# LAB - 14

Interfacing Temperature and Humidity Module (DHT11) with Node

Sensor module Overview

DHT11 sensor is a digital temperature and humidity sensor. The DHT11 sensor is pre-calibrated and doesn't require extra components so you can start measuring relative humidity and temperature right away.
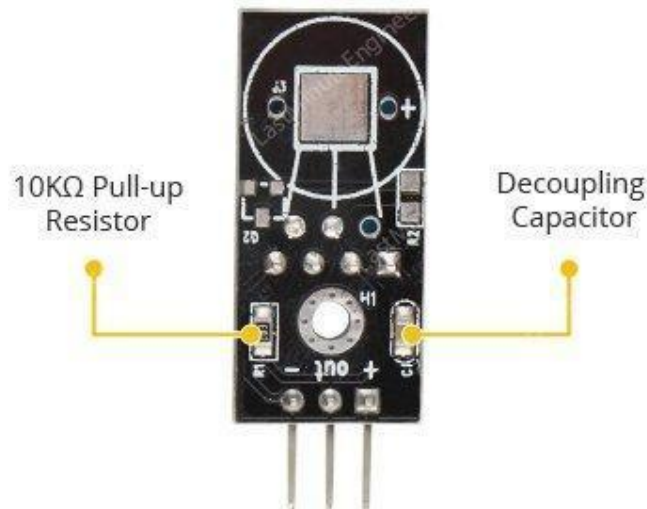
DHT11 Sensor

DHT11 can measure temperature from 0°C to 50°C with ±2.0°C accuracy, and humidity from 20 to 80% with 5% accuracy.
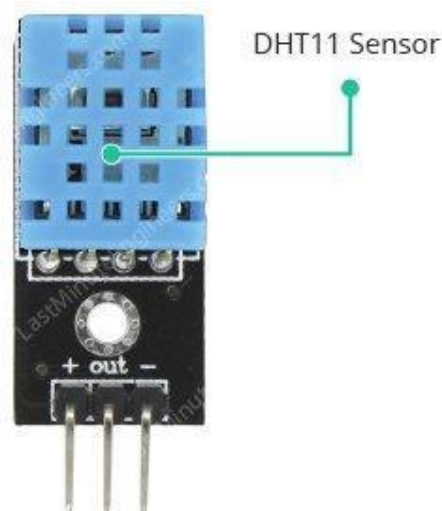
Note that the sampling rate of the DHT11 is 1Hz, meaning you can get new data from it once every second.

Supporting Circuitry

The module comes with all the essential supporting circuitry, so it should be ready to run without any extra components.

The DHT11 sensors usually require an external pull-up resistor of 10KΩ between VCC and Out pin for proper communication between sensor and the Arduino. However, the module has a built-in pull-up resistor, so you need not add it.

The module also has a decoupling capacitor for filtering noise on the power supply.

DHT11 Module Pinout

The DHT11 module is fairly easy to connect. It has only three pins:
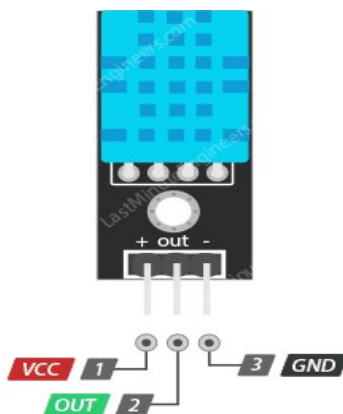

+ (VCC) pin supplies power for the sensor. 5V supply is recommended, although the supply voltage ranges from 3.3V to 5.5V. In case of 5V power supply, you can keep the sensor as long as 20 meters. However, with 3.3V supply voltage, cable length shall not be greater than 1 meter. Otherwise, the line voltage drop will lead to errors in measurement.

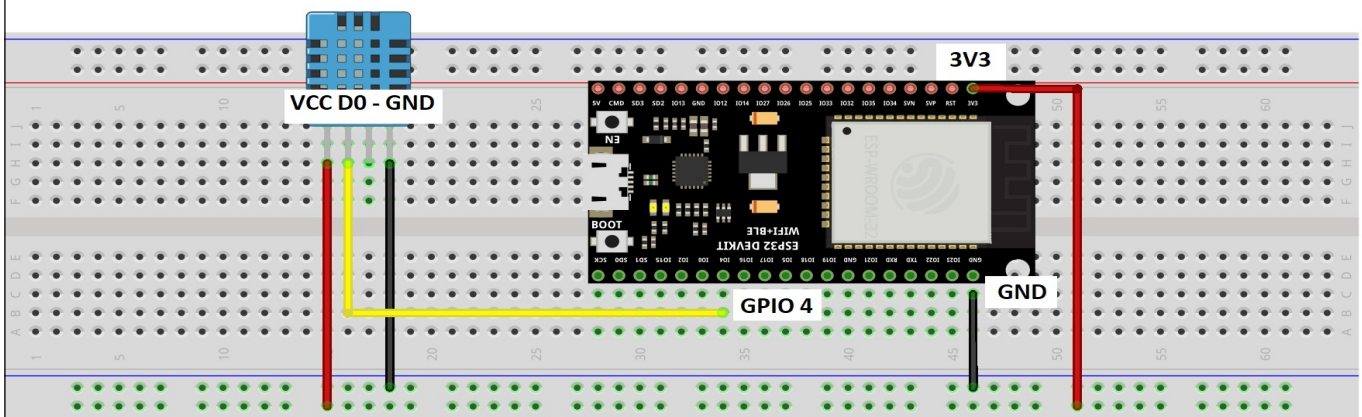Out pin is used to communication between the sensor and the Arduino.

– (GND) should be connected to the ground of Arduino.

Wiring DHT11 Module to ESP32

1. Connect the VCC pin on the sensor to the 3.3V pin on the arduino.
2. Connect ground pin to ground pin on arduino.
3. Connect the Data pin of the sensor to the D4 pin on the arduino.
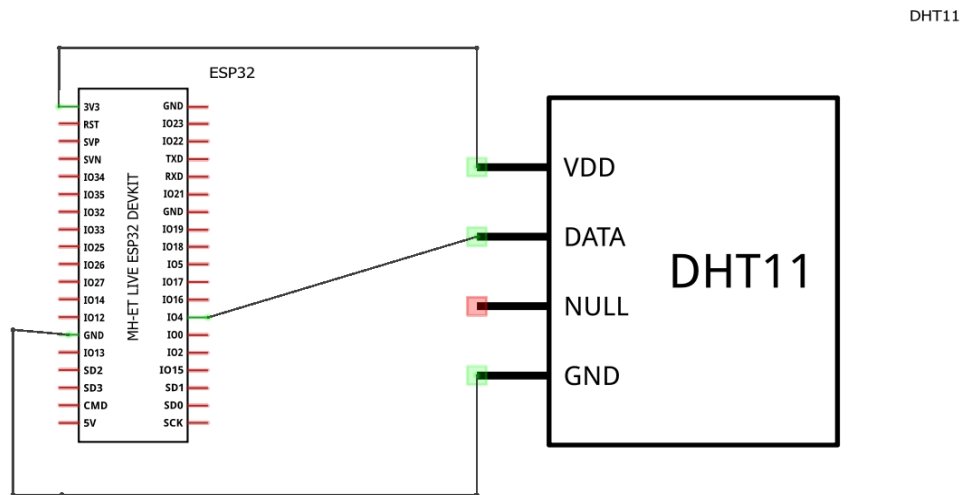
Installing DHT Sensor Library

Communicating with DHT11, DHT22/AM2302 sensors is a bunch of work, as they have their own single wire protocol for data transfer. And this protocol requires precise timing. Fortunately, we don't have to worry much about this because we are going to use the DHT library from Adafruit which takes care of almost everything. The library is so powerful that it runs on both Arduino and ESP architecture.

To install the library navigate to the Sketch > Include Library > Manage Libraries… Wait for the Library Manager to download the libraries index and update the list of installed libraries.
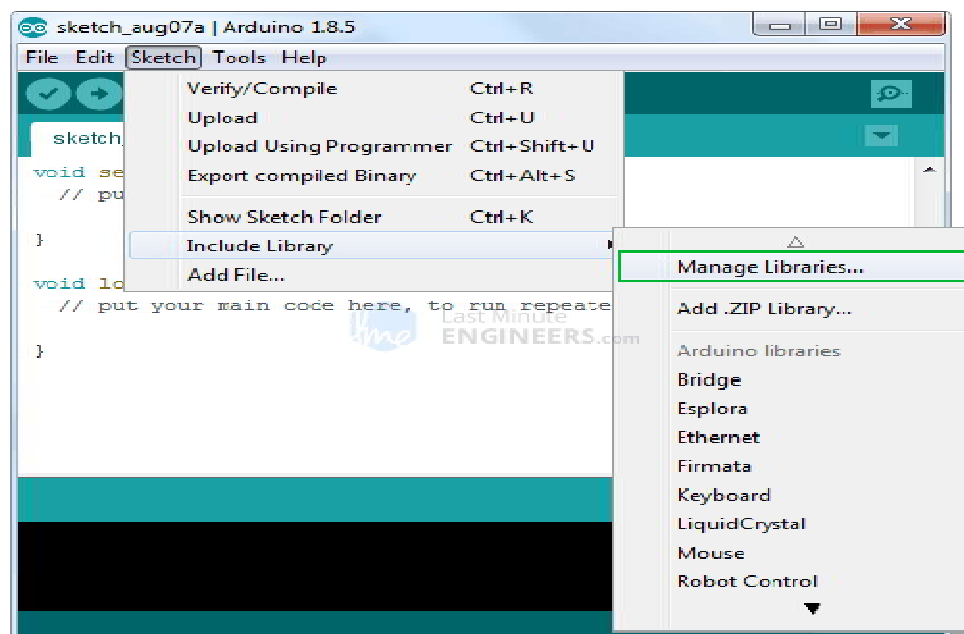
Filter your search by typing 'DHT sensor'. There should be a couple entries. Look for DHT sensor library by Adafruit. Click on that entry, and then select Install.
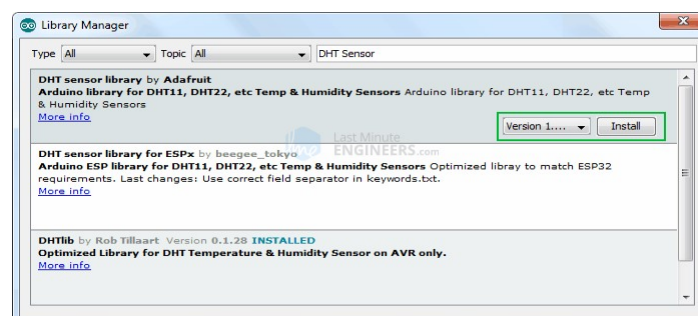
The DHT sensor library uses the **Adafruit Sensor support backend**. So, search the library manager for Adafruit Unified Sensor and install that too (you may have to scroll a bit)

Algorithm:

1. Define the type of DHT sensor.
2. Define GPIO4 as DHTpin.
3. Setup DHTpin as Input pin.
4. Start the serial communication with a certain baudrate.
5. In the loop, read the values of temperature and humidity by dht.readTemperature() and dht.readHumidity().
6. Print the temperature and humidity values in the serial monitor.

Code:

```
//install dht11 by adafruint in arduino ide

#include <DHT.h>
#define DHTPIN 2
// Pin connected to the DHT sensor
#define DHTTYPE DHT11
// DHT 11 sensor type
DHT dht(DHTPIN, DHTTYPE);
void setup() {
  Serial.begin(9600);
  Serial.println("DHT11 Humidity & temperature sensor test");
  dht.begin();
}
void loop() {
  delay(2000); // Delay between sensor readings
  float humidity = dht.readHumidity();
  float temperature = dht.readTemperature();
  // Check if any reads failed and exit early (to try again).
  // if (isnan(humidity) || isnan(temperature)) {
```

```
//  Serial.println("Failed to read from DHT sensor!");
//  return;
// }

// Print temperature and humidity values to Serial Monitor
Serial.print("Humidity: ");
Serial.print(humidity);
Serial.print(" %\t");
Serial.print("Temperature: ");
Serial.print(temperature);
Serial.println(" *C");
}
```

Output:

Humidity: 69
Temperature: 32*C
Humidity: 71
Temperature: 27*C

Result:

      Thus the temperature and humidity is found using DHT11 Sensor successfully.