A PROJECT REPORT

ON

LIVE WEATHER STATION USING ESP 8266

SUBMITTED TO YESHWANTRAO CHAVAN COLLEGE OF ENGINEERING, NAGPUR

THIRD YEAR OF ENGINEERING (SEM-5)

IN

ELECTRONICS AND TELECOMMUNICATION

BY

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UNDER THE GUIDANCE OF

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2022 – 2023

CERTIFICATE

This is to certify that the project report entitled

"LIVE WEATHER STATION USING ESP 8266"

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is a bonafide work carried out by them under the supervision of **S.A DESAI** and it is approved for the partial fulfillment of the requirement of university for the award of the third year of B.Tech of Engineering (Electronics and Telecommunication)

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Place: Nagpur

Date: /10/2022

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LIVE WEATHER STATION USING ESP8266

WEATHER STATION USING ESP8266

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

A live weather station is a device that collects data related to the weather & environment using different sensors. There are two types of weather stations, one which is having own sensors and the second type of weather station is where we pull data from the weather station servers. In this tutorial, we will go for the first one, i.e. we will design our own weather station**.**

Live weather station sensors may include a a barometer to measure the atmospheric pressure and Hygrometer to measure humidity. Weather stations are also called weather centers, personal weather stations, professional weather stations, home weather stations, weather forecaster, and forecasters.

This project will focus on development of the Thing Speak an IoT platform that to show the data of the sensor. The method divided into two parts which are hardware and software development part. The hardware development involves the circuit construction and develops the prototype. Meanwhile, the software part involves the IoT coding, circuit schematic diagram, circuit simulation and data acquisition. By using two types of sensor to monitoring the weather parameter that are humidity and atmospheric pressure. The system will be able to display the weather condition by an analysis about the current weather with the sensor value data. All the data will be control by a microcontroller ESP8266 and NODEMCU as the client that will receive the sensor data from ESP8266. This system will be seen on ThingSpeak channel that has been created to simplify user to check online. The data collected will be analyse and compare it with Jabatan Meteorologi Malaysia to ensure the precise of data and weather condition on current condition. The Internet of Things (IoT) will connect the system with the user wireless and online without the need of checking manually.

1.2 SUMMARY

Thus, this chapter contains introduction regarding the project description.

CHAPTER 2

DRAWING AND TESTING

2.1 INTRODUCTION

This chapter explains on how this project will be implemented and components used in the project, brief description of each component. It included each process from the beginning until the end of this project. This chapter includes the project as well as the hardware module wise discussion as the input module and the output module.

2.2 HARDWARE DESIGN

2.2.1 Node MCU

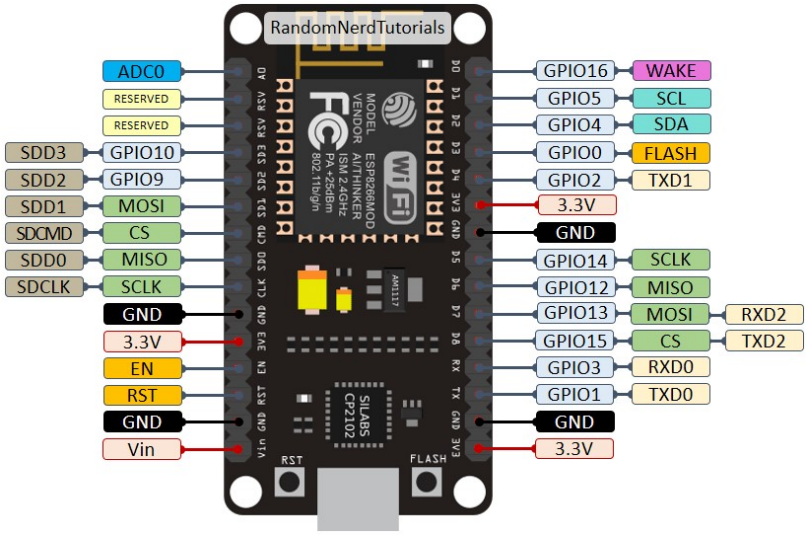


Figure 2.3.1 Node MCU

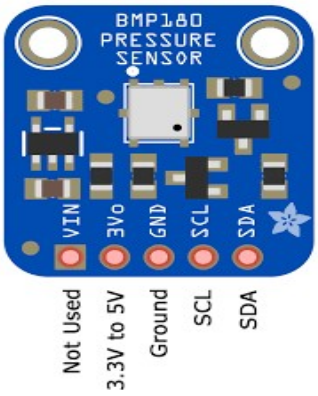
2.2.2 FEATURES OF NodeMCU

1. Processor: L106 32-bit RISC microprocessor core based on the Tensilica Diamond Standard 106Micro running at 80 or 160 MHz[5]
2. Memory:
    1. 32 KiB instruction RAM
    2. 32 KiB instruction cache RAM
    3. 80 KiB user-data RAM
    4. 16 KiB ETS system-data RAM
3. External QSPI flash: up to 16 MiB is supported (512 KiB to 4 MiB typically included)
4. IEEE 802.11 b/g/n Wi-Fi
    1. Integrated TR switch, balun, LNA, power amplifier and matching network
    2. WEP or WPA/WPA2 authentication, or open networks
5. 17 GPIO pins[7]

6. Serial Peripheral Interface Bus (SPI)
7. I²C (software implementation)[8]
8. I²S interfaces with DMA (sharing pins with GPIO)
9. UART on dedicated pins, plus a transmit-only UART can be enabled on GPIO2
10. 10-bit ADC (successive approximation ADC)

2.3.1 BMP180 Sensor

The BMP180 sensor is mainly used to measure atmospheric pressure or biometric pressure. The working principle of the air pressure sensor is very simple, it works based on the weight of air. Because the air around us has a certain weight, and this weight has a specific pressure.



BMP180 SENSOR

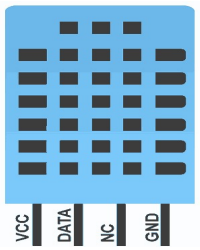
2.3.2 BMP180 SENSOR FEATURES

1. Can measure temperature and altitude.
2. Pressure range: 300 to 1100hPa
3. High relative accuracy of ±0.12hPa
4. Can work on low voltages
5. 3.4Mhz I2C interface
6. Low power consumption (3uA)
7. Pressure conversion time: 5msec
8. Potable size

2.4.1 DHT 11 SENSOR

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,Node MCU etc… to measure humidity and temperature instantaneously.

DHT11 humidity and temperature sensor is available as a sensor and as a module. The difference between this sensor and module is the pull-up resistor and a power-on LED. DHT11 is a relative humidity sensor. To measure the surrounding air this sensor uses a thermistor and a capacitive humidity sensor.



DHT11 SENSOR

2.5 SUMMARY

Thus, this chapter describes about the components selection for implementing our system. It briefly described about the specifications of the components selected.

CHAPTER 3

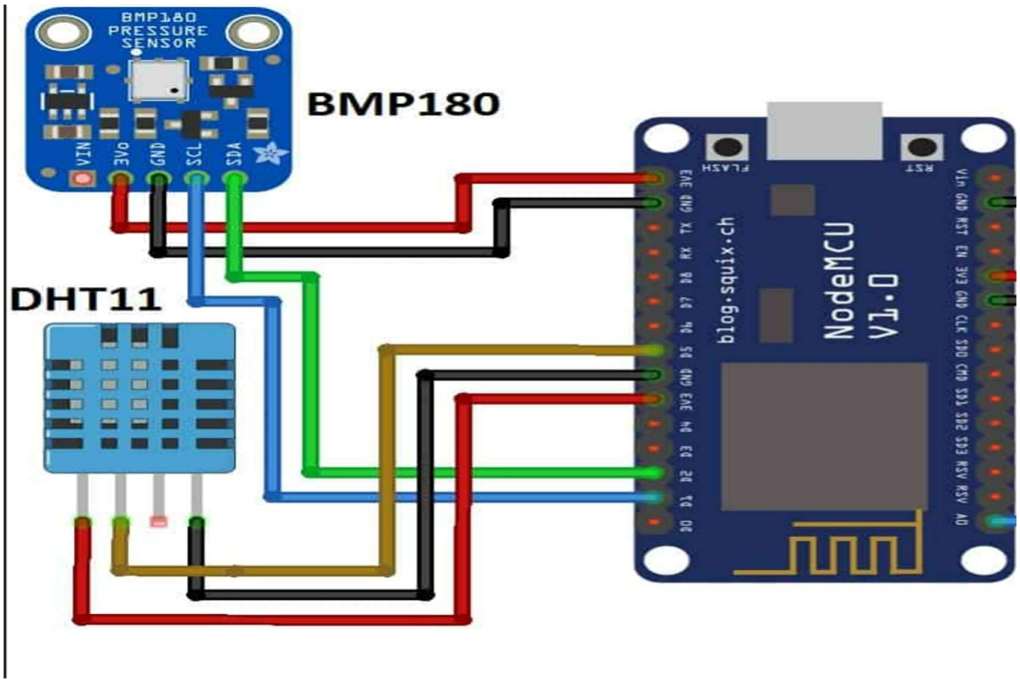
COMPONENTS

SR. NO.	COMPONENTS	QUANTITY
1.	Node MCU (ESP 8266)	1
2.	BMP 180 Sensor	1
3.	DHT 11 Sensor	1
4.	Printed PCB	1

CHAPTER 4

CIRCUIT DIAGRAM AND DESCRIPTION

5.1 CIRCUIT DIAGRAM



WEATHER STATION USING NodeMCU CIRCUIT DIAGRAM

The circuit diagram consists of the components that are utilized in this project. There are two modes available in this project working operation. Firstly, controlling mode will involve ESP8266 and monitoring mode will involve NODEMCU. This two-microcontroller board will communicate each other in order the monitoring mode get sensor data from controlling mode via wireless communication and hotspot Wi-Fi. Controlling mode will collect all the sensor data then send to the Thing Speak website and monitoring mode to display on thing speak display page. The client will display the sensor data on Things peak. The data collected will be analyze to configure the actual condition and the current condition by using simple formula in Equation 1. The result of this data analysis then will be made the weather state for this system to tell the user about the air quality condition is it good or bad in actual condition.

CHAPTER 5

CODE

5.1 CODE

```
#define BLYNK_TEMPLATE_ID "TMPLqack202H" //blynk template id.
#define BLYNK_DEVICE_NAME "Quickstart Template" //blynk template id name.
#include <Adafruit_Sensor.h> //sensor library.
#define BLYNK_PRINT Serial // shows the blynk logo and connection satus.
#include <DHT.h> //dht11 library
#include <ESP8266WiFi.h> // It provide node mcu with wifi routines for connection to
wifi & etc.
#include <BlynkSimpleEsp8266.h> //this is a blynk library to handle
connectivity,authentication in cloude, and commands processing between Blynk app,
Cloud, and hardware.
#include <Wire.h> //It is used to communicate with I2C/TWI devices
#include <Adafruit_BMP085.h> //bmp180 sensor library

Adafruit_BMP085 bmp;
#define I2C_SCL 12 //gpio pin 12
#define I2C_SDA 13 //gpio pin 13

float dst, bt, bp, ba;
char dstmp[20], btmp[20], bprs[20], balt[20];
bool bmp085_present = true;

char auth[] = "d6dRgrGb1Bu1Bj3R9Qt7njfaM07FbBfA"; //blynk authorization token
char ssid[] = "Galaxy A51F17B"; //wifi name
char pass[] = "nikhil123"; //wifi password
#define DHTPIN 2 //gpio pin 2
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE); //Defining the pin and the dhttype
BlynkTimer timer;
void sendSensor() {

  if (!bmp.begin()) {
    Serial.println("Could not find a valid BMP085 sensor, check wiring!");
    while (1) {}
  }

  float h = dht.readHumidity();
  float t = dht.readTemperature();


  if (isnan(h) || isnan(t)) {
    Serial.println("Failed to read from DHT sensor!");
    return;
  }
```

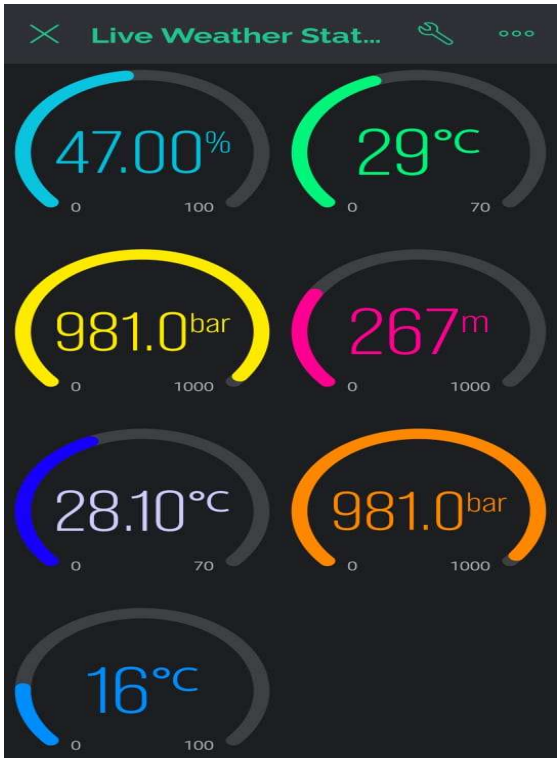
```
  double gamma = log(h / 100) + ((17.62 * t) / (243.5 + t));
  double dp = 243.5 * gamma / (17.62 - gamma);

  float bp = bmp.readPressure();
  float ba = bmp.readAltitude();
  float bt = bmp.readTemperature();
  float dst = bmp.readSealevelPressure();

  Blynk.virtualWrite(V5, h); //virtual pin in blynk app
  Blynk.virtualWrite(V6, t);
  Blynk.virtualWrite(V10, bp);
  Blynk.virtualWrite(V11, ba);
  Blynk.virtualWrite(V12, bt);
  Blynk.virtualWrite(V13, dst);
  Blynk.virtualWrite(V14, dp);
}
void setup() {
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);
  dht.begin(); //initiate dht 11
  Wire.begin(I2C_SDA, I2C_SCL); // initiate the Wire library and also we need to initiate
the serial communication because we will use the Serial Monitor to show the data from the
sensor
  delay(10);
  timer.setInterval(1000L, sendSensor); //send sensor data ever 1 sec.
}

void loop() {
  Blynk.run();
  timer.run();
}
```

CHAPTER 6

RESULTS

6.1 RESULT

First the circuit of control unit system have been made that ESP8266 microcontroller control all weather parameters sensor, that are DHT11(Temperature, Humidity) sensor, BMP180 (Atmospheric pressure), Rain sensor. Then it powered by USB cable also to upload the sketch of coding in ESP8266 microcontroller. The sensor data can be display on serial monitor in Arduino IDE software. ESP8266 will connect with the Wi-Fi hotspot that have applied to this system so that the web server can be create to display all the sensor data. Data that received by weather station will be displaying on thingspeak demonstrate the communication of both sensor station and weather station by using Wi-Fi hotspot. The communication is successfully established. The web server contains html that can display the sensor data by simple coding and connection where the IP address of the ESP8266 are needed to complete this action are shown in Figure . After that it will read all the sensor value and then send to the cloud data where ThingSpeak has been uses for this. ThingSpeak will stored the sensor value and display that data to the channel create there. The user can check the weather parameter via ThingSpeak websites. The data has collected from the reading of ESP8266 for all sensor and send that data to the ThingSpeak as the results of this project objective.



CHAPTER 6

CONCLUSION

6.1 CONCLUSION

As the conclusion this project have cleared the objective that to build a system that can monitored weather parameter by wireless system and IoT. The Sensor station and Weather station will be communicated by hotspot Wi-Fi and it is limited in areas covered but still better in communication via wireless. The value that been recorded from google sheet it seen that the weather at particular place has different condition from the exact condition with the accuracy of weather reporting system and forecast system data has been compared. It says that weather reporting system is more accurate than forecast system. This weather reporting system will display the sensor data to ThingSpeak and IFTTT to save the data into google sheet.

CHAPTER 7

SUMMARY

7.1 SUMMARY

This post is all about IoT based Live Weather Station Monitoring Using NodemCU ESP8266. We will interface DHT11 Humidity & Temperature Sensor and BMP180 Barometric Pressure Sensor with NodeMCU ESP8266-12E Wifi Module. We will measure humidity, temperature, Barometric pressure and upload the data to a web server. Once the code is uploaded you can find the IP address of NodeMCU in the serial monitor. With the same IP, you can go to any web browser and display the data in a beautiful widget format. The project is very interesting and can be used in remote areas or in a freezer where the data is to be monitored.

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