NED University of Engineering & Technology
Department of Electrical Engineering

For the course

INSTRUMENTATION AND MEASUREMENTS

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PROJECT

OBJECTIVE

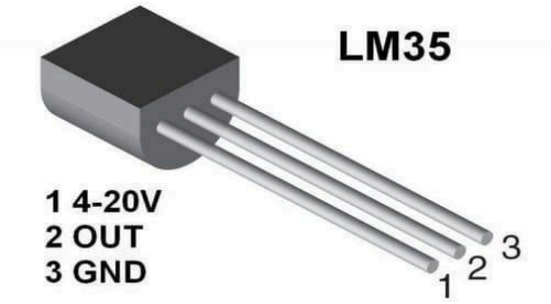
To measure temperature using LM35.

EQUIPMENT REQUIRED

- Breadboard
- 16x2 Display
- Jumper wires
- Arduino UNO
- Potentiometer
- LM35

THEORY:

LM35:



LM35 is a temperature sensor that outputs an analog signal proportional to the instantaneous temperature. The output voltage can easily be interpreted to obtain a temperature reading in Celsius.

- LM35 can measure from -55 degrees centigrade to 150-degree centigrade.
- The input voltage to LM35 can be from +4 volts to 30 volts.
- It consumes about 60 microamperes of current.

ADVANTAGES:

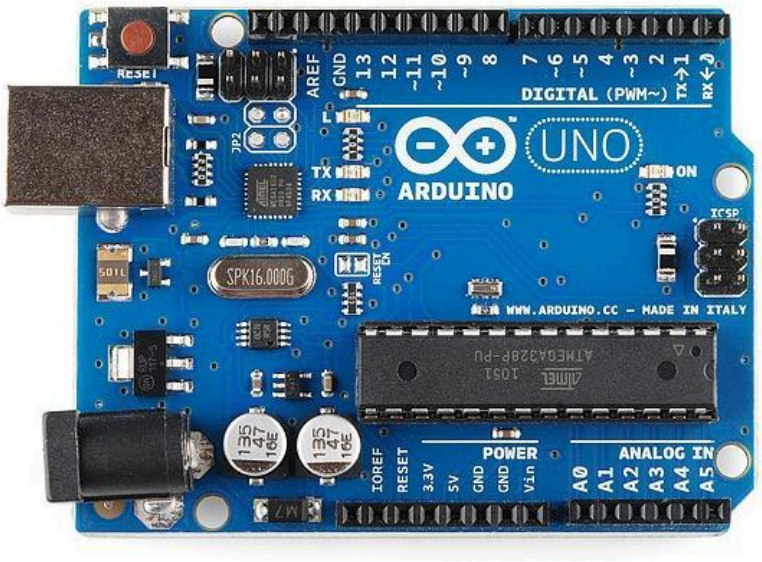
- The advantage of LM35 over thermistor is it does not require any external calibration.
- The accuracy level is very high if operated at optimal temperature and humidity levels.
- The conversion of the output voltage to centigrade is also easy and straight forward.

WORKING:

LM35 uses the basic principle of a diode, where, as the temperature increases, the voltage across a diode increases at a known rate.

ARDUINO UNO:

Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects.

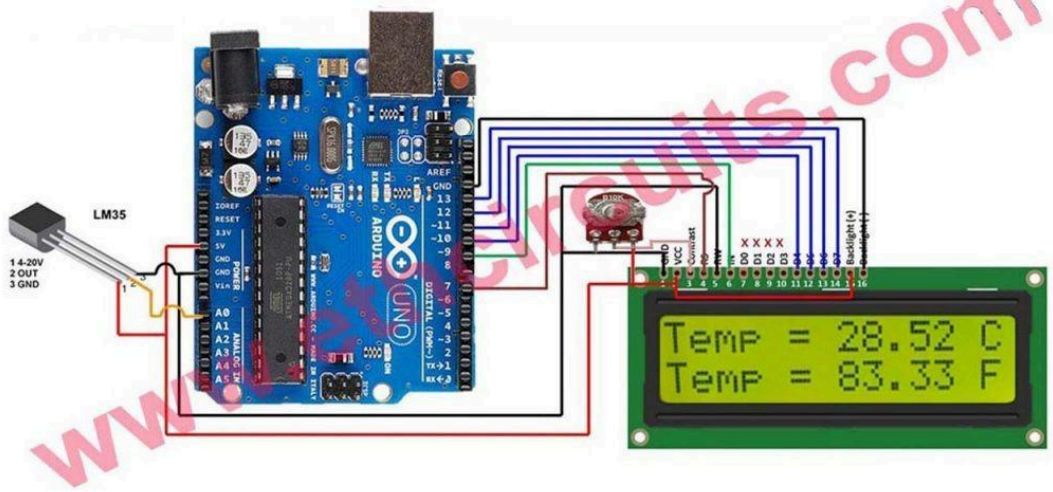


CODE:

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(7, 9, 10, 11, 12,13);

float tempC;

void setup(){
lcd.begin(16, 2);
lcd.print("Temp1=");
lcd.setCursor(0, 1);
}

void loop(){
tempC = analogRead(0);
tempC = (5.0 * tempC * 100.0)/1024.0;
lcd.setCursor(6, 0);
lcd.print(tempC,1);
lcd.print("'C");
delay(1000);
}
```

The above code is used to convert Analog Input Voltage (mV) into Digital Output Temperature (°C)

CIRCUIT DIAGRAM



PROCEDURE:

The connections made are given below:

- Connect LCD PIN 1 to PIN 5 and to GND of Arduino.
- Connect LCD PIN 3 to the Potentiometer and connect one terminal to the ground and one to Vcc.

- Connect LCD PIN 15 to PIN 2 and to Supply.
- Connect LCD PINS D4, D5, D6 and D7 to PINS 13 - 10 of the Arduino.
- Connect LCD PIN 4(RS) to PIN 7 of the Arduino.
- Connect LCD PIN 5(RW) to Ground.
- Connect LCD PIN 6(E) to PIN 9 of the Arduino.

- Attach the LM35 to the Bread Board horizontally, the flat side of the sensor must be facing you. Then, connect three wires under the three pins of the sensor. The wire on the left will go to the 5v (+5 volts) on the Arduino. The middle wire will go to Ao (analog pin 0). The wire on the right will go to GND (-) on the Arduino.

- Take the output of the LM35 i.e. PIN 2 of the LM35 and connect it to the Analog Input Ao of the Arduino.

RESULT:

Therefore, the above project accurately measures the temperature around LM35.