Experiment No. 4

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Class : T. Y. B.Tech Computer	**Academic Year :** 2024-25
Subject : CO357UB IOT Lab	**Course Teacher** : Miss. Prajakta Sawale
Date of Performance :	**Date of Completion :**

TITLE: Interfacing Sensors with Arduino

AIM: To interface the TMP36 analog temperature sensor with an Arduino Uno and measure ambient temperature in degrees Celsius.

COMPONENT REQUIRED:

- Arduino Uno R3
- TMP36 Temperature Sensor
- Jumper Wires
- USB Cable (Arduino)
- Computer with Arduino IDE installed

THEORY:

The TMP36 is a low voltage, precision centigrade temperature sensor produced by Analog Devices. It provides an analog voltage output that is linearly proportional to the ambient temperature. Unlike digital sensors like DHT11, TMP36 directly outputs an analog signal which must be converted using the Arduino's ADC (Analog-to-Digital Converter).

Key Features of TMP36:

- Operating Voltage: 2.7V to 5.5V
- Temperature Range: -40°C to +125°C
- Accuracy: ± 2°C (typical)
- No calibration required
- Linear output: 10 mV/°C
- Output voltage at 25°C: ~0.75V (i.e., 500 mV at 0°C)

Voltage to Temperature Conversion Formula:

Temperature (°C) = (Vout - 0.5) × 100 Where:

- Vout is the voltage read from the sensor (in volts)
- 0.5V corresponds to 0°C
- The sensor output increases by 10mV for each °C

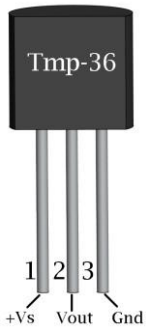


Fig. TMP36 Sensor Pinout

Circuit Diagram Description:

1. TMP36 Pin 1 (VCC) → Arduino 5V
2. TMP36 Pin 2 (Vout) → Arduino A0
3. TMP36 Pin 3 (GND) → Arduino GND **Sample Calculation:**

Given:

Analog value = 153

ADC resolution = 10-bit (0–1023), Vcc = 5V

Voltage =

(153 × 5.0) / 1023 = 0.748 V

Temperature =

(0.748 - 0.5) × 100 = 24.8°C **Applications:**

- Environmental monitoring systems
- Weather stations
- IoT-based smart homes
- Greenhouse automation

PROCEDURE:

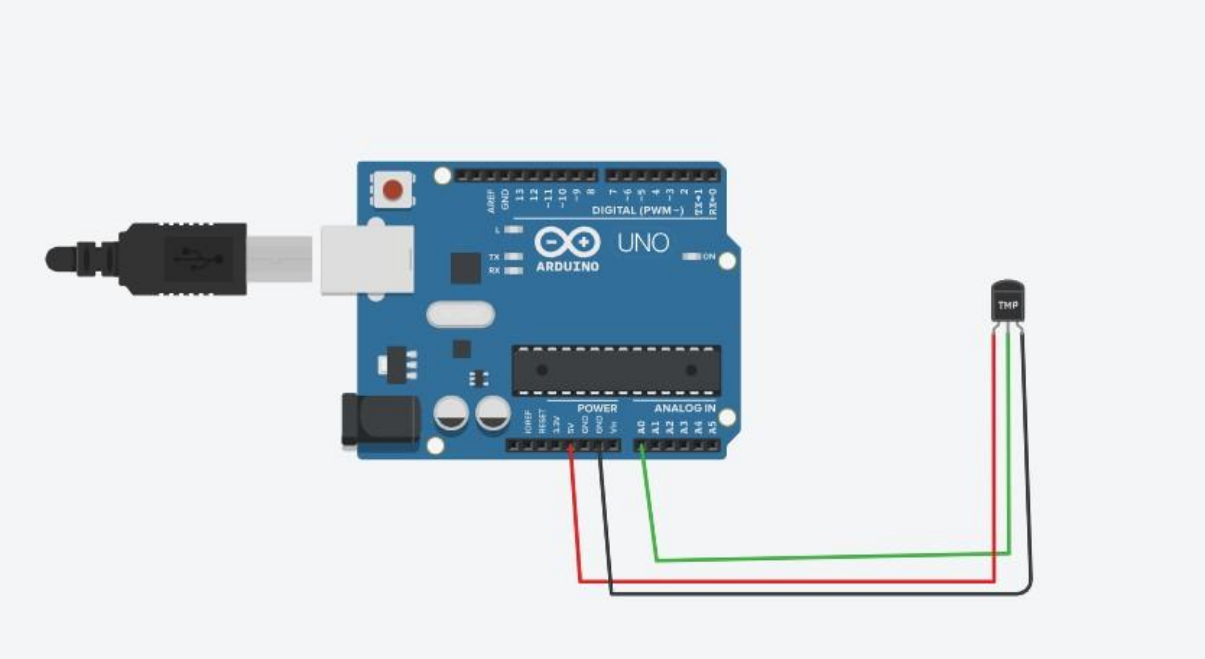
1. Identify the pins of the TMP36 sensor.
2. Connect each pin directly to the Arduino using jumper wires:
    - **VCC** to **5V**
    - **VOUT** to **A0**
    - **GND** to **GND**
3. Connect the Arduino Uno to the computer using the USB cable.
4. Open Arduino IDE and write the program.
5. Upload the program to the board.
6. Open the Serial Monitor to observe real-time temperature readings.

CODE:

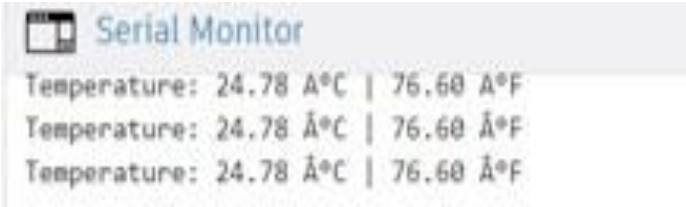
```
// TMP36 connected to A0

const int tempPin = A0;

void setup() {

  Serial.begin(9600); // Start serial communication at 9600 baud

} void loop() {    int analogValue = analogRead(tempPin); // Read the analog

value   float voltage = analogValue * (5.0 / 1023.0); // Convert analog value to

voltage

  // TMP36 outputs 0.5V at 0°C, with 10mV per °C    float temperatureC = (voltage -

0.5) * 100.0; // Convert voltage to temperature in °C    float temperatureF =

(temperatureC * 9.0 / 5.0) + 32.0; // Convert to °F (optional)

  Serial.print("Temperature: ");

  Serial.print(temperatureC);

  Serial.print(" °C | ");

  Serial.print(temperatureF);
  Serial.println(" °F");

delay(1000); // Wait for 1 second
```

}

OUTPUT:



Serial Monitor :



RESULT:

The TMP36 sensor was successfully interfaced with the Arduino without using a breadboard, and real-time temperature was read and displayed via the Serial Monitor.

Sign of Course Teacher