**Experiment No.:** 02

**Experiment Name:** Experimental study on Humidity and Temperature Sensing using DHT21 sensor.

**Objective:**

**Theory:**

**Required Hardwares with Quantity:**

**Required Software:**

**Theory:**

**Working Procedure:**

**Hardware Arrangement Diagram:**

**Sketch:**

**Result and Output:**

**Conclusion:**

## Basic Knowledge:

## What is humidity?

Humidity is the water vapor around you mixed with air. It is measured in percents. So, if the humidity is 60 percent (which is the average humidity), then 60 percent of the air is water vapor around you.

If it is 100%, then it means either the sensor is not correct, the sensor is broken/damaged, the Arduino crashed, the Arduino can't receive any signal, there's an error in the code or you're underwater *.

If it's 0%, it means all the reasons above except the last one, you're in space or you're in the middle of a desert**.

** The air in a desert does contain some water but it is a very little amount compared to a normal place. The Sahara Desert has a mean humidity of 25%.

## DHTs:

DHT stands for Digital Humidity and Temperature. DHT11 is a low-cost digital sensor for sensing temperature and humidity. This sensor can be easily interfaced with any micro-controller such as Arduino, Raspberry Pi etc… to measure humidity and temperature instantaneously. There are two versions of the DHT sensors they are: 1. DHT11 2. DHT22

They look a bit similar and have the same pinout, but have different characteristics. Here are the details of these two sensors: The DHT22 is bit more expensive as it has better specifications like

it is more precise, more accurate and works in a bigger range of temperature & humidity. Its temperature measuring range is from -40°C to +125°C with +-0.5 degrees accuracy, while the DHT11 temperature range is from 0°C to 50°C with +-2 degrees accuracy. Also the DHT22 sensor has better humidity measuring range, from 0 to 100% with 2-5% accuracy, while the DHT11 humidity range is from 20 to 80% with 5% accuracy. There are few things where DHT11 sensor can be a better choice than DHT22 sensor. As it is less expensive, smaller in size and has higher sampling rate. The sampling rate of the DHT11 is 1Hz i.e. one reading every second, while the sampling rate of DHT22 is 0.5Hz i.e. one reading for every two seconds

**DHT21:**

The DHT21, also known as AM2301, is a digital sensor similar to the DHT11 but with better performance in terms of accuracy and range. It is widely used for measuring both temperature and humidity in various environments.

**DHT21 Sensor Overview**

- **Measurement Parameters:**
    - **Relative Humidity (RH):** Measures the percentage of moisture in the air relative to the maximum amount the air can hold at a given temperature.
    - **Temperature:** Measures the ambient temperature.
- **Sensor Type:** The DHT21 is a capacitive humidity sensor and a thermistor-based temperature sensor combined in a single package.

**Key Features of DHT21**

- **Humidity Range:** 0% to 100% RH with ±2% accuracy.
- **Temperature Range:** -40°C to 80°C (-40°F to 176°F) with ±0.5°C accuracy.
- **Operating Voltage:** 3.3V to 5.5V, making it compatible with most microcontrollers.
- **Response Time:** Typically, 2 seconds.

**How DHT21 Works**

- **Humidity Sensing:** The DHT21 uses a capacitive sensor element that detects moisture by measuring changes in capacitance. This data is then converted to a humidity percentage.
- **Temperature Sensing:** The DHT21 uses a thermistor to measure temperature. The thermistor's resistance varies with temperature, which is converted into a temperature reading.

DHT21 sensor

## The Circuit

The connections are pretty easy:

- Red cable to Arduino 3.3V or 5V pin
- Black cable to Arduino GND pin
- Yellow cable to Arduino 2 digital pin

## Sketch:

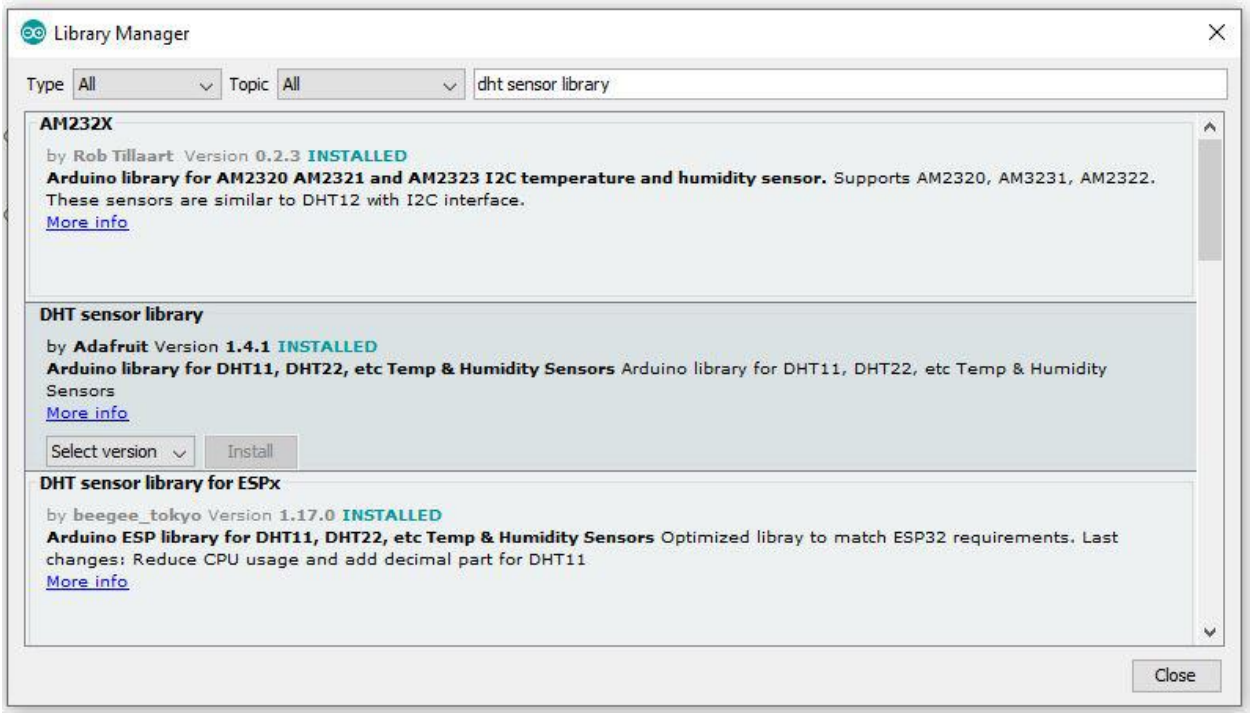
```
//Libraries
#include <DHT.h>;
//Constants
#define DHTPIN 2 //what pin we're connected to
#define DHTTYPE DHT21 //DHT 21 (AM2301)
DHT dht(DHTPIN, DHTTYPE); //Initialize DHT sensor for normal 16mhz Arduino
//Variables
float hum; //Stores humidity value
float temp; //Stores temperature value
void setup()
{
 Serial.begin(9600);
 dht.begin();
}
```

```
void loop()
{
 //Read data and store it to variables hum and temp
 hum = dht.readHumidity();
 temp= dht.readTemperature();

 //Print temp and humidity values to serial monitor
 Serial.print("Humidity: ");
 Serial.print(hum);
 Serial.print("%, Temperature: ");
 Serial.print(temp);
 Serial.println(" Celsius");

 delay(2000); //Delay 2 sec.
}
```

**Include Library** and install **DHT sensor library**.




TASK-2: Humidity and Temperature Sensing using DHT21 sensor and displaying the values using LCD.