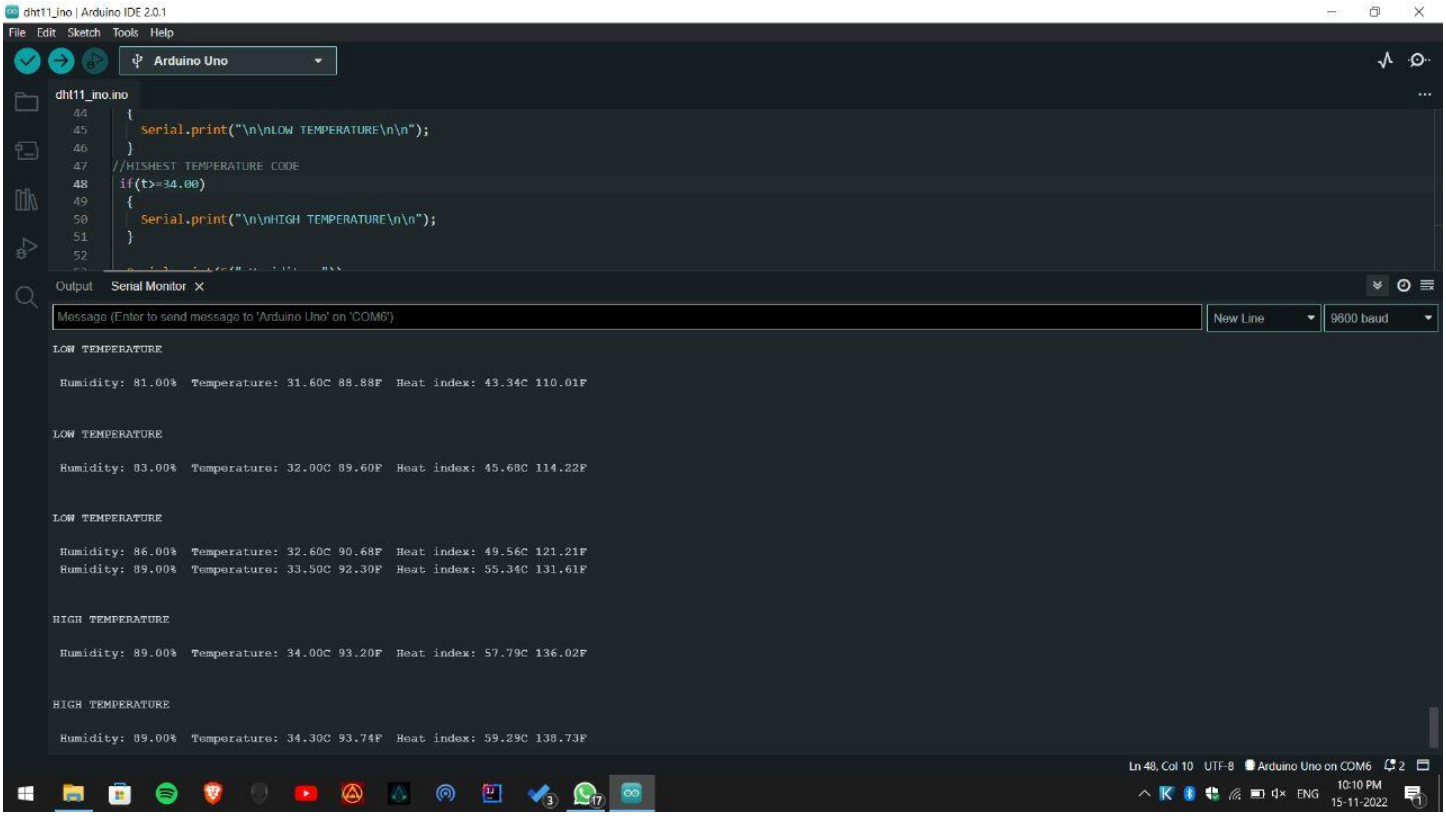
# OUTPUT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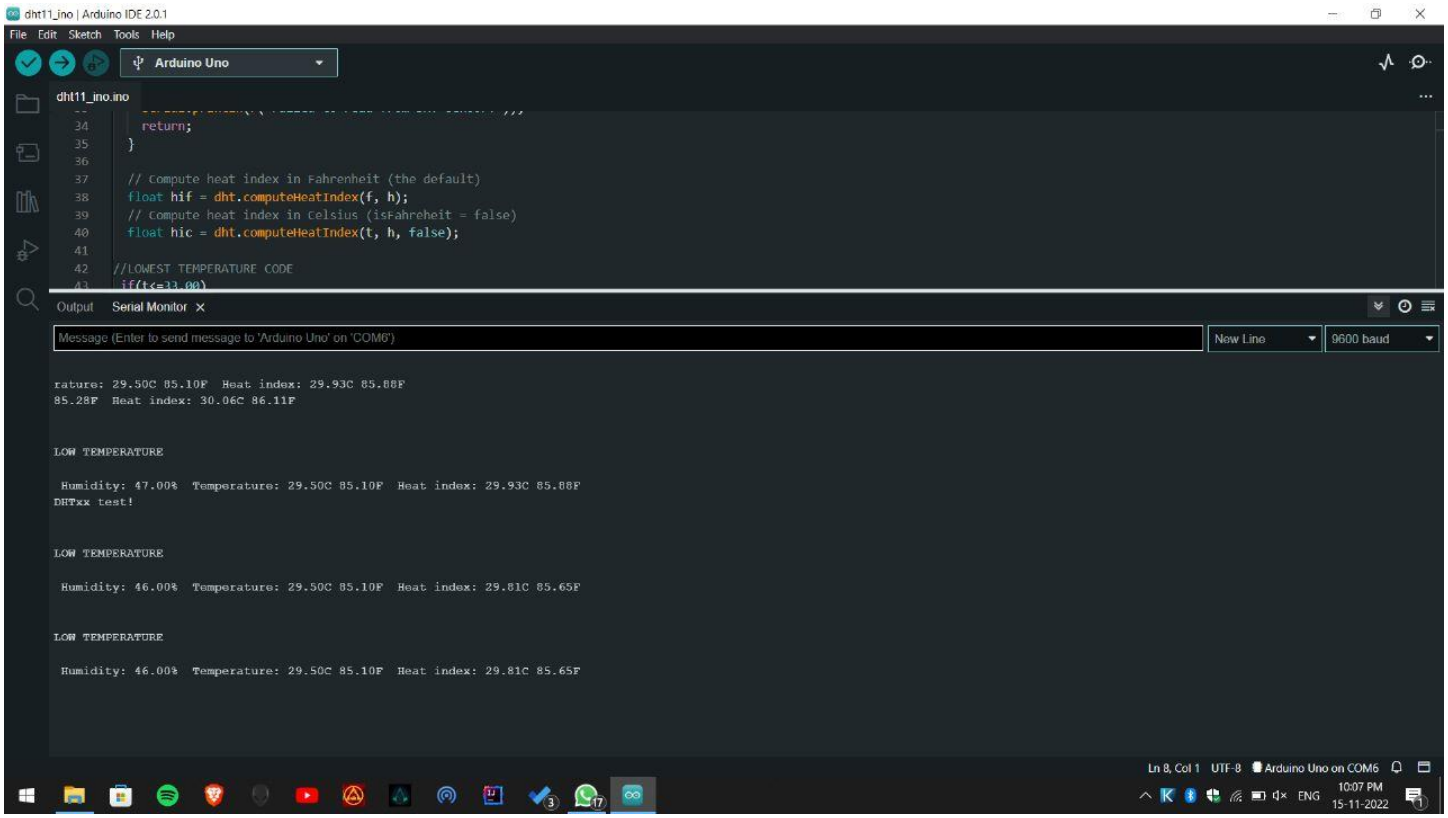
File Edit Sketch Tools Help
Arduino Uno
dht11_ino.ino
{
Serial.print("\n\nLOW TEMPERATURE\n\n");
}
//HISHEST TEMPERATURE CODE
if(t>=34.00)
{
Serial.print("\n\nHIGH TEMPERATURE\n\n");
}
Output Serial Monitor
Message (Enter to send message to 'Arduino Uno' on 'COM6')
New Line
9600 baud
LOW TEMPERATURE
Humidity: 81.00% Temperature: 31.60C 88.88F Heat index: 43.34C 110.01F
LOW TEMPERATURE
Humidity: 83.00% Temperature: 32.00C 89.60F Heat index: 45.68C 114.22F
LOW TEMPERATURE
Humidity: 86.00% Temperature: 32.60C 90.68F Heat index: 49.56C 121.21F
Humidity: 89.00% Temperature: 33.50C 92.30F Heat index: 55.34C 131.61F
HIGH TEMPERATURE
Humidity: 89.00% Temperature: 34.00C 93.20F Heat index: 57.79C 136.02F
HIGH TEMPERATURE
Humidity: 89.00% Temperature: 34.30C 93.74F Heat index: 59.29C 138.73F
Ln 48, Col 10 UTF-8 Arduino Uno on COM6
ENG 10:10 PM 15-11-2022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// Compute heat index in Celsius (isFahreheit = false)
float hic = dht.computeHeatIndex(t, h, false);
//LOWEST TEMPERATURE CODE
if(t<=33.00)
Output Serial Monitor
Message (Enter to send message to 'Arduino Uno' on 'COM6')
New Line
9600 baud
rature: 29.50C 85.10F Heat index: 29.93C 85.88F
85.28F Heat index: 30.06C 86.11F
LOW TEMPERATURE
Humidity: 47.00% Temperature: 29.50C 85.10F Heat index: 29.93C 85.88F
DHTxx test!
LOW TEMPERATURE
Humidity: 46.00% Temperature: 29.50C 85.10F Heat index: 29.81C 85.65F
LOW TEMPERATURE
Humidity: 46.00% Temperature: 29.50C 85.10F Heat index: 29.81C 85.65F
Ln 8, Col 1 UTF-8 Arduino Uno on COM6
ENG 10:07 PM 15-11-2022

# Result

The main objective of developing this ROOM TEMPERATURE SENSOR using microcontroller is to provide the information about the temperature of the surroundings or specific applications such as the temperature of the processor or the engine of a vehicle.

# Conclusion

This project aims at providing a low cost and efficient method of measuring temperature. This concept uses a heat sensor and Arduino uno to measure the temperature of surroundings or specific applications. The modularity of the project allows the user to modify it according to our needs. This design imparts wide flexibility and can be applied in industries as well as in homes.