Welcome!

Thank you for purchasing our *AZ-Delivery DHT11 Temperature/Humidity Sensor Module*. On the following pages, you will be introduced to how to use and set-up this handy device.

Have fun!

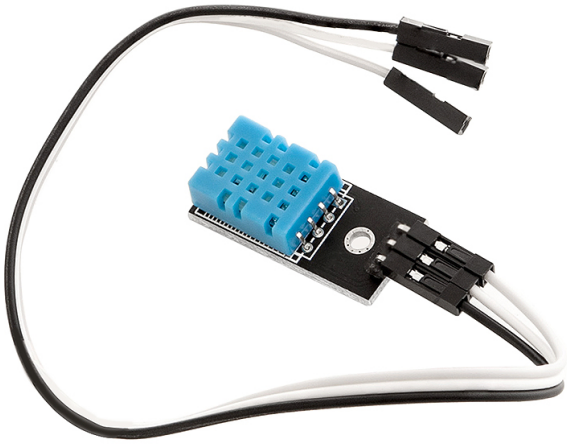


Table of Contents

Introduction

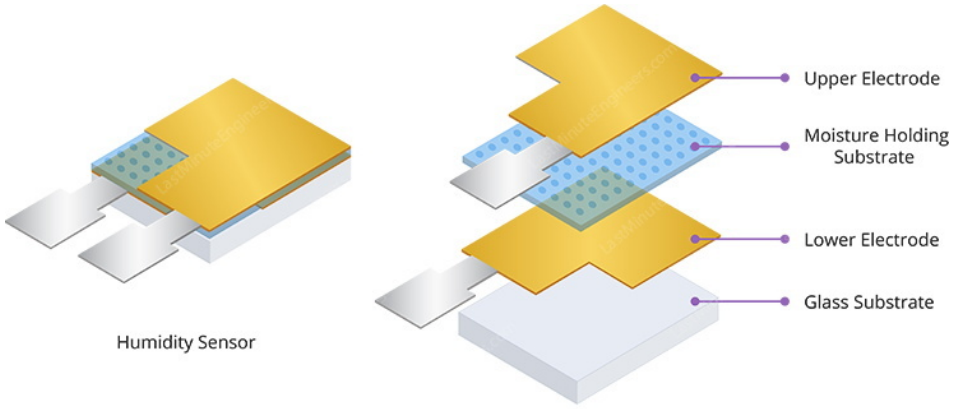
The DHT11 sensor is relative humidity and temperature sensor that outputs a digital signal. It uses a capacitive humidity sensor and a thermistor to measure the humidity and the temperature of the surrounding air.

Temperature measuring range of the DHT11 sensor is from *0°C* to *+50°C,* with *±2°C* accuracy. The humidity measuring range is from *20%* to *90%*, with *±5%* accuracy.

Specifications

Operating voltage range:	from 3.3V to 5V DC
Max operating current:	2.5mA max
Humidity range:	20% - 90% with accuracy of 5%
Temperature range:	0°C - 50°C with accuracy of ±2°C
Sampling rate:	1Hz (reading once per second)
Dimensions:	15 x 32 x 9mm [0.6 x 1.3 x 0.35in]

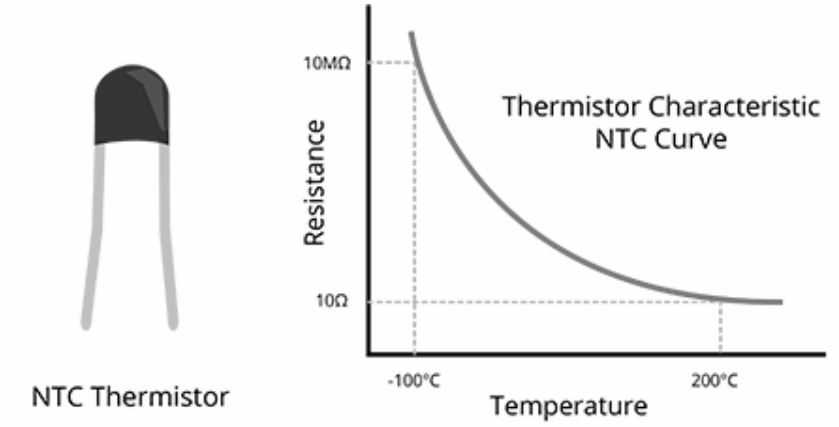
Inside the case, on the sensing side of the DHT11 sensor, there is a humidity sensing component along with an NTC temperature sensor (or thermistor).



The Humidity sensing component is used to measure relative humidity, it has two electrodes with moisture holding substrate (usually salt or conductive plastic polymer) sandwiched between electrodes. The ions are released by the substrate as water vapor is absorbed by it, which in turn increases the conductivity between the electrodes. The change in resistance between the two electrodes is proportional to the relative humidity.

Higher relative humidity decreases the resistance between the electrodes, while lower relative humidity increases the resistance between the electrodes.

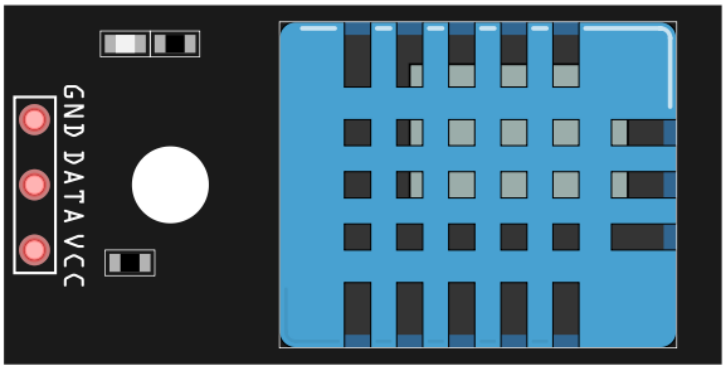
The temperature sensing part of the sensor consists of an NTC temperature sensor (thermistor). A thermistor is a thermal resistor, a resistor that changes its resistance with temperature. Technically, all resistors are thermistors, their resistance changes slightly with temperature, but the change is usually small and difficult to measure. Thermistors are made so that the resistance changes drastically with temperature. The resistance change can be up to *100Ω* per degree of temperature. The term *NTC* means *Negative Temperature Coefficient*, which means that the resistance decreases with the increase of temperature.



On the other side, there is a small *PCB* with an *8-bit SOIC-14* packaged integrated circuit (IC for short). The IC measures and processes the analog signal with stored calibration coefficients, does analog to digital conversion and outputs a digital signal with the data that contains information for temperature and humidity.

The pinout

GROUND - GND
DATA OUTPUT - DATA
POWER SUPPLY - VCC



***VCC* pin** - supplies power for the sensor. Although supply voltage can range between *3.3V* and *5V*, a *5V* supply is recommended. In the case of a *5V* power supply, a cable that connects sensor and microcontroller can be up to *20* meters long. However, with *3.3V* supply voltage, cable length shall not be longer than one meter, otherwise, the line voltage drop will lead to errors in measurement.

***DATA* pin** - is the data pin and it is used for communication between the sensor and the microcontroller.

***GND* pin** - is a ground pin and should be connected to the common ground or *0V* (on Uno or Raspberry Pi).

How to set-up Arduino IDE

If the Arduino IDE is not installed, follow the *link* and download the installation file for the operating system of choice.

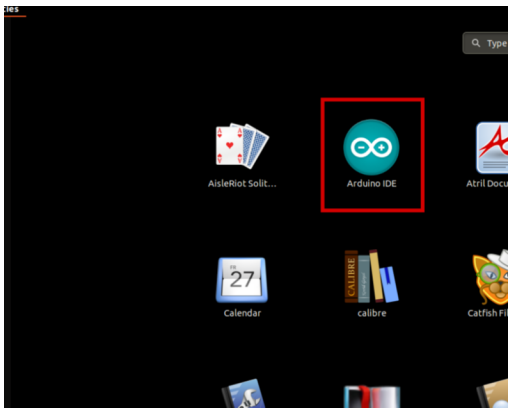
For *Windows* users, double click on the downloaded *.exe* file and follow the instructions in the installation window.

For *Linux* users, download a file with the extension *.tar.xz*, which has to be extracted. When it is extracted, go to the extracted directory and open the terminal in that directory. Two *.sh* scripts have to be executed, the first called *arduino-linux-setup.sh* and the second called *install.sh*.

To run the first script in the terminal, open the terminal in the extracted directory and run the following command:
sh arduino-linux-setup.sh user_name
user_name - is the name of a superuser in Linux operating system. A password for the superuser has to be entered when the command is started. Wait for a few minutes for the script to complete everything.

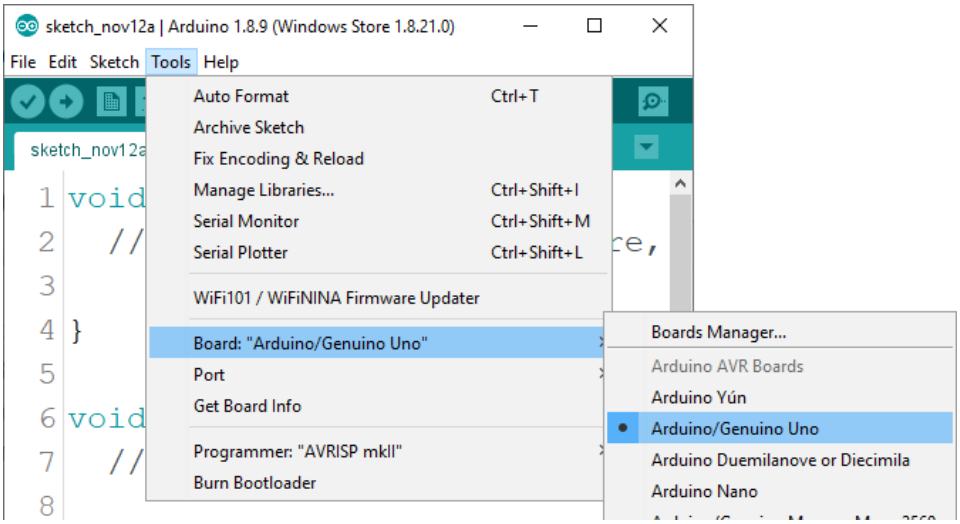
The second script, called *install.sh* has to be used after the installation of the first script. Run the following command in the terminal (extracted directory): **sh install.sh**

After the installation of these scripts, go to the *All Apps*, where the *Arduino IDE* is installed.



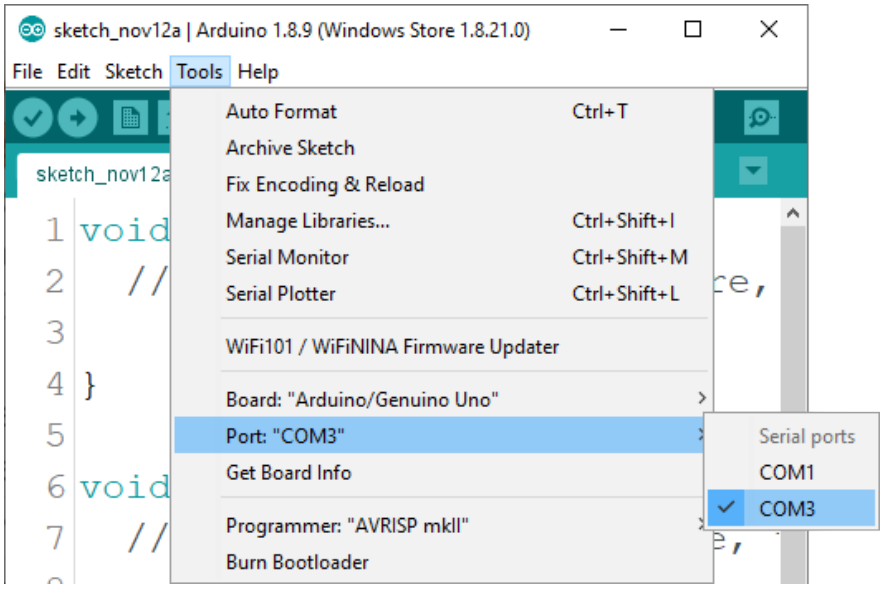
Almost all operating systems come with a text editor preinstalled (for example, *Windows* comes with *Notepad*, *Linux Ubuntu* comes with *Gedit*, *Linux Raspbian* comes with *Leafpad*, etc.). All of these text editors are perfectly fine for the purpose of the eBook.

Next thing is to check if your PC can detect an Arduino board. Open freshly installed Arduino IDE, and go to:
Tools > Board > {your board name here}
{your board name here} should be the *Arduino/Genuino Uno*, as it can be seen on the following image:



The port to which the Arduino board is connected has to be selected. Go to:
Tools > Port > {port name goes here}
and when the Arduino board is connected to the USB port, the port name can be seen in the drop-down menu on the previous image.

If the Arduino IDE is used on Windows, port names are as follows:



For *Linux* users, for example port name is */dev/ttyUSBx*, where *x* represents integer number between *0* and *9*.

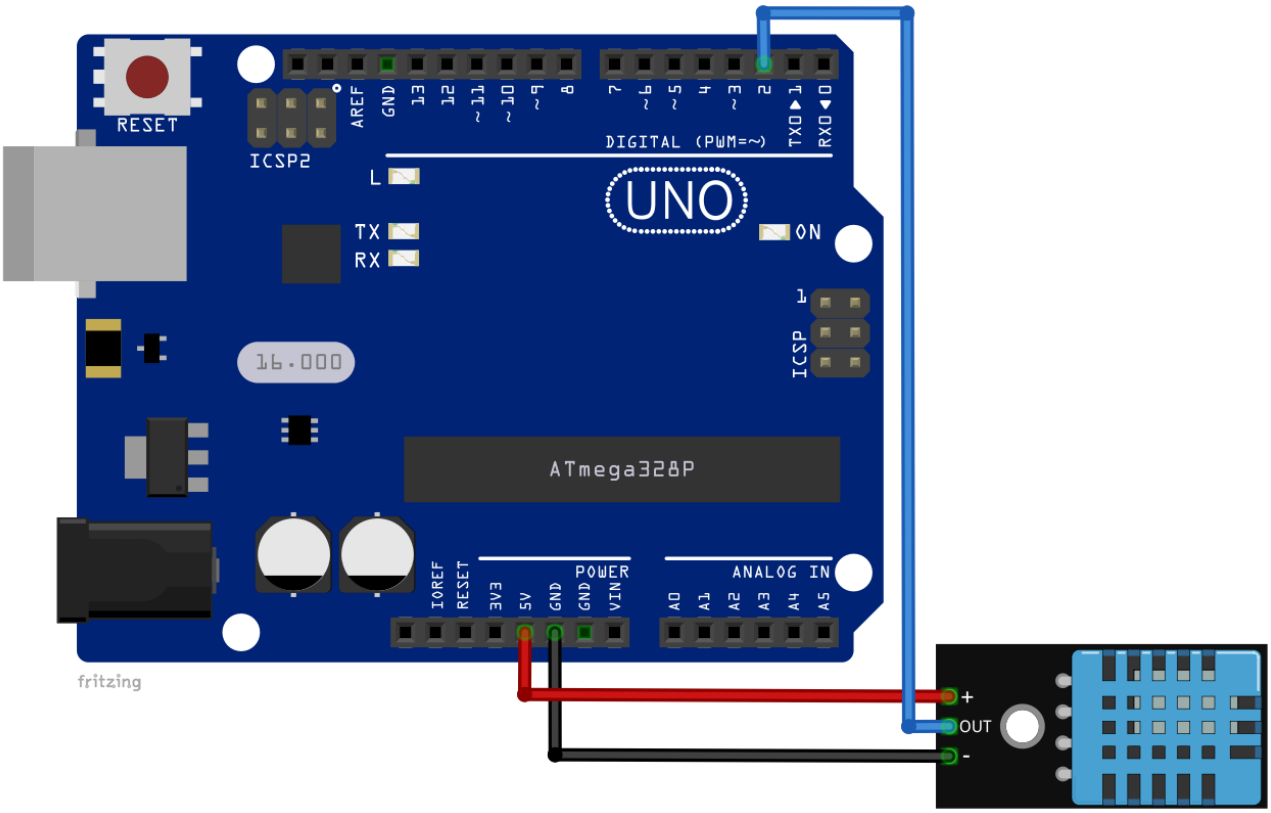
How to set-up the Raspberry Pi and Python

For the Raspberry Pi, first the operating system has to be installed, then everything has to be set-up so that it can be used in the *Headless* mode. The *Headless* mode enables remote connection to the Raspberry Pi, without the need for a *PC* screen Monitor, mouse or keyboard. The only things that are used in this mode are the Raspberry Pi itself, power supply and internet connection. All of this is explained minutely in the free eBook: *Raspberry Pi Quick Startup Guide*

The *Raspbian* operating system comes with *Python* preinstalled

Connecting the module with Uno

Connect the module with the Uno as shown on the following image:



Module pin	Uno pin	Wire color
DATA	D2	**Blue Wire**
GND	GND	**Black Wire**
VCC	5V	**Red Wire**

Library for Arduino IDE

To use the module with Uno it is recommended to download an external library. The most simple library that is used in this eBook is called the *SimpleDHT* library, which can be downloaded on the following *link*.

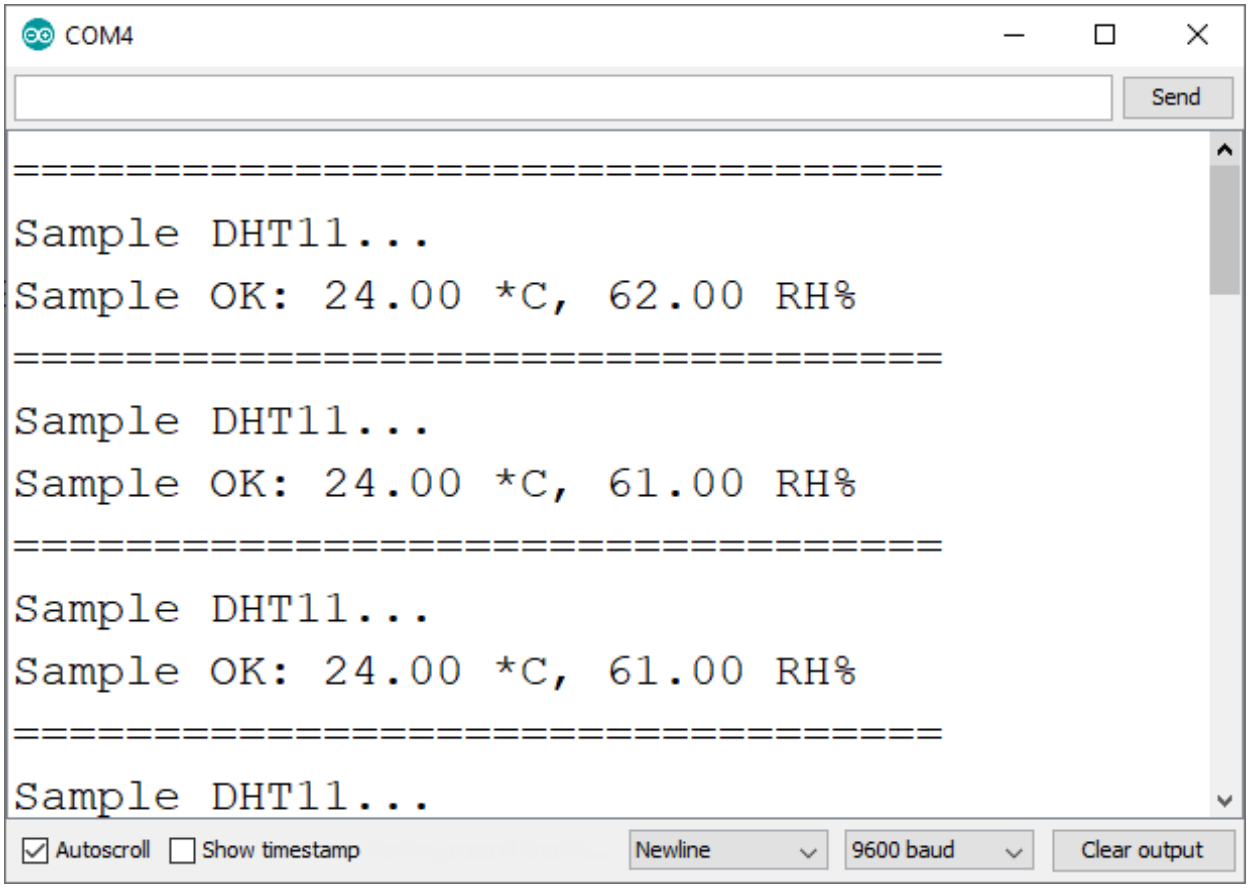
When the *.zip* file is downloaded, open Arduino IDE and go to:
Sketch > Include Library > Add .ZIP Library
and add the downloaded zip file.

Sketch example

Go to: *File > Examples > SimpleDHT > DHT11Default*
and open the sketch. The following is the sketch code:

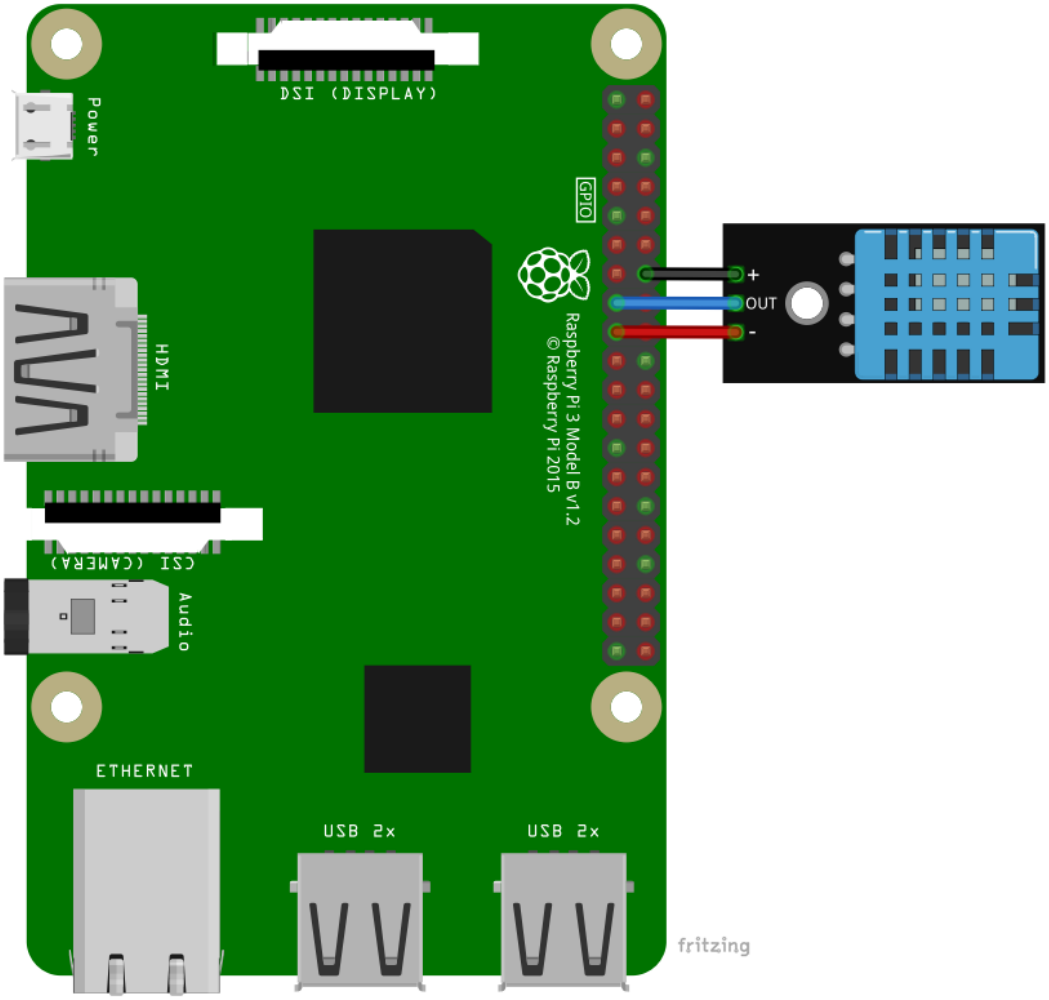
```
#include <SimpleDHT.h>
int pinDHT11 = 2;
SimpleDHT11 dht11(pinDHT11);
void setup() { Serial.begin(9600); }
void loop() {
  Serial.println("Sample DHT11...");
  float temperature = 0;
  float humidity = 0;
  int err = SimpleDHTErrSuccess;
  if((err=dht11.read2(&temperature, &humidity, NULL)) != SimpleDHTErrSuccess){
    Serial.print("Read DHT11 failed, err=");
    Serial.println(err);
    delay(2000);
    return;
  }
  Serial.print("Sample OK: ");
  Serial.print((float)temperature);
  Serial.print(" *C, ");
  Serial.print((float)humidity);
  Serial.println(" RH%");
  delay(1500); // DHT11 sampling rate is 1HZ.
}
```

Upload the sketch to the Uno and run the Serial Monitor (*Tools* > *Serial Monitor*). The result should look like as on the following image:



Connecting the module with Raspberry Pi

Connect the module with the Raspberry Pi as shown on the following image:



Module pin	Raspberry Pi pin	Physical pin	Wire color
GND	GND	14	**Black Wire**
DATA	GPIO22	15	**Blue Wire**
VCC	3V3	17	**Red Wire**

Library and tools for Python

In order to use the DHT11 with a Raspberry Pi, it is recommended to download and install an external library. The library that is used in this eBook is called *Adafruit_DHT*. To install the library make sure that Raspbian is up to date. Start your Raspberry Pi, open the terminal and run the following commands:

The first command is for making the system up to date:

```
sudo apt-get update && sudo apt-get upgrade -y
```

If the pip3 tool is not installed, run the following command:

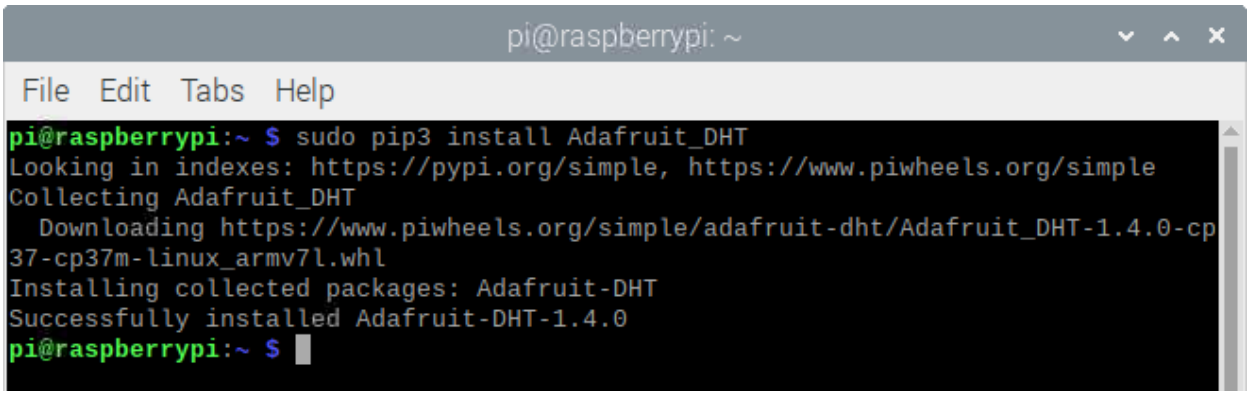
```
sudo apt-get install python3-pip
```

The third command is for additional tools, used for installing libraries:

```
sudo python3 -m pip install --upgrade pip setuptools wheel
```

Next, use the pip3 to install the library. To do so, run the following command:

```
sudo pip3 install Adafruit_DHT
```



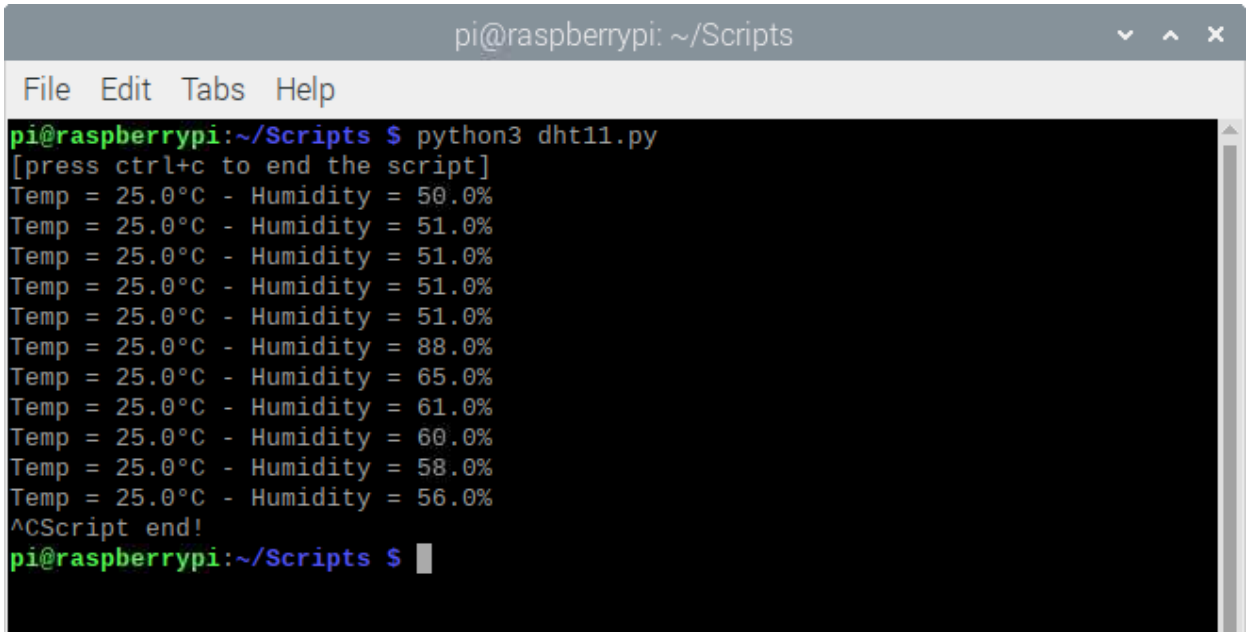
Python script

```
import Adafruit_DHT
from time import sleep

sensor = Adafruit_DHT.DHT11
pin = 22 # DHT11 sensor connected to GPIO22

degree_sign = u'\xb0' # degree sign

print('press CTRL+C to end the script')
try: # Main program loop
      while True:
            humidity, temperature = Adafruit_DHT.read_retry(sensor,pin)
            sleep(1.5)
            if humidity is not None and temperature is not None:
                  print('Temp = {:0.1f}{}C - Humidity = {:0.1f}%'
                        .format(temperature,degree_sign,humidity))
            else:
                  print('Failed to get reading. Try again!')

except KeyboardInterrupt:
      print('\nScript end!')
```

Save the script by the name *dht11.py*. To run the script, open the terminal in the directory where the script is saved and run the following command:

python3 dht11.py

The result should look like as on the following image:



To stop the script press ‘CTRL + C’ on the keyboard.

Now it is the time to learn and make your own projects. You can do that with the help of many example scripts and other tutorials, which can be found on the Internet.

If you are looking for the high quality products for Arduino and Raspberry Pi, AZ-Delivery Vertriebs GmbH is the right company to get them from. You will be provided with numerous application examples, full installation guides, eBooks, libraries and assistance from our technical experts.

https://az-delivery.de

Have Fun!

Impressum

https://az-delivery.de/pages/about-us