

Sensor with OLED Display

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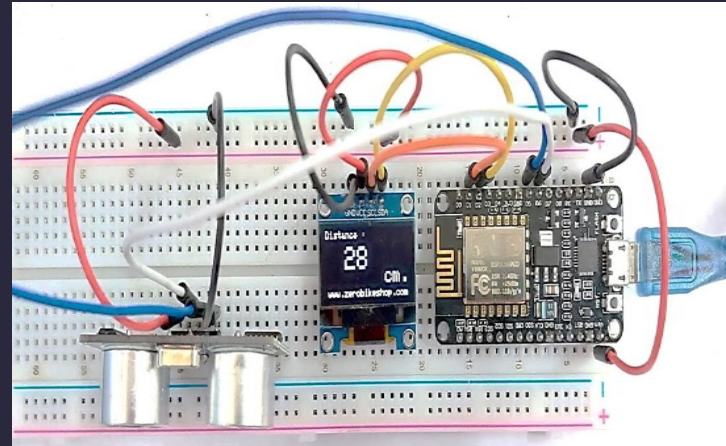
/01 Measuring distance wirelessly and displaying it on the OLED screen

/02 Weather Station - a device for measuring weather conditions

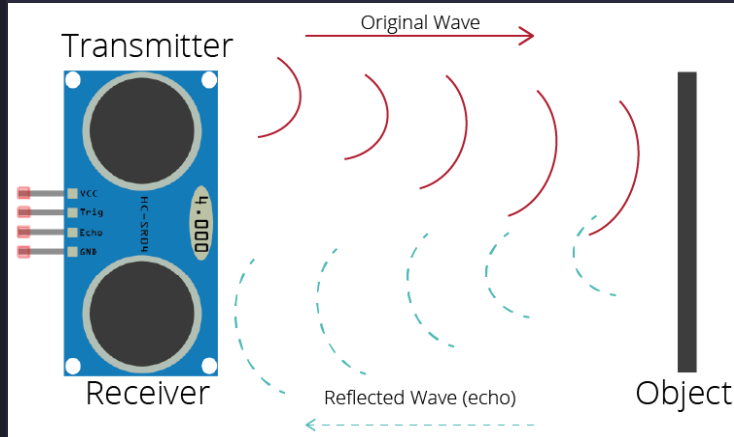


/01

/ Measuring distance
wirelessly and displaying
it on the OLED screen



→ Main features of Ultrasonic

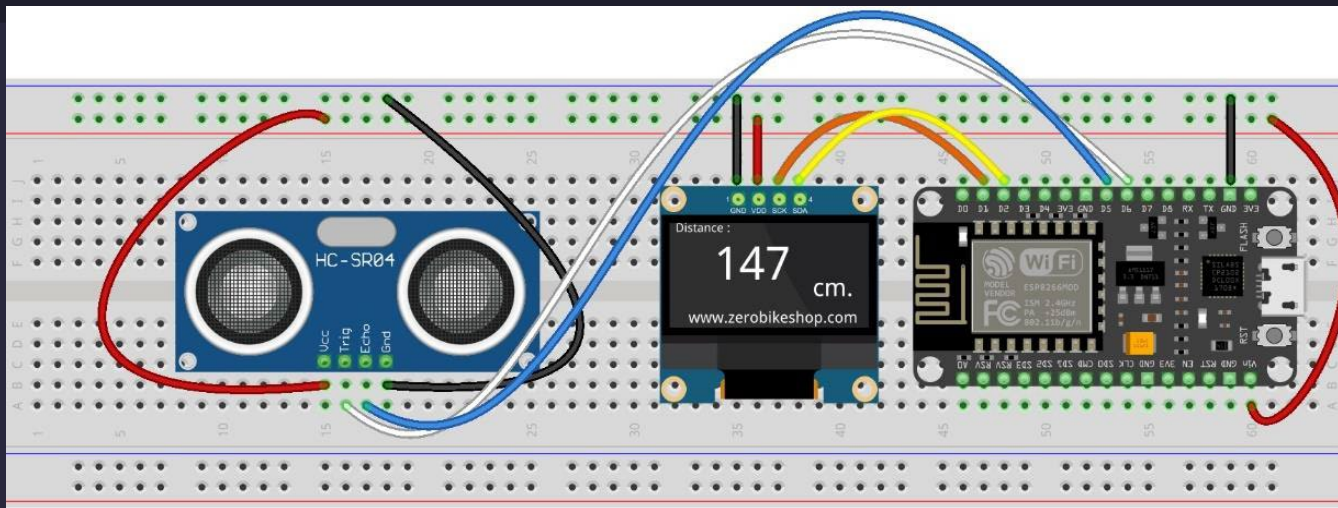


The working principle involves using a transmitter (trig) to send out ultrasonic waves at a frequency of 40kHz. When these waves hit an object, they bounce back to the receiver (echo). By measuring the time it takes for the wave to travel from the transmitter, reflect off the object, and return to the receiver, the distance can be calculated. This calculation takes into account the speed of sound in the air and the time of flight. You can calculate the distance to an object using the formula:

$$\text{Distance} = ((\text{Speed of Sound}) \times \text{Time of Flight}) / 2$$

The HC-SR04 distance measuring module can measure distances in the range of 2 to 450 centimeters. It is suitable for applications where high precision is not required or for educational purposes.

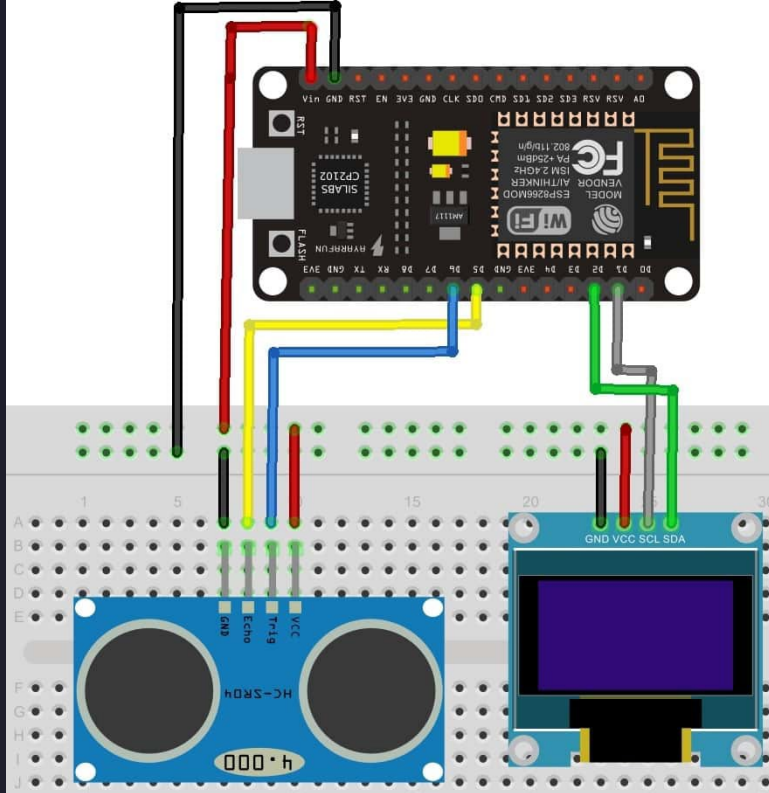
Wiring



HCSR-04 Module	NodeMCU ESP8266
Vcc	Vin
Gnd	GND
Trig	D6
Echo	D5

OLED Display Module	NodeMCU ESP8266
VCC	Vin
GND	GND
SCL	D1
SDA	D2

Wiring

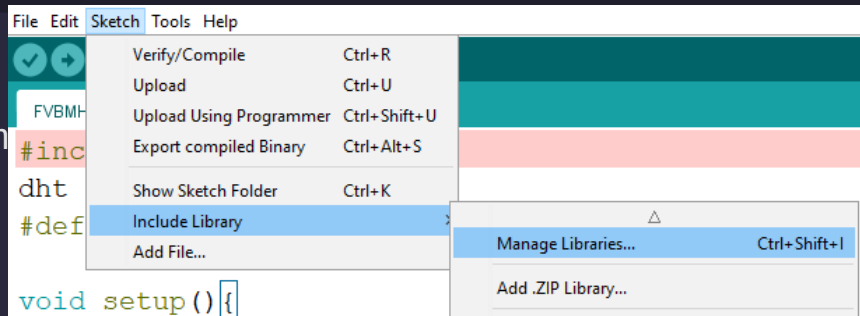


HCSR-04 Module	NodeMCU ESP8266
Vcc	Vin
Gnd	GND
Trig	D6
Echo	D5

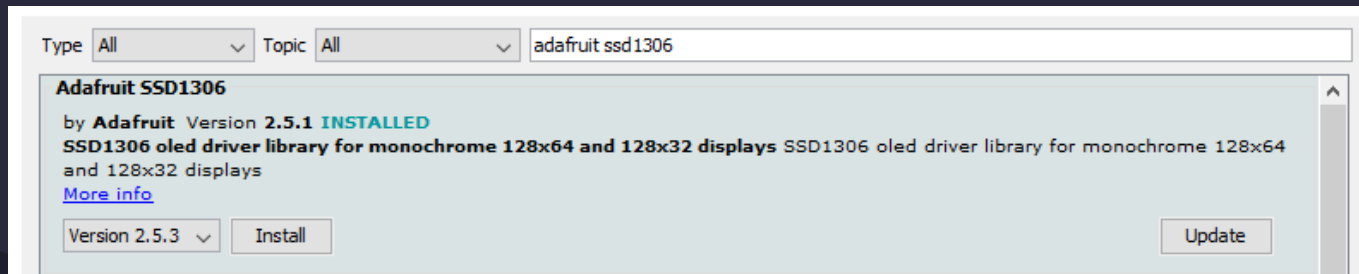
OLED Display Module	NodeMCU ESP8266
VCC	Vin
GND	GND
SCL	D1
SDA	D2

Include Library

1. Open Arduino IDE and go to Sketch > Include Library, then select Manage Libraries as shown in the image.

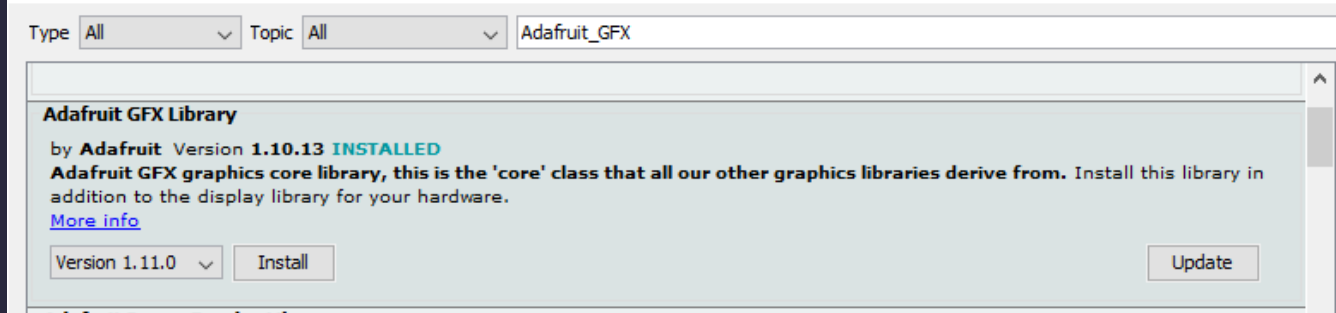


2. Type "adafruit ssd1306" in the "Filter your search.." box to search for and install the library. The library "Adafruit SSD1306" should appear for installation as shown in the image.



Include Library

3. Select the latest version (in the image, it's 2.5.3), then click on "Install".
4. Type "Adafruit_GFX" in the "Filter your search..." box to search for and install the "Adafruit_GFX" library. The library named "Adafruit_GFX" will appear as shown in the image.



5. Select the latest version (which is 1.11.0 as shown in the picture) and click on "Install."

Coding

Type this code into
Arduino IDE

```
Ex06-wireless-Distance wireless-Distance
1 #include <Wire.h>
2 #include <Adafruit_GFX.h>
3 #include <Adafruit_SSD1306.h>
4 #define SCREEN_WIDTH 128 // OLED display width, in pixels
5 #define SCREEN_HEIGHT 64 // OLED display height, in pixels
6
7 Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);
8 const int trigPin = 12; //D6 on NodeMCU ESP8266
9 const int echoPin = 14; //D5 on NodeMCU ESP8266
10
11 //define sound speed in cm/uS
12 #define SOUND_SPEED 0.034
13 #define CM_TO_INCH 0.393701
14 long duration;
15 int distanceCm;
16 int distanceInch;
17
18 void setup() {
19   Serial.begin(115200);
20   pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
21   pinMode(echoPin, INPUT); // Sets the echoPin as an Input
22
23   if(!display.begin(SSD1306_SWITCHCAPVCC, 0x3C)) {
24     Serial.println(F("SSD1306 allocation failed"));
25     for(;;);
26   }
27   delay(500);
28   display.clearDisplay();
29   display.setTextColor(WHITE);
30 }
```

Coding

Ex06-wireless-Distance

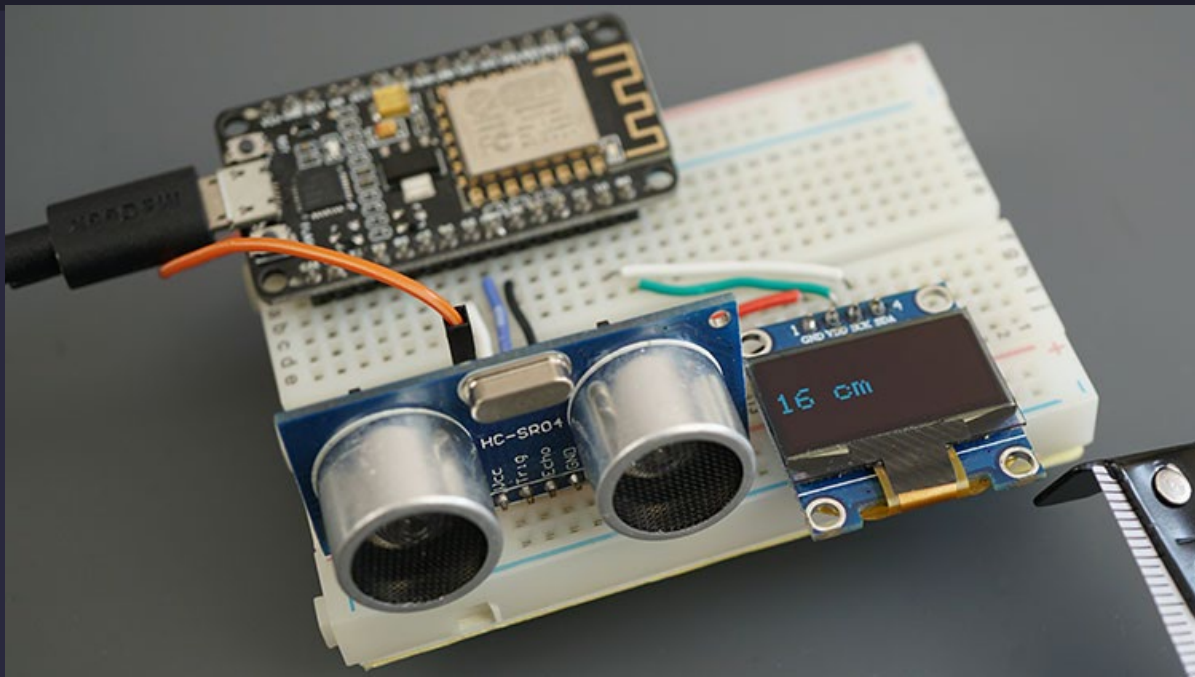
wireless-Distance

```
31
32 void distance()
33 { // Clears the trigPin
34   digitalWrite(trigPin, LOW);
35   delayMicroseconds(2);
36   // Sets the trigPin on HIGH state for 10 micro seconds
37   digitalWrite(trigPin, HIGH);
38   delayMicroseconds(10);
39   digitalWrite(trigPin, LOW);
40
41   // Reads the echoPin, returns the sound wave travel time in microseconds
42   duration = pulseIn(echoPin, HIGH);
43
44   // Calculate the distance
45   distanceCm = duration * SOUND_SPEED/2;
46
47   // Convert to inches
48   distanceInch = distanceCm * CM_TO_INCH;
49
50   // Prints the distance in the Serial Monitor
51   Serial.print("Distance (cm): ");
52   Serial.println(distanceCm);
53   Serial.print("Distance (inch): ");
54   Serial.println(distanceInch);
55 }
56
57 void oledDisplay()
58 {
59   display.clearDisplay();
60   display.setCursor(2,0); // กำหนดตำแหน่งจุดเริ่มต้นที่จะแสดงผล (x,y) = (แถวแอน, แนวนั่ง)
```

Coding

```
61 display.setTextSize(1); // กำหนดขนาดตัวอักษร
62 display.setTextColor(WHITE); // กำหนดสีตัวอักษร
63 display.println("Distance :"); // แสดงผลข้อความ
64
65   display.setCursor(30, 15);
66   display.setTextSize(3);
67   display.print(distanceCm); // Display distance in cm
68
69   display.setCursor(90, 35);
70   display.setTextSize(2);
71   display.print("cm.");
72
73   display.setCursor(5, 55);
74   display.setTextSize(1);
75   display.print("Smart Farm");
76
77   display.display();
78   delay(500);
79 }
80
81 void loop() {
82
83   distance();
84   oledDisplay();
```

Test





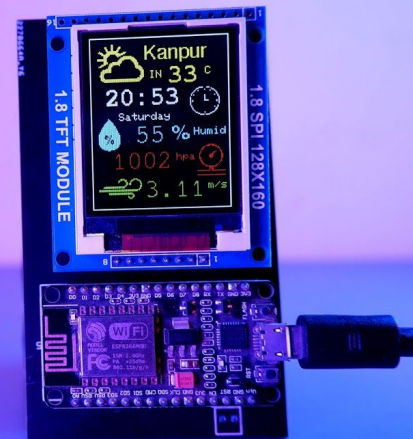
/02

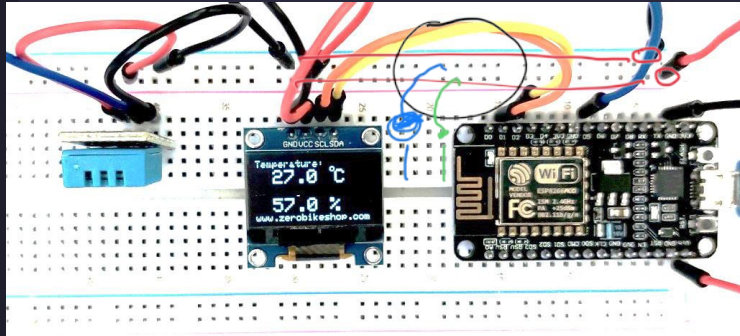
/Weather Station – a device for measuring weather conditions



ESP8266

WEATHER STATION

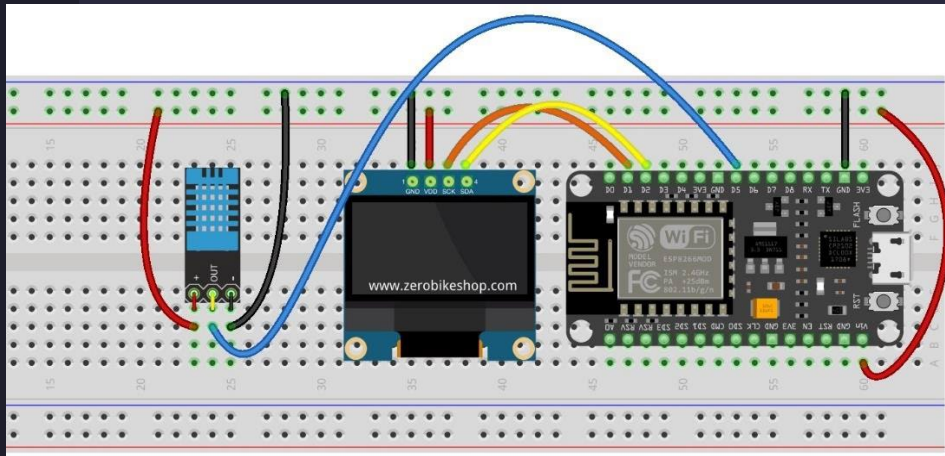




The Weather Station that displays data on an OLED screen

Using the 0.96-inch I2C OLED Display module to display temperature and humidity data in the air using the DHT11 sensor as the sensing and processing unit, interfaced with the NodeMCU ESP8266 board.

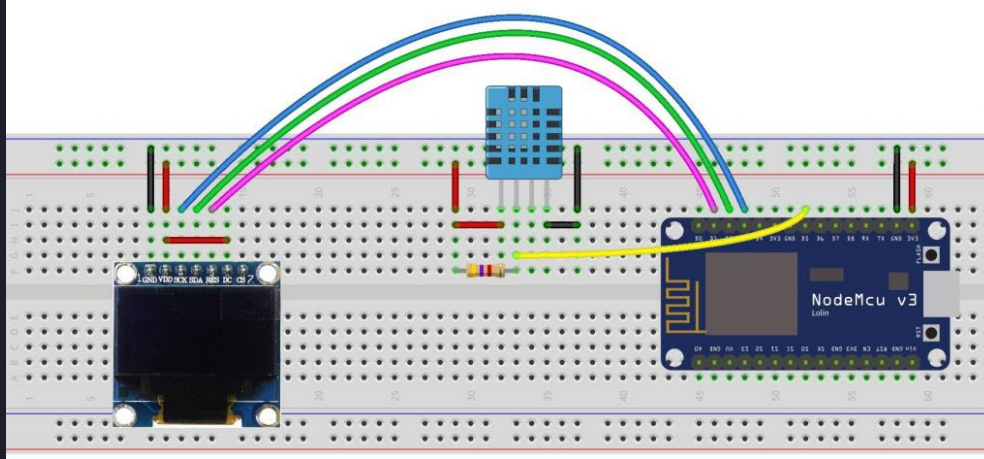
Wiring



DHT11 Module	NodeMCU ESP8266
+	Vin
-	GND
OUT	D5

DHT11 Module	NodeMCU ESP8266
VCC	Vin
GND	GND
SCL	D1
SDA	D2

Wiring

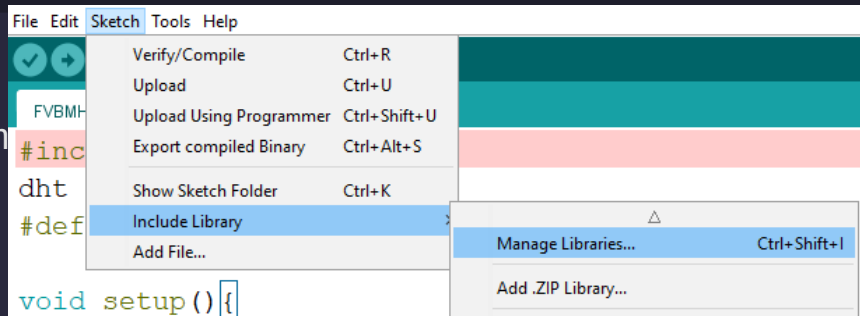


DHT11 Module	NodeMCU ESP8266
+	Vin
-	GND
OUT	D5

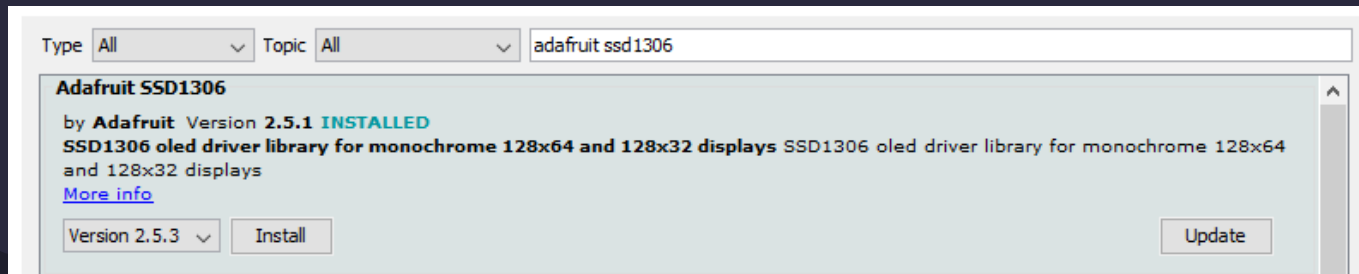
DHT11 Module	NodeMCU ESP8266
VCC	Vin
GND	GND
SCL	D1
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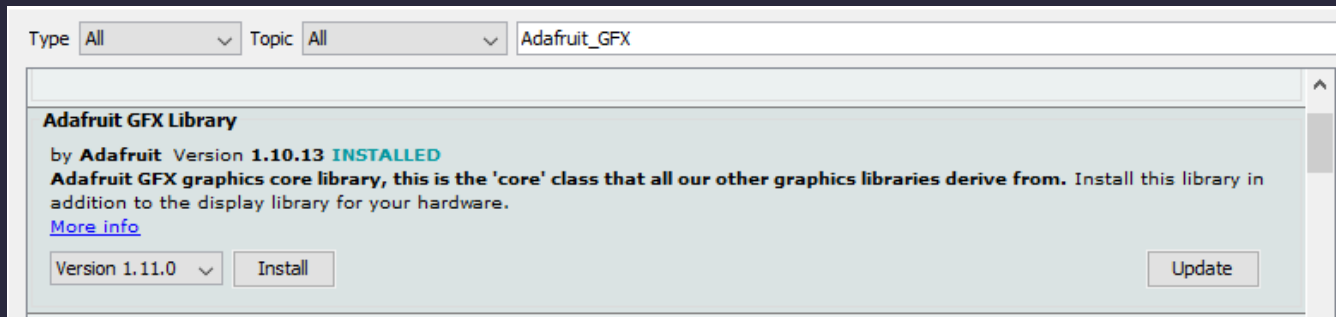
2. Type "adafruit ssd1306" in the "Filter your search.." box to search for and install the library. The library "Adafruit SSD1306" should appear for installation as shown in the image.



Include Library

3. Select the latest version (in the image, it's 2.5.3), then click on "Install".

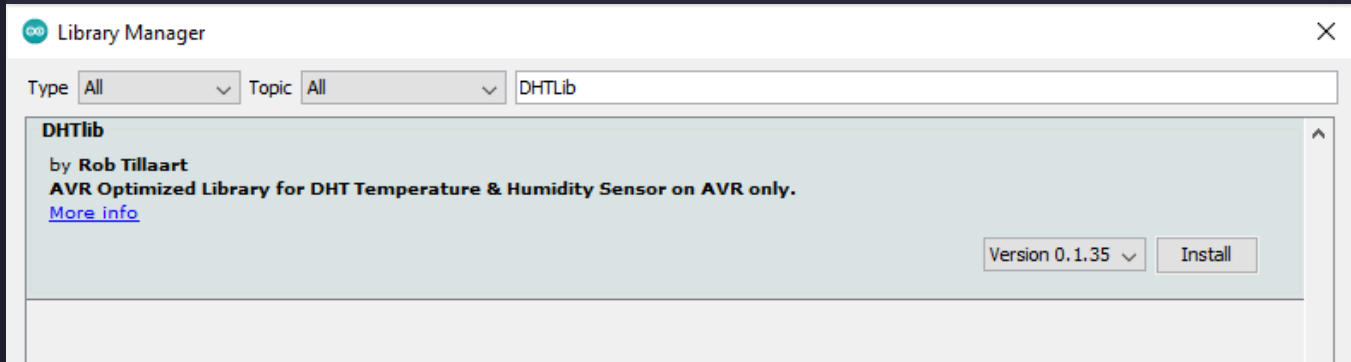
4. Type "Adafruit_GFX" in the "Filter your search..." box to search for and install the "Adafruit_GFX" library. The library named "Adafruit_GFX" will appear as shown in the image.



5. Select the latest version (which is 1.11.0 as shown in the picture) and click on "Install."

Include Library

6. Search for "DHTLib" and then click on "Install" to install it.



Coding

Type this code into
Arduino IDE

```
1 #include "DHT.h"
2 DHT dht;
3 #include <Wire.h>
4 #include <Adafruit_GFX.h>
5 #include <Adafruit_SSD1306.h>
6 #define SCREEN_WIDTH 128 // OLED display width, in pixels
7 #define SCREEN_HEIGHT 64 // OLED display height, in pixels
8
9 // Declaration for an SSD1306 display connected to I2C (SDA, SCL pins)
10 Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, -1);
11
12 void setup()
13 {
14     Serial.begin(9600);
15     Serial.println();
16     Serial.println("Status\tHumidity (%)\tTemperature (C)\t(F)");
17     dht.setup(14); // GPIO14 pin D5
18
19     if (!display.begin(SSD1306_SWITCHCAPVCC, 0x3C)) {
20         Serial.println(F("SSD1306 allocation failed"));
21         for (;;);
22     }
23     delay(500);
24     display.clearDisplay();
25     display.setTextColor(WHITE);
26 }
27
28 void loop()
29 {
30     delay(dht.getMinimumSamplingPeriod());
```

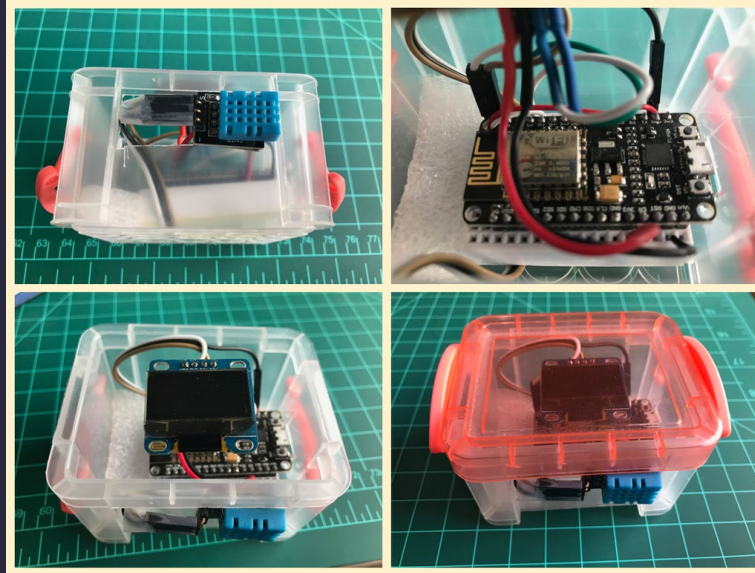
Coding

```
31 float humidity = dht.getHumidity();
32 float temperature = dht.getTemperature();
33 Serial.print(dht.getStatusString());
34 Serial.print("\t");
35 Serial.print(humidity, 1);
36 Serial.print("\t\t");
37 Serial.print(temperature, 1);
38 Serial.print("\t\t");
39 Serial.println(dht.toFahrenheit(temperature), 1);
40
41 display.clearDisplay(); // ลบภาพในหน้าจอทั้งหมด
42
43 display.setCursor(2,0); // กำหนดตำแหน่งจุดเริ่มต้นที่จะแสดงผล (x,y) = (แนวนอน, แนวตั้ง)
44 display.setTextSize(1); // กำหนดขนาดตัวอักษร
45 display.println("Temperature:"); // แสดงผลข้อความ
46
47 display.setCursor(20,10); // กำหนดตำแหน่งจุดเริ่มต้นที่จะแสดงผล (x,y) = (แนวนอน, แนวตั้ง)
48 display.setTextSize(2); // กำหนดขนาดตัวอักษร
49 display.println(temperature,1); // แสดงผลข้อมูลอุณหภูมิห้องค่าเซลเซียส ทศนิยม 1 ตำแหน่ง
50
51 display.setCursor(80,5); // กำหนดตำแหน่งจุดเริ่มต้นที่จะแสดงผล (x,y) = (แนวนอน, แนวตั้ง)
52 display.setTextSize(1); // กำหนดขนาดตัวอักษร
53 display.println("o"); // แสดงผลข้อความ o
54
55 display.setCursor(85,10); // กำหนดตำแหน่งจุดเริ่มต้นที่จะแสดงผล (x,y) = (แนวนอน, แนวตั้ง)
56 display.setTextSize(2); // กำหนดขนาดตัวอักษร
57 display.println("C"); // แสดงผลข้อความ C
58
59 display.setCursor(2,30);
60 display.setTextSize(1);
```

Coding

```
61 display.println("Humidity:"); // แสดงผลข้อความ Humidity:
62
63 display.setCursor(20,40); // กำหนดตำแหน่งจุดเริ่มต้นที่จะแสดงผล (x,y) = (แนวนอน, แนวตั้ง)
64 display.setTextSize(2); // กำหนดขนาดตัวอักษร
65 display.println(humidity,1); // แสดงผลข้อมูลความชื้นสัมพัทธ์ ทศนิยม 1 ตำแหน่ง
66
67 display.setCursor(80,40); // กำหนดตำแหน่งจุดเริ่มต้นที่จะแสดงผล (x,y) = (แนวนอน, แนวตั้ง)
68 display.setTextSize(2); // กำหนดขนาดตัวอักษร
69 display.println("%"); // แสดงผลข้อความ %
70
71 display.setCursor(2,57); // กำหนดตำแหน่งจุดเริ่มต้นที่จะแสดงผล (x,y) = (แนวนอน, แนวตั้ง)
72 display.setTextSize(1); // กำหนดขนาดตัวอักษร
73 display.println("Smart Farm"); // แสดงผลข้อความ
74 display.display();
75 delay(500);
76 }
```

Test



Work :

Try modifying the program to display the text "Student Name" and the name of the school.



Q/A

