ASSIGNMENT NO: 8

Title:

Write a program read the temperature sensor and send the values to the serial monitor on the computer.

Aim:

Understand working principle of DHT11, LM35 temperature sensor

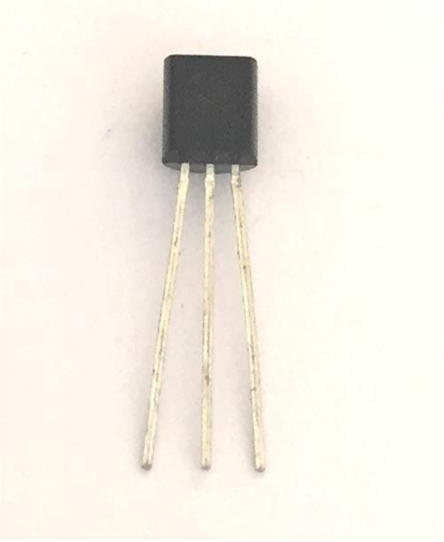
Objectives:.

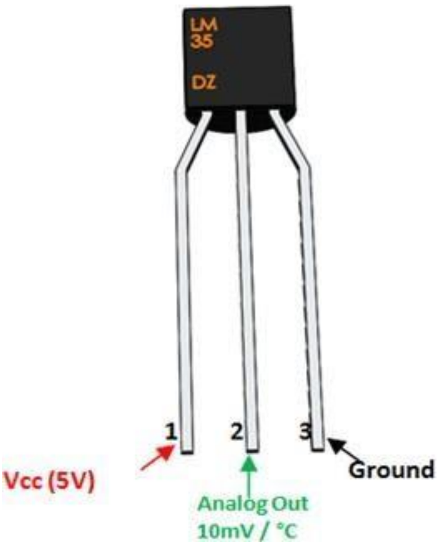
1. Hardware platforms and operating systems commonly used in IoT systems.
2. Help the students in providing a good learning environment and also work with real time problems faced in day to day life

Hardware Requirement*:* Arduino, LED, LM35, DHT11 etc.

Software Requirement: Arduino IDE

Temperature Sensor:





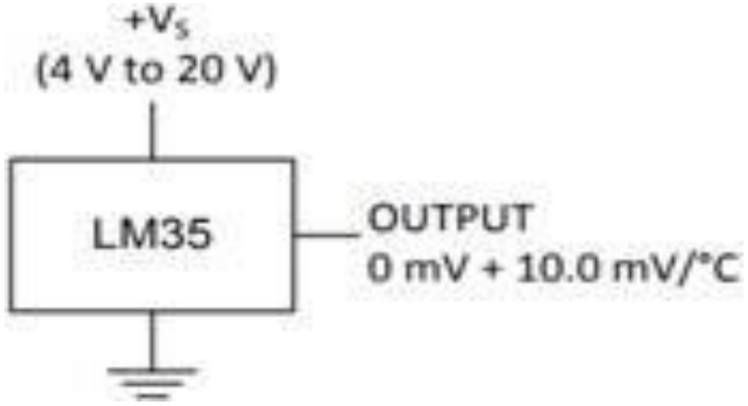
PinNumber	PinName	Description
1	Vcc	Input voltage is+5Vfor typical applications
2	Analog Out	There will be increase in 10mV for raise of every1°C.Can range from-1V(-55°C) to 6V(150°C)
3	Ground	Connected to ground of circuit

LM35 Sensor Features:

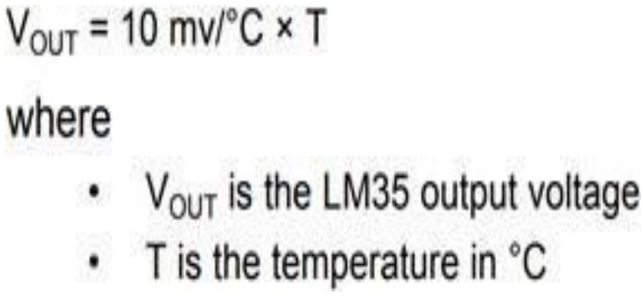
- Minimum and Maximum Input Voltage: 2V and 35V, respectively (Typically 5V).
- Temperature Measurement Range: -55°C to 150°C.
- Output Voltage is linearly proportional to temperature, with a rise of 10mV (0.01V) for every 1°C increase.
- Accuracy: ±0.5°C.
- Drain Current: Less than 60uA.
- Cost-effective temperature sensor.
- Compact size, suitable for remote applications.
- Available in TO-92, TO-220, TO-CAN, and SOIC packages.

LM35 Temperature Sensor Equivalents: LM34, DS18B20, DS1620, LM9402

How to use LM35 Temperature Sensor:
LM35 is a precise temperature sensor with an output voltage varying based on the temperature. It operates from -55°C to 150°C and interfaces easily with microcontrollers, requiring +5V power and a ground connection for temperature measurement in voltage



If the temperature is 0°C, the LM35's output voltage is 0V. For every degree Celsius increase, there's a rise of 0.01V (10mV). The temperature can be obtained by converting the voltage using the following formula



$$V_{OUT} = 10\ \text{mv/°C} \times T$$

where

- V_{OUT} is the LM35 output voltage
- T is the temperature in °C

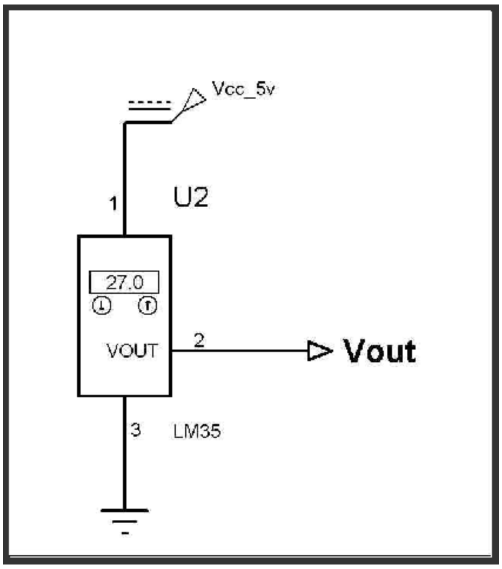
LM35 Temperature Sensor is used for:

- Measuring environmental temperature
- Providing thermal shutdown in circuits/components
- Monitoring battery temperature
- Measuring temperatures in HVAC applications

Working of LMT 35:

The main advantage of LM35 is its linearity, providing an output of 10mV per degree Celsius rise in temperature. For example, if the output is 220mV, the temperature is 22°C. Therefore, if the room temperature is 32°C, the LM35 output will be 320mV (0.32V)

Circuit Diagram **LMT 35**



DHT11 Interfacing with Arduino and Weather Station

The DHT11 sensor is employed to measure both temperature and humidity. It incorporates a resistive humidity sensing component with a negative temperature coefficient (NTC) and an 8-bit MCU for rapid response. Despite being very affordable, it provides simultaneous readings of temperature and humidity.

Specifications of DHT11:

Humidity Range: 20% to 90% RH
Temperature Range: 0°C to 50°C
Signal Transmission Range: 20m
Cost-effectiveness
Fast response and durability
In weather stations, the DHT11 is commonly utilized for monitoring and recording both temperature and humidity levels.

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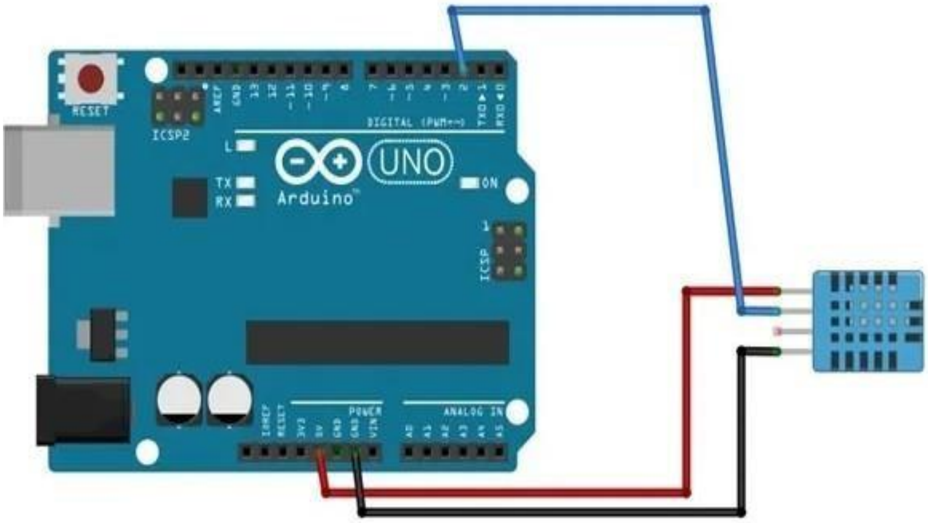


To install the DHT11 library for Arduino, follow these steps:

1. To execute this code in the Arduino IDE, you need to first install the DHT library in your Arduino directory
2. Download the zip file from this location and move it into your Arduino library folder.
3. The path to the Arduino library folder on my computer path : Documents/Arduino/Libraries
4. Extract the downloaded file and move its contents to the specified folder
5. After copying the files, ensure that the Arduino library folder contains a new folder named "DHT" with the files "dht.h" and "dht.cpp." Next, copy the following code into the Arduino IDE and upload it

Temperature Scales

Thermometers help measure temperature, and there are three common scales: Celsius & Fahrenheit and Kelvin.

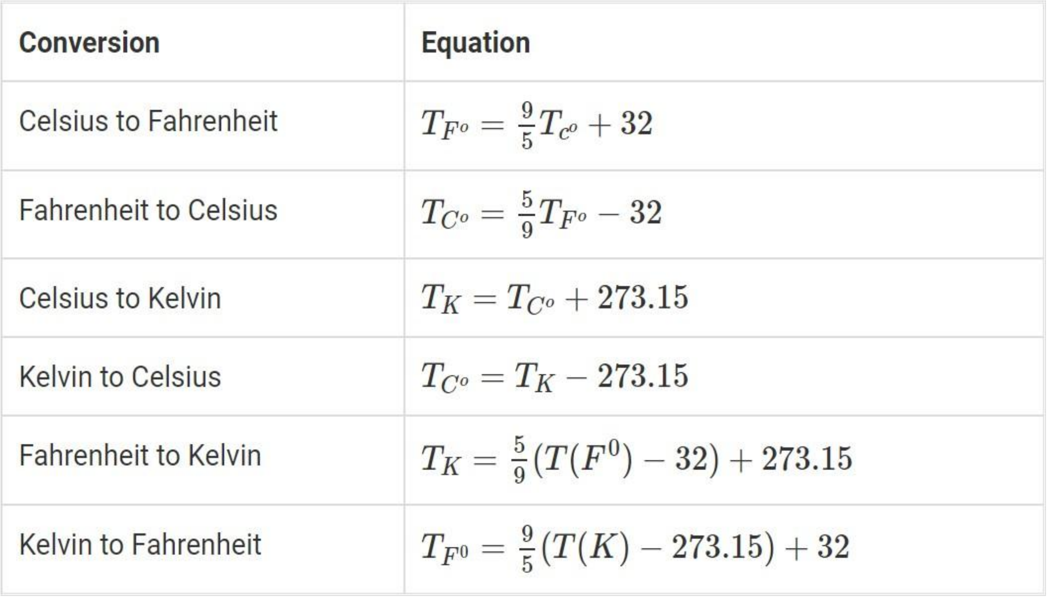
Celsius Scale & Fahrenheit Scale:

Celsius uses 0ºC for water freezing and 100ºC for boiling. Fahrenheit uses 32ºF for water freezing and 212ºF for boiling. One degree Celsius is 1.8 times larger than one degree Fahrenheit.

Kelvin Scale:

Kelvin is widely used in science, starting at 0 K (absolute zero). Water freezes at 273.15 K and boils at 373.15 K. Kelvin is an absolute scale with no negative temperatures, representing the lowest theoretically achievable temperature

Relationship between Different Temperature Scales



Conversion	Equation
Celsius to Fahrenheit	$T_{F^o} = \frac{9}{5}T_{c^o} + 32$
Fahrenheit to Celsius	$T_{C^o} = \frac{5}{9}T_{F^o} - 32$
Celsius to Kelvin	$T_K = T_{C^o} + 273.15$
Kelvin to Celsius	$T_{C^o} = T_K - 273.15$
Fahrenheit to Kelvin	$T_K = \frac{5}{9}(T(F^0) - 32) + 273.15$
Kelvin to Fahrenheit	$T_{F^0} = \frac{9}{5}(T(K) - 273.15) + 32$

Conclusion*:* Thus we conclude program read the temperature sensor and send the values to the serial monitor on the computer