



VIRTUAL COURSE
**BUILD YOUR OWN
DATA LOGGER**



WILDLABS.NET

[The conservation technology network]

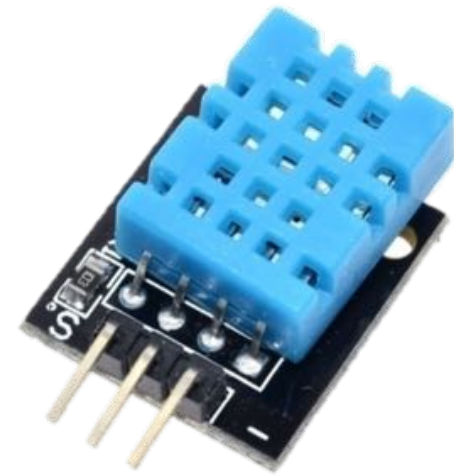
FREAKLABS



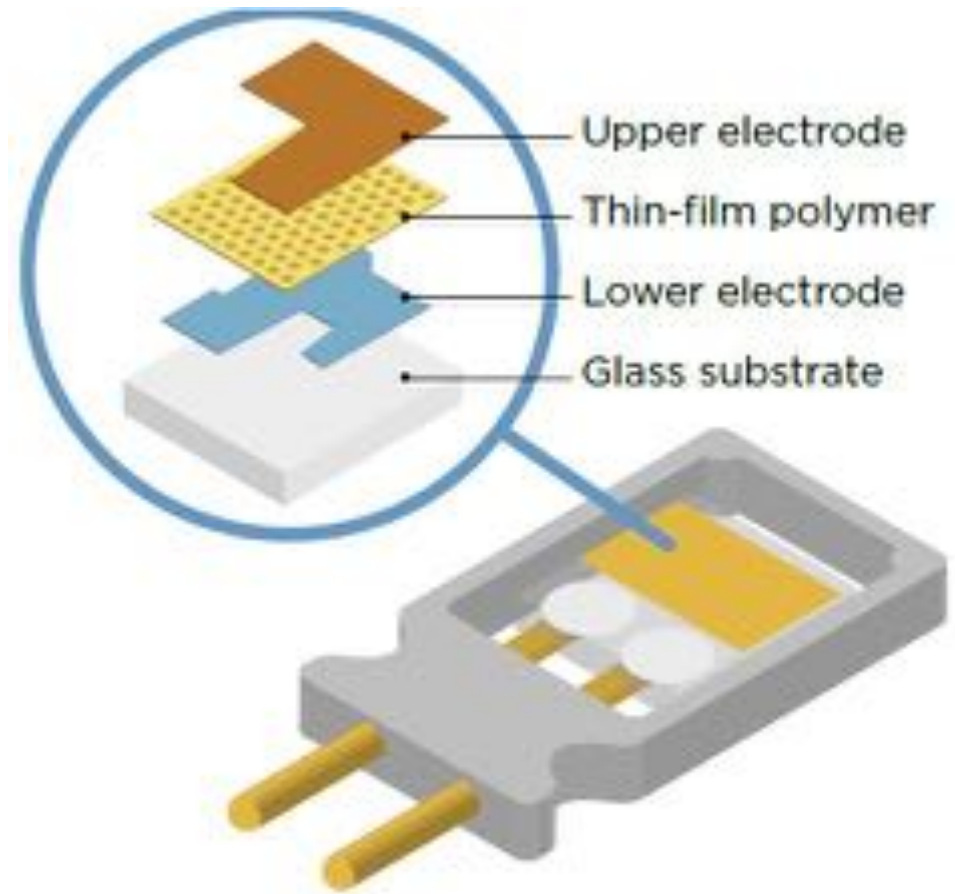
MODULE 3-2

TEMPERATURE AND HUMIDITY SENSING

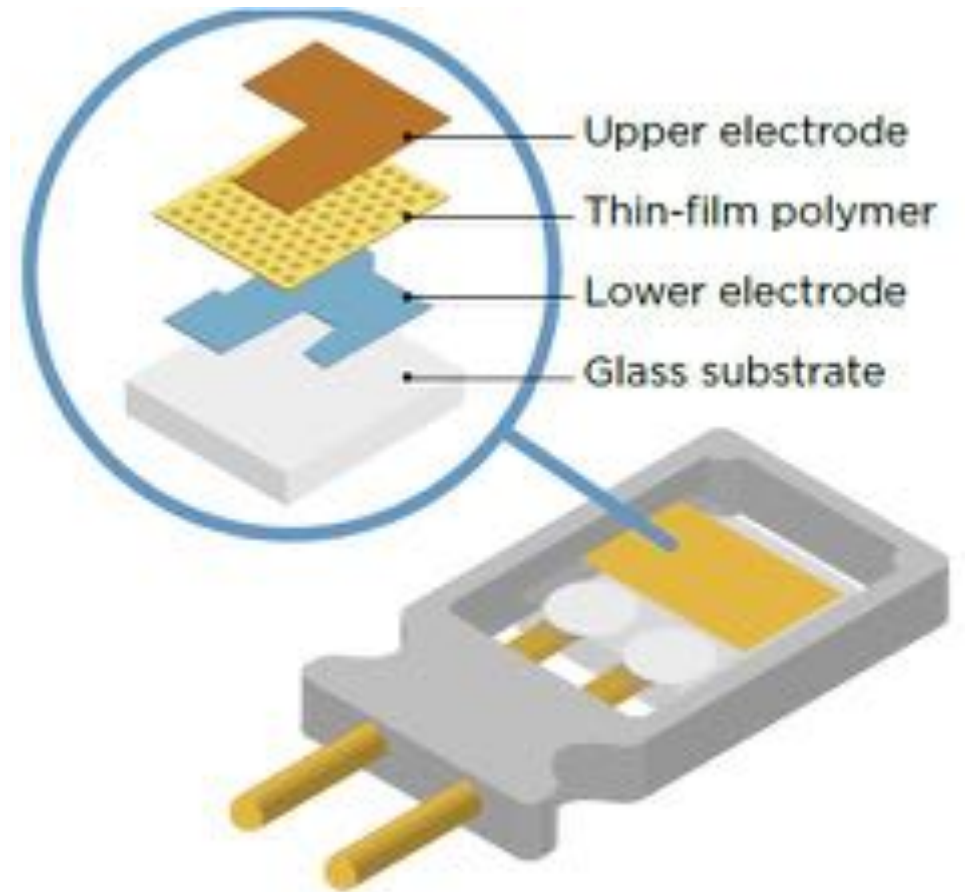
Temperature



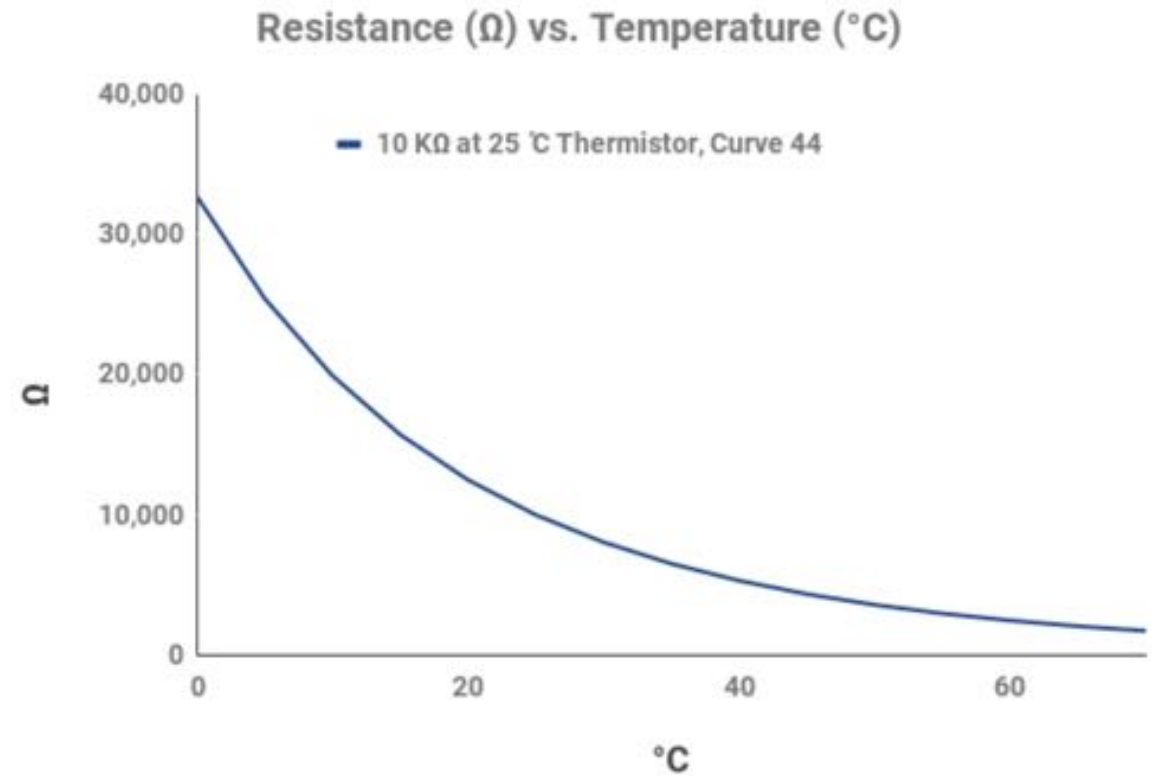
Humidity



DHT11 - Humidity



DHT-11 Temperature



DHT-11 Temperature

Analog Signal




Digital Signal



DHT-11 Temperature





Module 3-2
**Temperature and humidity
Sensing**

Lab 2a
Hello Temperature & Humidity

Lab 2a – Hello Temperature & Humidity

Goal:

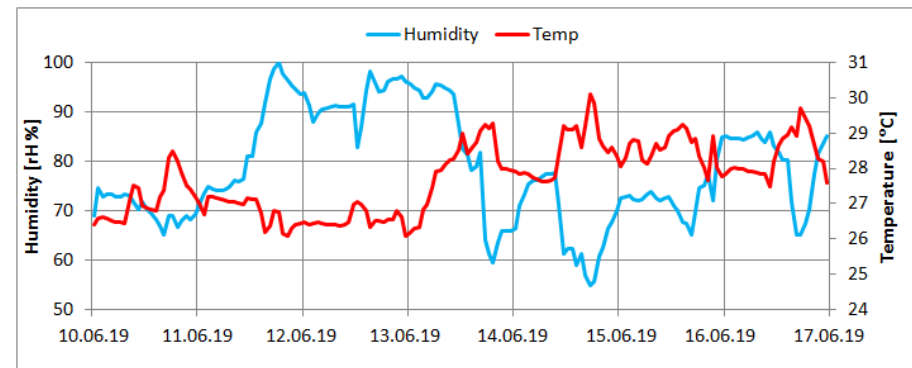
- Install DHT11 sensor library
- Read temperature and humidity from sensor



Lab 2a – Hello Temperature & Humidity

Why do I need to know this?

- Environmental factors that affect humans and animals
- Important for health and safety
- Affects storage of things like food, equipment
- Also potentially environmental variable that can affect behavior



Lab 2a – Hello Temperature & Humidity




What do I need to know?

- Install DHT11 library via Arduino Library manager
 - Also need to install Adafruit Unified Sensor Library
- **DHT dht(pin, sensor)**
 - Constructor that initializes sensor object
- **dht.begin()**
 - Initializer for the sensor
- **dht.readTemperature()**
 - Read temperature from sensor in Celsius units
- **dht.readHumidity()**
 - Read temperature from sensor in %RH

Lab 2a

Temperature & Humidity Sensing



```
TempHumiditySensing | Arduino 1.8.13  
TempHumiditySensing §  
1 #include "DHT.h"  
2  
3 DHT dht(A0, DHT11);  
4  
5  
6 void setup() {  
7 // put your setup code here, to run once:  
8 dht.begin();  
9 Serial.begin(57600);  
10 Serial.println("Lab 2a - Reading Temperature and Humidity");  
11 }  
12  
13 void loop() {  
14 // put your main code here, to run repeatedly:  
15 float temperature = dht.readTemperature();  
16 float humidity = dht.readHumidity();  
17  
18 Serial.print("Temperature: ");  
19 Serial.print(temperature);  
20 Serial.print(", Humidity: ");  
21 Serial.println(humidity);  
22 delay(2000);  
23 }  
24  
25 |
```



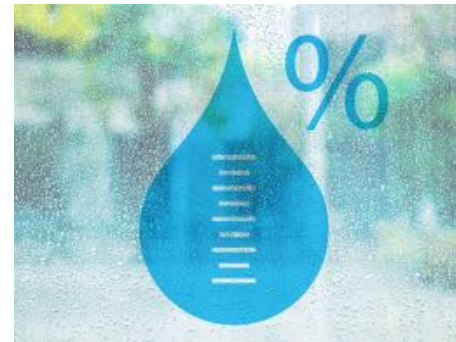
Module 3-2
Temperature and humidity Sensing

Lab 2b
Command Line Temperature and Humidity

Lab 2b – Command Line Temp & Humidity

Goal:

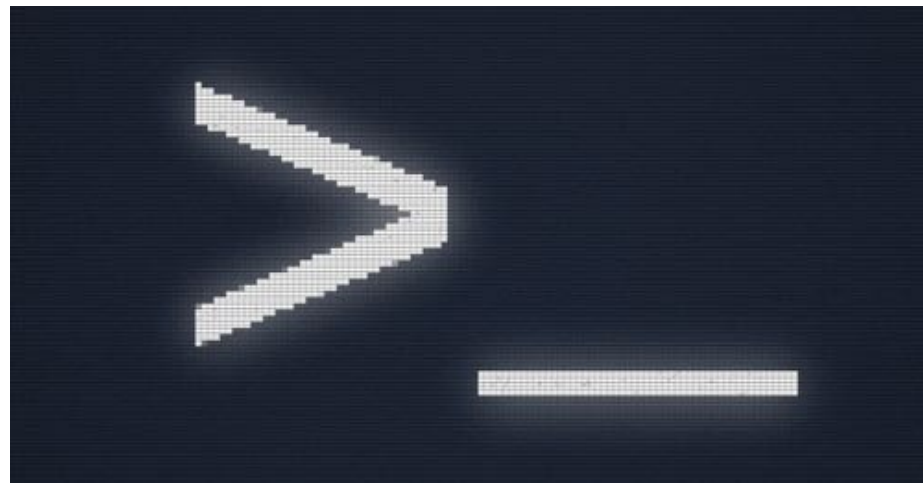
- Create a command that prints out the temperature
- Create a command that prints out the humidity



Lab 2b – Command Line Temp & Humidity

Why do I need to know this?

- We can interactively test out the sensor without having to constantly loop readings
- We can combine the interactive commands with other commands into a test program



Lab 2b – Command Line Temp & Humidity

What do I need to know?

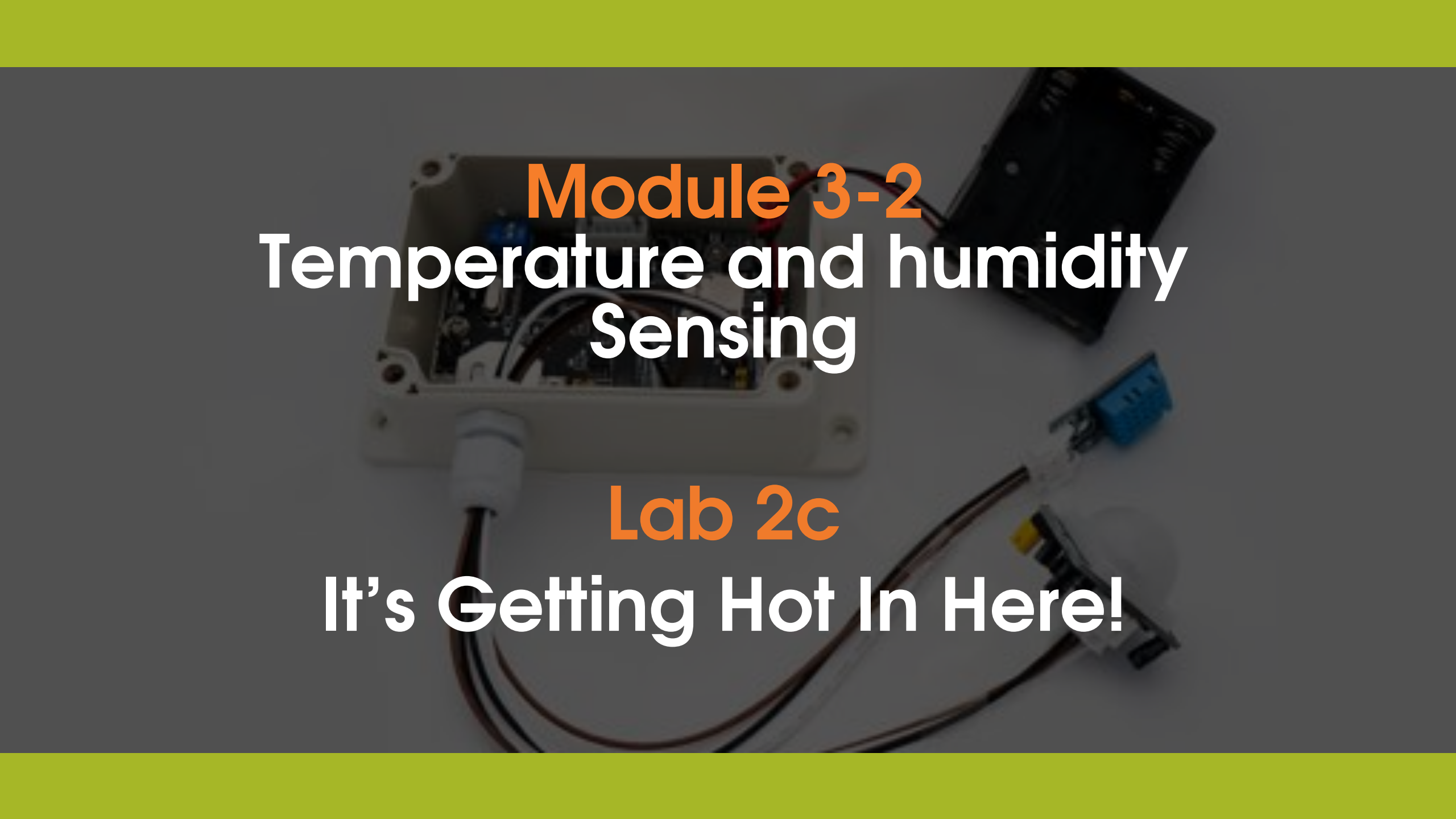


Lab 2b

Command Line – Temperature & Humidity Sensing



```
CommandLineTempHumiditySensing | Arduino 1.8.13
1 #include "cmdArduino.h"
2 #include "DHT.h"
3
4
5 DHT dht(A0, DHT11);
6
7
8
9 void setup() {
10 // put your setup code here, to run once:
11 dht.begin();
12 cmd.begin(57600);
13 Serial.println("Lab 2b - Command Temp and Humidity");
14
15 cmd.add("temp", cmdTemperature);
16 cmd.add("humid", cmdHumidity);
17
18 }
19
20 void loop() {
21 // put your main code here, to run repeatedly:
22 cmd.poll();
23 }
24
25
26 void cmdTemperature(int argc, char **args)
27 {
28 float temperature = dht.readTemperature();
29 Serial.print("Temperature: ");
30 Serial.print(temperature);
31 Serial.println(" deg Celsius");
32 }
33
34
35 void cmdHumidity(int argc, char **args)
36 {
37 float humidity = dht.readHumidity();
38 Serial.print("Humidity: ");
39 Serial.print(humidity);
40 Serial.println(" %RH");
41 }
42
43
Done Saving.
```



Module 3-2
**Temperature and humidity
Sensing**

Lab 2c
It's Getting Hot In Here!

Lab 2c – It's Getting Hot In Here!

Goal:

- Create a program that uses sensor input to trigger an output



Lab 2c – It's Getting Hot In Here!

Why do I need to know this?

- Understanding temperature control
- Using information from sensors to trigger outputs



Lab 2c – It's Getting Hot In Here!

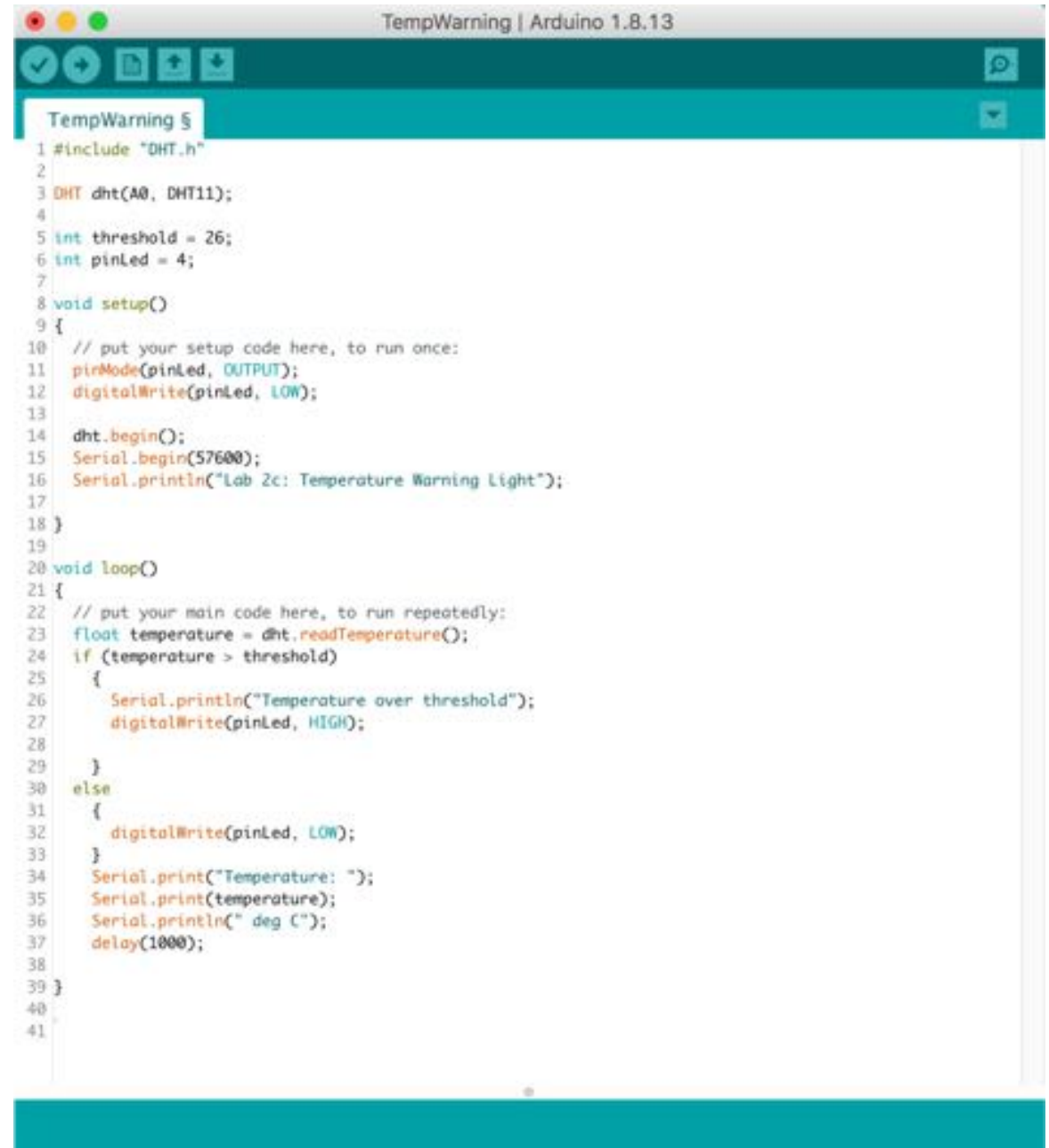
What do I need to know?

- Conditional statements
 - `if (something > somethingElse) doSomething();`



Lab 2c

Temperature Over Threshold Warning

The image shows a screenshot of the Arduino IDE interface. The window title is "TempWarning | Arduino 1.8.13". The code editor displays the following C++ code:

```
TempWarning §
1 #include "DHT.h"
2
3 DHT dht(A0, DHT11);
4
5 int threshold = 26;
6 int pinLed = 4;
7
8 void setup()
9 {
10 // put your setup code here, to run once:
11 pinMode(pinLed, OUTPUT);
12 digitalWrite(pinLed, LOW);
13
14 dht.begin();
15 Serial.begin(57600);
16 Serial.println("Lab 2c: Temperature Warning Light");
17
18 }
19
20 void loop()
21 {
22 // put your main code here, to run repeatedly:
23 float temperature = dht.readTemperature();
24 if (temperature > threshold)
25 {
26   Serial.println("Temperature over threshold");
27   digitalWrite(pinLed, HIGH);
28 }
29 else
30 {
31   digitalWrite(pinLed, LOW);
32 }
33 Serial.print("Temperature: ");
34 Serial.print(temperature);
35 Serial.println(" deg C");
36 delay(1000);
37 }
38
39 }
40
41
```



COMING UP
Module 3-3
**Measuring Battery Status With the
ADC**