TEMPERATURE SENSOR

Submitted by:

Vignesh (1NH18EC120)
Rahul M(1NH18EE045)
Mahesh babu(1NH18EC118)
Kalyan(1NH18EE034)

ABSTRACT

Our project is **TEMPERATURE SENSOR** it is basically a temperature measuring device which detect the surrounding atmosphere heat using the temperature sensor called **LM35** which sense the temperature according to the voltage difference that produced by the LM35 sensor when it is in contact with the surrounding atmosphere. Output temperature are displayed on the **16×2 LCD** display.

Keywords: **LM35 SENSOR**

16×2 LCD DISPLAY

BREAD BOARD

AURDUINO

INTRODUCTION

Temperature is the most-measured process variable in industrial automation . Most commonly, a temperature sensor is used to convert temperature value to an electrical value. Temperature Sensors are used to read temperatures correctly and to control temperature in industrials applications .

Temperature sensors are devices used to measure the temperature of a medium. There are 2 kinds of temperature sensors: 1) contact sensors and 2) noncontact sensors

Temperature sensors are vital to a variety of everyday products. For example, household ovens, refrigerators, and thermostats all rely on temperature maintenance and control in order to function properlyTemperature control also has applications in chemical engineering. Examples of this include maintaining the temperature of a chemical reactor at the ideal set-point, monitoring the temperature of a possible runaway reaction to ensure the safety of employees, and maintaining the temperature of streams released to the environment to minimize harmful environmental impact

LITERATURE SURVEY

There are a wide assortment of temperature estimation tests being used today relying uponwhat you are attempting to quantify, how precisely you have to gauge it, in the event that you have to utilize it for control or simply man checking, or in the event that you can even touch what you are attempting to screen. Temperature estimation can be ordered into a couple of general classifications:

a) Thermometers

b) Probes

c) Non-contact

Thermometers are the most seasoned of the gathering. The need to gauge and measure the temperature of something began around 150 A.D. at the point when Galen decided the 'appearance' of somebody dependent on four perceptible amounts. The real study of 'thermometry' didn't advance until the development of the sciences in the 1500's The first genuine thermometer was an air-thermoscope portrayed in Natural Magic (1558, 1589). This gadget was the fore sprinter of the present class of glass thermometers. Up to 1841 there were 18 diverse temperature scales being used. An instrument producer, Daniel Gabriel Fahrenheit figured out how to align thermometers from Ole Romer, a Danish cosmologist. Somewhere in the range of 1708 and 1724 Fahrenheit started delivering thermometers utilizing Romer's scale and afterward adjusted that to what we know to day as the Fahrenheit scale. Fahrenheit significantly improved the thermometer by changing the store to a chamber and supplanted the spirits utilized in the early gadgets with mercury. This was done in light of the fact that it had an about direct pace of warm extension. His alignment strategies were a competitive advantage, however it was realized that he utilized a specific blend of the dissolving purpose of a blend of ocean salt, ice also, water and the armpit temperature of a sound man as alignment focuses.scale was received by Great Britain the temperature of 212 was characterized as the bubbling purpose of water. This point just as the liquefying purpose of plain ice were utilized as two realized alignment focuses.Around 1740 Anders Celsius proposed the centigrade scale. It isn't clear who designed the scale, yet it separated the scope of the softening purpose of ice (100) to the steam purpose of water (0) into 100 sections, subsequently 'centigrade'. Linnaeus rearranged the scale with the goal that 0 was the ice point and 100 was the steam point. In 1948 the name of the centigrade scale was changed to Celsius. About the time that Fahrenheit was trying different things with his fluid filled gadgets, Jaspeh L. Gay-Lussac was working with gas filled tubes. He presumed that at a consistent pressure, the volume of the gas would grow at a specific rate for every level of temperature rise, that being 1/267 for every degree. In 1874 Victor Regnault acquired better test results, demonstrating this number to be 1/273 and inferred that the weight would move toward zero at 1/273.15 degrees C. This lead to the meaning of zero weight at -273.15 degrees C, or what we presently know as the total scale.

The vibes of hot and cold are central to the human experience, yet how to quantify temperature has tested numerous extraordinary personalities. It's indistinct if the antiquated Greeks or Chinese had approaches to gauge temperature, so supposedly, the historical backdrop of temperature estimation started during the Renaissance.The Temperature Estimation ChallengeRobert Hooke

Robert Hooke

Ole Roemer

Ole Roemer

Warmth is a proportion of the vitality in a body or material — the more vitality, the more sultry it is. Be that as it may, in contrast to physical properties of mass and length, it's been hard to gauge. Most techniques or temperature sensors have been backhanded, watching the impact that warmth has on something and concluding temperature from this.

Making a size of estimation has been a test, as well. In 1664, Robert Hooke proposed the point of solidification of water be utilized as a zero point, with temperatures being estimated from this. Around a similar time, Ole Roemer saw the requirement for two fixed focuses, permitting interjection between them. The focuses he picked were Hooke's the point of solidification and furthermore the breaking point of water. This, obviously, leaves open the subject of how hot or cold things can get.

That was replied by Gay-Lussac and different researchers chipping away at the gas laws. During the nineteenth century, while researching the impact of temperature on gas at a consistent weight, they saw that volume ascends by the division of 1/267 for each degree Celsius, (later overhauled to 1/273.15). This prompted the idea of outright zero at less 273.15°C.Temperature sensors dependent on Fluids and BimetalsRTD brouchure bannerGalileo is accounted for to have manufactured a gadget that demonstrated changes in temperature at some point around 1592. This seems to have utilized the withdrawal of air in a vessel to draw up a segment of water, the stature of the section demonstrating the degree of cooling. Nonetheless, this was emphatically affected via pneumatic stress and was minimal in excess of a curiosity.

The thermometer as we probably am aware it was designed in 1612 in what is presently Italy by Santorio Santorii. He fixed fluid inside a glass tube, seeing how it climbed the cylinder as it extended. A scale on the cylinder made it simpler to see changes, yet this temperature estimating gadget needed exact units.

Working with Roemer was Daniel Gabriel Fahrenheit. He started producing thermometers, utilizing both liquor and mercury as the fluid. Mercury is perfect, as it has an exceptionally direct reaction to temperature change over an enormous range, however worries over lethality have prompted decreased use. Different fluids have now been created to supplant it. Fluid thermometers are still broadly utilized, despite the fact that it is critical to control the profundity at which the bulb is drenched. Utilizing a thermowell guarantees great warmth move to the temperature sensor.

The bimetallic temperature sensor was created late in the nineteenth century. This exploits the differential development of two metal strips fortified together. Temperature changes make bowing that can be utilized to enact an indoor regulator or a measure like those utilized in gas flame broils. Precision is low — maybe give or take 2 degrees — yet these sensors are cheap, so they have numerous applications.Galileo Galilei

Galileo Galilei

Santorio Santorii

Santorio Santorii

Internment Plaque of Daniel Gabriel Fahrenheit

Internment Plaque of Daniel Gabriel Fahrenheit

Instances of sensors dependent on fluids and bimetalsTopGT 736000 Arrangement Glass-Bulb Thermometers Temperature sensorFluid-Development thermometers

Liquid extension gadgets, as the family thermometer, by and large have two groupings: the mercury type and the natural fluid sort. Anyway a few gas adaptations are additionally accessible. Liquid development sensors don't require electric power, don't present blast risks, and are steady considerably after rehashed cycling.B and S DIALTEMP BiMetallic Temperature sensorBimetallic Estimation Gadgets

Bimetallic thermometers have segments of two metals fortified together. At the point when warmed, one side will grow more than the other, and the subsequent bowing is converted into a temperature perusing by mechanical linkage to a pointer.Thermoelectric EffectsEarly in the nineteenth century, power was an energizing region of logical examination, and researchers before long found that metals shifted in their opposition and conductivity. In 1821, Thomas Johann Seebeck found that a voltage is made when the parts of the bargains are joined and set at various temperatures. Peltier found that this thermocouple impact is reversible and can be utilized for cooling.

Around the same time, Humphrey Davey exhibited how the electrical resistivity of a metal is identified with temperature. After five years, Becquerel proposed utilizing a platinum-platinum thermocouple for temperature estimation, yet it took until 1829 for Leopoldi Nobili to really make the temperature sensor.

Platinum is additionally utilized in the opposition temperature indicator imagined in 1932 by C.H. Meyers. This estimates the electrical obstruction of a length of platinum wire and is commonly viewed as the most exact kind of temperature sensor. RTDs utilizing wire are ordinarily delicate and unacceptable for modern applications. Ongoing years have seen the improvement of film RTDs, which are less exact however progressively vigorous.

The twentieth century likewise observed the creation of semiconductor temperature estimating gadgets. These react to temperature changes with great precision however up to this point needed linearity.

In this other article we spread the fundamental contrasts of those temperature sensors.Examples of sensors dependent on thermoelectric effectsTopBare SH Thermocouple Temperature sensorThermocouple Sensors

Thermocouples comprise basically of two strips or wires made of various metals and joined toward one side. Changes in the temperature at that crossroads actuate a change in electromotive power (emf) between the other ends.F Arrangement RTD Temperature sensorRTDs

RTDs depend on opposition change in a metal, with the obstruction rising pretty much straightly with temperature. These sort of sensors are one of the most precise temperature sensors and are comprehensively utilized in industry and labs.TJ36 Thermistor ProbeThermistor Tests

Thermistor tests are thermistor components installed in metal cylinders. Since thermistors are non-straight, the instrument used to peruse the temperature must linearize the reading.Thermal RadiationWilliam Herschel

William Herschel

Samuel Langley

Samuel Langley

Extremely hot and liquid metals gleam, radiating warmth and obvious light. They transmit heat at lower temperatures, as well, yet at longer wavelengths. English space expert William Herschel was the first to perceive, around 1800, that this "dim" or infrared light causes warming. Working with his comrade Melloni, Nobili figured out how to recognize this emanated vitality by interfacing thermocouples in an arrangement to make a thermopile.

This was followed in 1878 by the bolometer sensor. Developed by American Samuel Langley, it utilized two platinum strips, one of which was darkened, in a Wheatstone connect plan. Warming by infrared radiation caused a quantifiable change in obstruction.

Bolometers are touchy to infrared light over a wide scope of wavelengths. Interestingly, the photon finder type gadgets created since the 1940s will in general react just to infrared in a constrained wave band. Lead sulfide indicators are delicate to wavelengths up to 3 microns while the disclosure of HgCdTe ternary composite in 1959 opened the entryway to locators custom-made to explicit wavelengths.

Today, cheap infrared pyrometers are utilized generally, and warm cameras are discovering more applications as their costs drop.Examples of sensors dependent on warm radiationTopOS532 Infrared Temperature sensorInfrared Temperature sensors

Infrared sensors are non-reaching gadgets. They convert the vitality to an electrical sign that can be shown in units of temperature subsequent to being made up for surrounding temperature variation.Temperature ScalesAnders Celsius

Anders Celsius

Master Kelvin

Master Kelvin

At the point when Fahrenheit was making thermometers, he understood he required a temperature scale. He set the point of solidification of salt water at 30 degrees and its breaking point 180 degrees higher. In this way it was chosen to utilize unadulterated water, which solidifies at a marginally higher temperature, giving us solidifying at 32°Fand bubbling at 212°F.

After 25 year, Anders Celsius proposed the 0 to 100 scale, which today bears his name. Afterward, seeing the advantage in a fixed point toward one side of the scale, William Thomson, later Master Kelvin, proposed utilizing supreme zero as the beginning stage of the Celsius framework. That prompted the Kelvin scale, utilized today in the logical field.

Today, temperature estimation scales are characterized in a report titled Global Temperature Framework 90, or ITS-90 for short. Perusers wishing to check or better comprehend their estimation units ought to acquire a duplicate.

METHODOLOGY

LM35 is a commonly used temperature sensor, It shows values in the form of output voltages instead of degree Celsius.

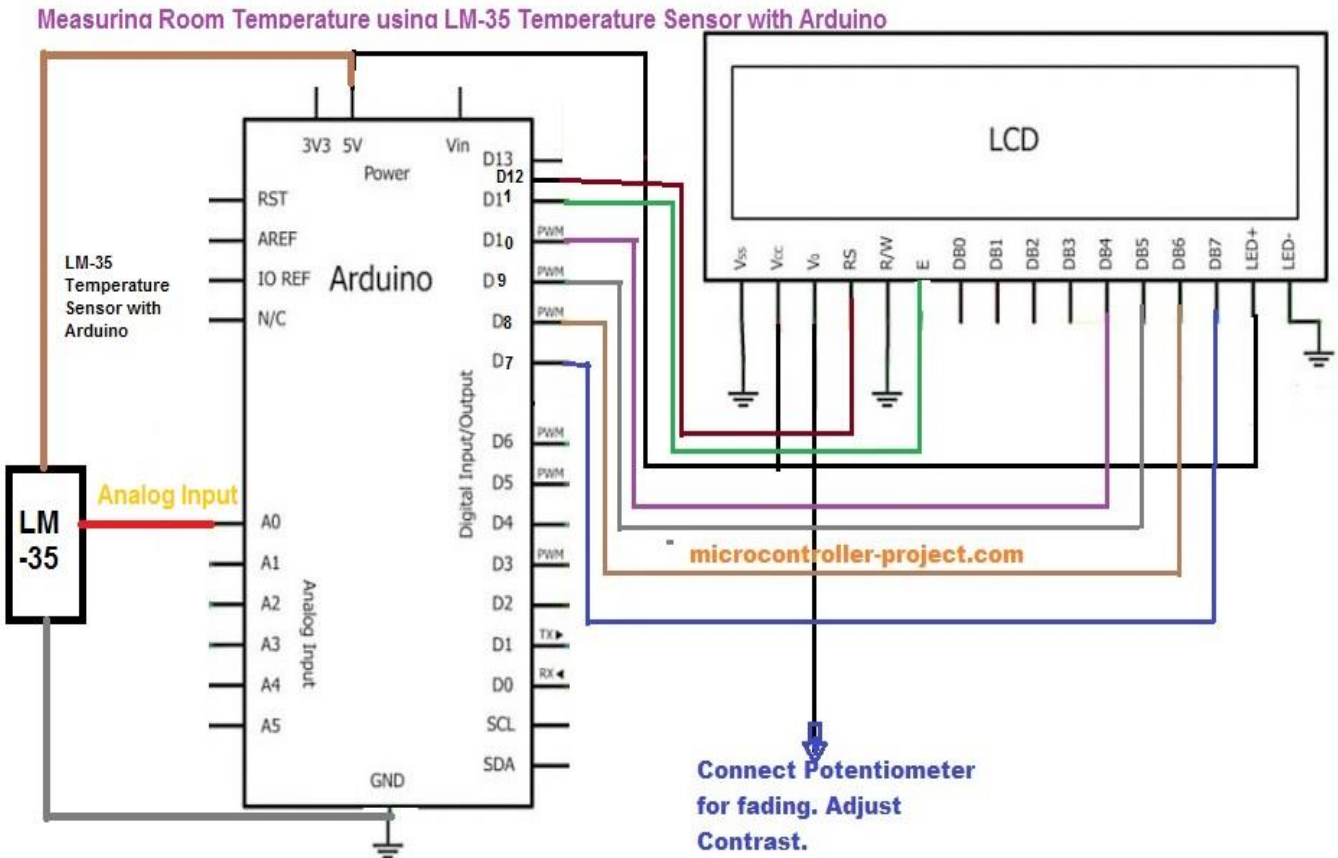
- LM35 is used to measure precise centigrade temperature. The output of this sensor changes describes the linearity. The output voltages of this sensor are linearly comparative to the Celsius temperature.
- The output voltage range of this sensor is from -55˚ to +150˚C. It also has low self-heating power.
- Its operating voltages is 4 to 30 volts.
- In the most circuit, this sensor is used with an operational amplifier. An amplifier is a device which amplifies applied a voltage at a certain level.

- Operational Amplifier has three terminal, first two are inverting and noninverting inputs third one is used for output.
- By using LM35 with operational amplifier we can get amplification of output voltages of LM35.

OBJECTIVE

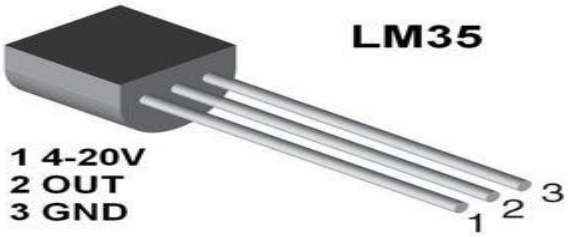
- Program Arduino board to measure temperature**.**
- Convert the temperature changes to an equivalent voltage value using sensor.
- Measuring the temperature according to the voltage value.
- Display the results on lcd display.

CIRCUIT DIAGRAM

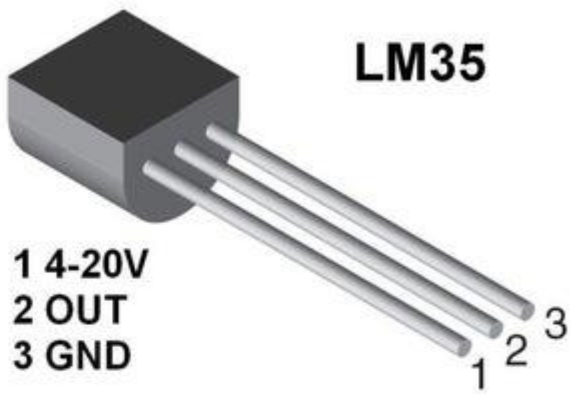


The circuit connections are made as above diagram. Connect the Potentiometer for fading. Adjust the contract bye connecting the resistance series with the potentiometer.

COMPONENTS DIAGRAM



1 LM35



1. Pin 1 to 5v.
2. Pin 2 to A0.
3. Pin 3 to GND.

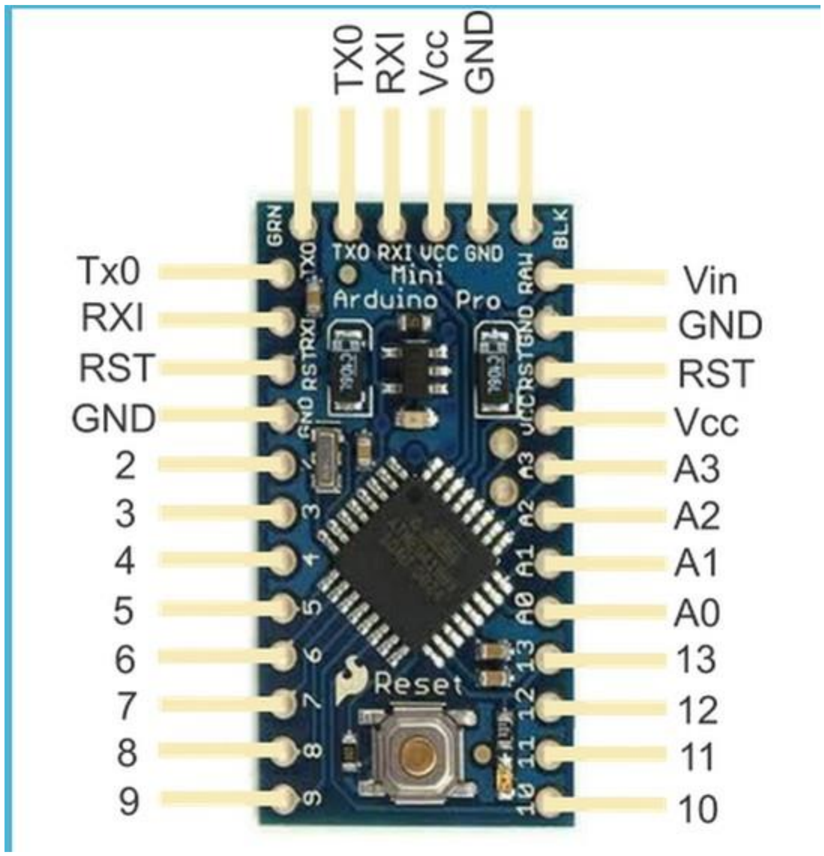
FEATURES

- **Calibrated Directly in Celsius (Centigrade)**
- **Linear + 10-mV/°C Scale Factor**
- **0.5°C Ensured Accuracy (at 25°C)**
- **Rated for Full −55°C to 150°C Range**
- **Suitable for Remote Applications**
- **Low-Cost Due to Wafer-Level Trimming**
- **Operates From 4 V to 30 V**
- **Less Than 60-µA Current Drain**
- **Low Self-Heating, 0.08°C in Still Air**
- **Non-Linearity Only ±¼°C Typical**
- **Low-Impedance Output, 0.1 Ω for 1-mA Load**

2 RESISTOR

We used 330 ohms resistor to control the brightness of the LCD display. It increases the contrast level of the LCD display. Is is connected to the RS to the series with the Aurdino.

2 AURDINO MINI



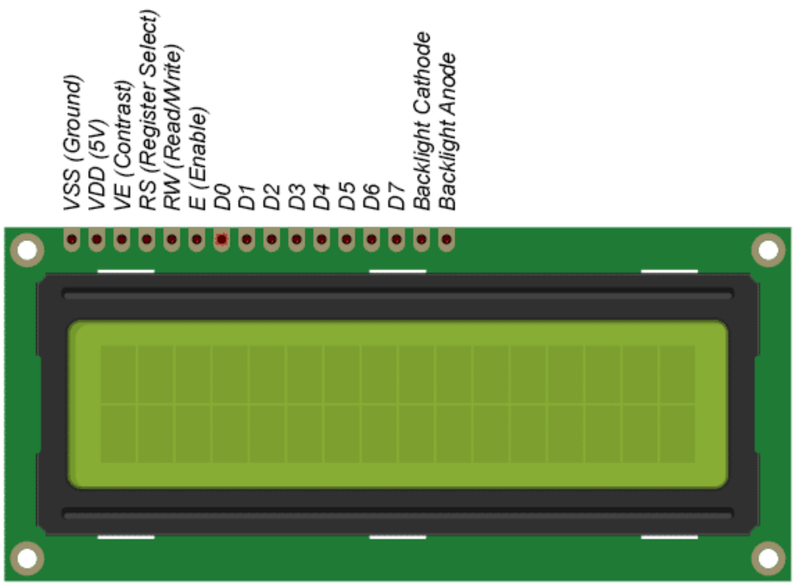
The Arduino Mini is a small microcontrollerboard. It is originally based on the ATmega328P

prefer to use on breadboards and when you have less space. Because of its small size,

connecting the Arduino Mini is a lot more complicated than a regular Arduino board.

The Arduino Mini is programmed using the Arduino Software (IDE).Once the program is flashed into the Aurdino it will be remain in it.

4 LCD DISPLAY



1. GND pin if aurdino is connected to GND pin of LCD.
2. 5 volt VDD is connected to aurdino vin.
3. VE contrast pin is connected to GND of aurdino.
4. RS is connected to D12.
5. RW us connected to GND.
6. E enable is connected to D11.
7. D4 databus pin is connected to D5.
8. D5 pin to D4.

9. D6 pin to D3.

10. D7 pin to D2.

11. Backlight cathode to vin.

12. Backlight anode pin to parallel to the resistor.

PROGRAMMING

```
#include <LiquidCrystal.h>
LiquidCrystal lcd(12,11,5,4,3,2);
int analog_OP,d,f;
void setup()
{
 lcd.begin(16,2);
}
void loop()
{
 lcd.clear();
 lcd.print("Temp:-");
 analog_OP=analogRead(A0);
 d=(int)((analog_OP*10)/2.045)%10;//celsius scale
  if(((analog_OP*10)/2.045)>1000)
      lcd.setCursor(3,1);
  else
    {
      lcd.setCursor(2,1);
      lcd.print(".");
      lcd.print(d);
      lcd.setCursor(5,1);
      lcd.print("'C");
      lcd.setCursor(0,1);
      lcd.print((((analog_OP*10)/2.045)/10)-2.1666);
      lcd.setCursor(9,1);// kelvin scale
```

```
    lcd.print((((analog_OP*10)/2.045)/10)+271.8666);
    lcd.setCursor(14,1);
    lcd.print(" K");
    lcd.setCursor(11,0);// farenheit scale
    f=((((analog_OP*10)/2.045)/10)*1.8)+28;
    lcd.print(f);
    lcd.print("'F");
    delay(300);
     lcd.clear();
   }
}
```

We created the programming part using aurdino ide software.

After creating the program it can be feed into the aurdino board

Using the USB to mini b cable. Using this program we can able

To convert analog output that is given by the lm35 sensor to

Digital value and that can be displayed on the LCD display.

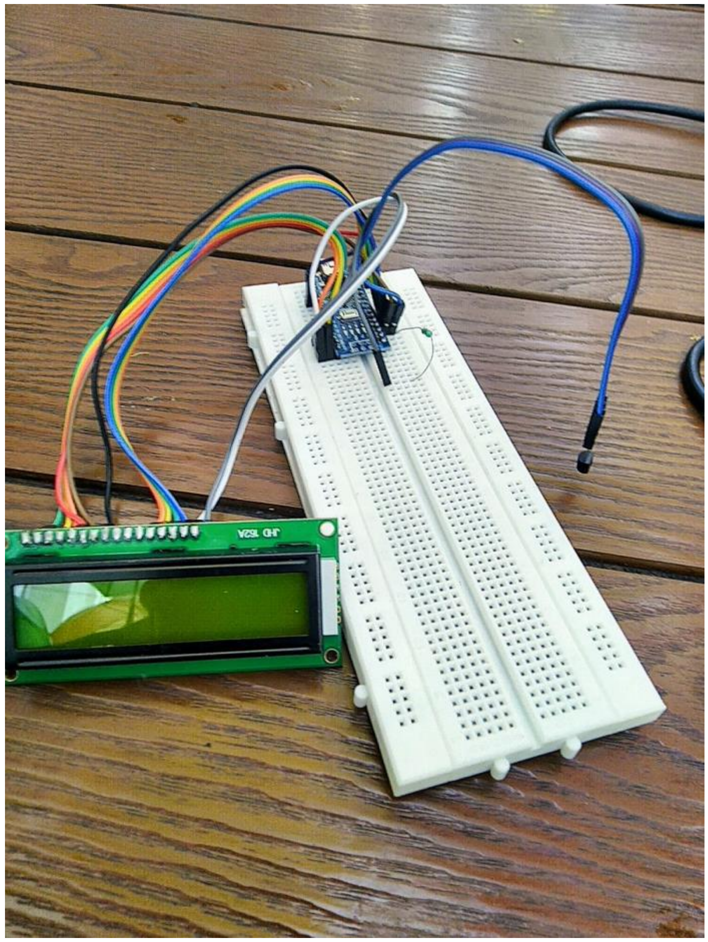
APPLICATION

- It’s used for measuring the temperature of a particular environment.
- It provides thermal shutdown for a circuit or component used in a specific project.
- It can be used for battery temperature measurement. It provides battery protection from overheating.
- It can be used in HVAC applications as a temperature measurement device.
- Temperature sensors are widely used in domestic and industrial applications such as: refrigerators; ovens;

OUTPUT

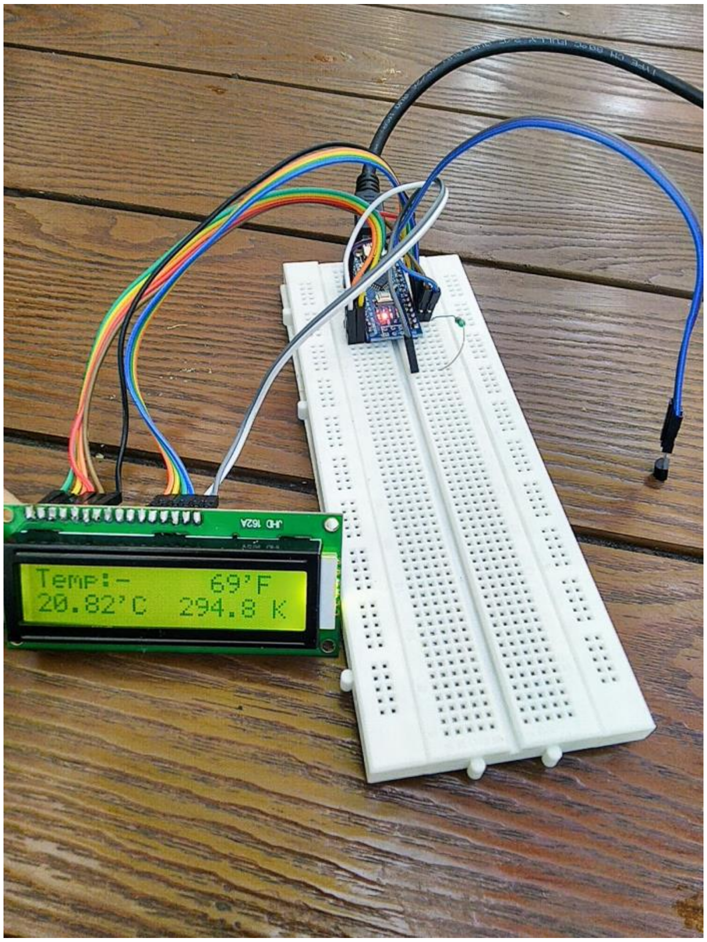
BEFORE SWITCHING ON

The below picture shows the off condition of the temperature sensor circuit. The sensor is currently in switch off condition because there is no power supply is connected to the aurdino. So we can't see any output.



AFTER SWITCHING ON

The below picture shows the on Condition of the temperature sensor circuit. We can give the power supply from the laptop or powerbank using a USB to mini B cable. The Aurdino takes the supply it transforms 5-30v supply to the sensor so the procedure beings. The circuit working is explained above. We can get the accurate temperature reading in the LCD display.



CONCLUSION

Temperature sensor plays a very important role in our everyday activity it is either for commercial use or household application we used this type of measuring device frequently. Controlling and monitoring the temperature is essential in every aspect of work.

We used the lm35 sensor to measure the temperature of surrounding atmosphere it is very cheap and gives more accurate value. Implementation is also easier in this type of sensor. It requires only aurdino and a breadboard to to measure the temperature.

We can implement this sensor in any industries to monitor the temperature of the automation that requires a particular temperature to operate and work. This can also used in household appliances like heater, Owen, air-condition,also can be used to measure room temperature.

At present we implemented on the breadboard by connecting the wire between the LCD display and the sensor to the aurdino board. Next upcoming time we will replace the breadboard connection by printed circuit board so it will consume less space and more cost effective also.

REFERENCE

★ www.microcontroller project.com

- ★ www.electronicwing.com