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Thalavapalayam, Karur – 639 113.

A Minor Project Report

On

IOT ENABLED SMART REAL TIME WEATHER MONITORING SYSTEM

Submitted in partial fulfilment of requirements for the award of the

Degree of

BACHELOR OF ENGINEERING

in **ELECTRONICS AND COMMUNICATION ENGINEERING**

Under the guidance of

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(Autonomous)

KARUR – 639 113

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M.KUMARASAMY COLLEGE OF ENGINEERING, KARUR

BONAFIDE CERTIFICATE

Certified that this project report **"IOT ENABLED SMART REAL TIME WEATHER MONITORING SYSTEM"** is the bonafide work of **"RAGHURAJ S (19BEC4156), NITHISH KUMAR S (19BEC4136), ROAHIT S (19BEC4166), RAGHUL V (19BEC4155)"** who carried out the project work under my supervision in the academic year 2020-2021.

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Vision

To emerge as a leader among the top institutions in the field of technical education.

Mission

- ❖ Produce smart technocrats with empirical knowledge who can surmount the global challenges.
- ❖ Create a diverse, fully-engaged, learner-centric campus environment to provide quality education to the students.
- ❖ Maintain mutually beneficial partnerships with our alumni, industry and professional associations.

Department of Electronics and Communication Engineering

Vision

- ❖ To empower the Electronics and Communication Engineering students with Emerging Technologies, Professionalism, Innovative Research and Social Responsibility.

Mission

- ❖ Attain the academic excellence through innovative teaching learning process, research areas & laboratories and Consultancy projects.
- ❖ Inculcate the students in problem solving and lifelong learning ability.
- ❖ Provide entrepreneurial skills and leadership qualities.
- ❖ Render the technical knowledge and industrial skills of faculties.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

- **PEO1:** Graduates will have a successful career in academia or industry associated withelectronics and communication engineering.

- **PEO2:** Graduates will provide feasible solutions for the challenging problems through comprehensive research and innovation in the allied areas of electronics and communication engineering..

- **PEO3:** Graduates will contribute to the social needs through lifelong learning,practicing professional ethics and leadership quality.

PROGRAM OUTCOMES(PO'S)

- **PO1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
- **PO2: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
- **PO3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
- **PO4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
- **PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
- **PO6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
- **PO7: Environment and sustainability:**Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

- ❖ **PO8: Ethics :**Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
- ❖ **PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
- ❖ **PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
- ❖ **PO11: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
- ❖ **PO12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES(PSO'S)

- ❖ **PSO1**: Applying knowledge in various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of Engineering application.
- ❖ **PSO2**: Able to solve complex problems in Electronics and Communication Engineering with analytical and managerial skills either independently or in team using latest hardware and software tools to fulfil the industrialexpectations**.**

MAPPING OF PROJET WITH POs AND PSO

Abstract	**Matching with POs , PSOs**
Node MCU ESP8266, Rain sensor, DHT11, BMP180, Resistors, Connecting wires, Bread board	PO1, PO2, PO6, PO7, PO9, PO12, PSO1, PSO2

ABSTRACT

The IOT enabled smart real time weather monitoring system measures four weather parameters using respective three sensors. These sensors are temperature and humidity sensor, pressure sensor and rain level sensor. These three sensors are directly connected to Node MCU ESP-12E. It calculates and displays these weather parameters in a HTML web page. This web page can be accessed through smart phones, laptops, computers, etc. It sends these parameters to the Internet using IOT techniques. The process of sending data to the internet using Wi-Fi is repeated after constant time intervals. Thus the user gets Live reporting of weather conditions. Internet connectivity or Internet connection with Wi-Fi is compulsory in this IOT weather monitoring project.

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Acronyms/List of Abbreviations

Acronym	Abbreviations
MCU	Micro Controller unit
DHT	Digital Humidity and Temperature
BMP	Baro Metric Pressure
IOT	Internet Of Things
SoC	System on a Chip

1. INTRODUCTION:

The IOT enabled smart real time weather monitoring system measures four weather parameters. Temperature and Humidity sensor, Pressure sensor and Rain level sensor these are the three sensors that are used in this system. These sensors are directly connected to Node MCU ESP8266. It calculates and displays these weather parameters in a HTML web page. This web page can be accessed through smart phones, laptops, computers, etc. It sends these parameters to the Internet using IOT techniques. The monitoring system update the weather parameters at constant time intervals. Thus the user gets Live reporting of weather conditions. Internet connectivity or Wi-Fi is compulsory in this IOT enabled smart real time weather monitoring project.

1.1 BACKGROUND:

Weather Forecasts are never 100% and it is almost impossible to predict the future with certainty. Even if you have a great process in place and forecasting experts on your payroll, your forecasts will never be spot on. Some products and markets will have a high level of volatility, especially during times of crisis. which is why understanding what factors influence your demand can potentially aid with developing forecasts during this time. Having said that, the main drawback of forecasts are that they are almost always wrong - which leads to excess or shortage of inventory.

1.2 PROBLEM STATEMENT:

Every house should have an iot enabled smart real time weather monitoring system.

- This system can help monitor a home atmosphere by using temperature and humidity, pressure and rain sensors.
- The weather can be predicted with the help of this system.
- The weather parameters are monitored constantly by using a HTML wed page.
- This web page can be seen anywhere using a smartphone or laptop with a internet connection.
- Using this system if we see an abnormally high temperature then we can assume that there is fire near the system.
- The alteration for weather forecasts.

1.3 OBJECTIVES:

To acquire weather parameters including temperature, humidity, pressure and rain level using respective sensors.

Updating the weather parameters at constant time interval to the HTML webpage.

2. LITERATURE REVIEW:

In this chapter, the analysis of the different circuit stages. Review of the component used in the project circuit and the basic information necessary for the achievement of the module is being dealt with/discussed.

3.PROJECT METHODOLOGY:

3.1 EXISTING METHOD:

Weather forecasts are made by collecting quantitative data about the current state of the atmosphere at a given place and using meteorology to project how the atmosphere will change. Once calculated by hand based mainly upon changes in barometric pressure, current weather conditions, and sky condition or cloud cover, weather forecasting now relies on computer-based models that take many atmospheric factors into account. Human input is still required to pick the best possible forecast model to base the forecast upon, which involves pattern recognition skills, teleconnections, knowledge of model performance, and knowledge of model biases. The inaccuracy of forecasting is due to the chaotic nature of the atmosphere, the massive computational power required to solve the equations that describe the atmosphere, the error involved in measuring the initial conditions, and an incomplete understanding of atmospheric processes. Hence, forecasts become less accurate as the difference between current time and the time for which the forecast is being made (the *range* of the forecast) increases. The use of ensembles and model consensus help narrow the error and pick the most likely outcome.

3.2 PROPOSED METHOD:

The weather forecasts were made for a large area weather conditions. The probability of the forecasts is correct in our surrounding is very less. So, by using IOT based real time weather monitoring system one can know the real time weather around the house.

3.2.1 CIRCUIT DIAGRAM:

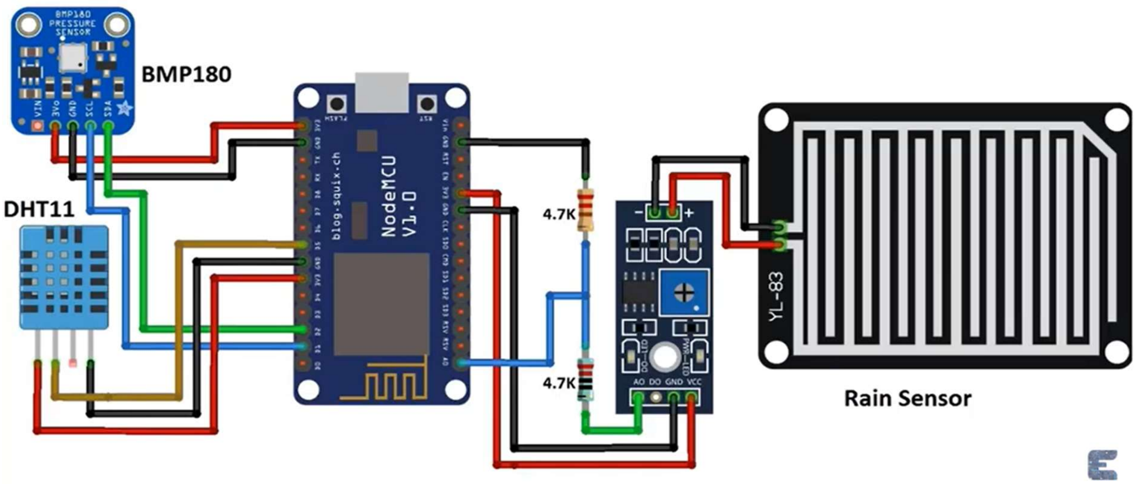

Fig. 3.21 Circuit diagram

- This circuit utilising Rain sensor, DHT11 and BMP180 can be used to measure weather parameters around the house.
- The Node MCU ESP8266 controls all these sensors and collects the data on the weather parameter.
- The Node MCU ESP8266 updates these data in a webpage at constant time interval.
- Then with the help of the WiFi and internet connection IOT is enabled.
- Thus this webpage can be visited on any smart phone, laptop or computer with an internet connection anywhere.

3.2.2 WORKING PRINCIPLE:

The IOT enabled smart real time weather monitoring system measures four weather parameters. Temperature and Humidity sensor, Pressure sensor and Rain level sensor these are the three sensors that are used in this system. These sensors are directly connected to Node MCU ESP8266. The Node MCU ESP8266 collects the data from them and displays these weather parameters in a HTML web page with the help of the command uploaded in it. This web page can be accessed through smart phones, laptops, computers, etc with internet connection by using the IP address. The monitoring system update the weather parameters at constant time intervals. Thus the user gets Live reporting of weather conditions. Internet connectivity or Wi-Fi is compulsory in this IOT enabled smart real time weather monitoring project.

3.2.3 REQUIRED COMPONENTS:

- Node MCU ESP8266
- Rain sensor
- DHT11 sensor
- BMP180 sensor
- 4.7k ohm Resistors
- Connecting wires
- Bread board

A. Node MCU ESP8266:

NodeMCU is a low-cost open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which was based on the ESP-12 module. The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications.

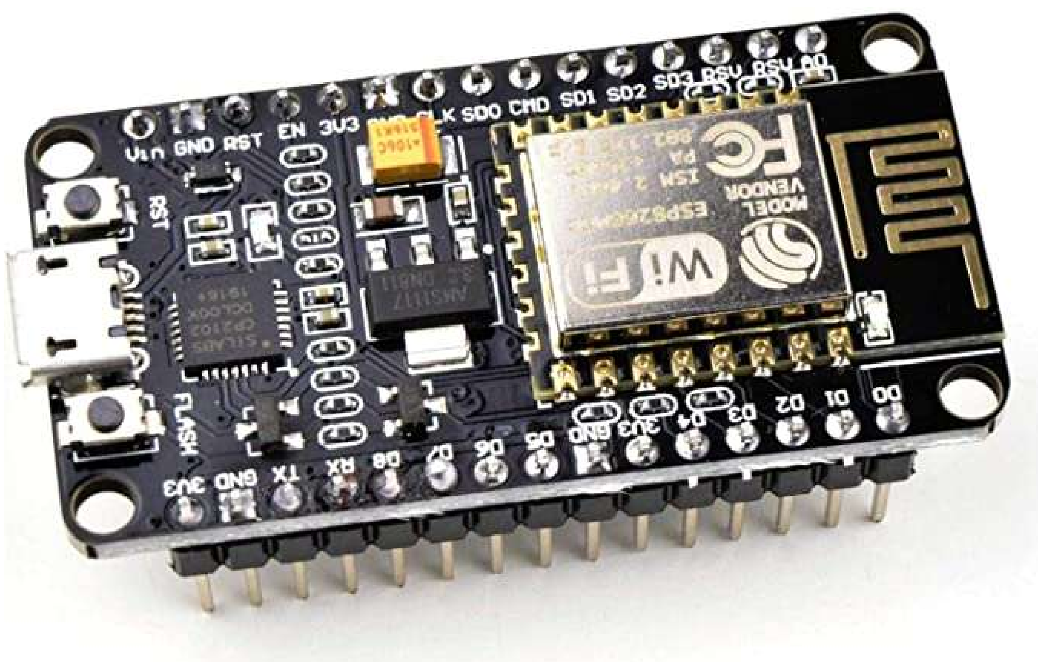

Fig.3.22 Picture of Node MCU ESP8266

B. Rain sensor:

Rain sensors are used in the detection of water beyond what a humidity sensor can detect. The rain sensor detects water that completes the circuits on its sensor boards' printed leads. The sensor board acts as a variable resistor that will change from 100k ohms when wet to 2M ohms when dry. In short, the wetter the board the more current that will be conducted.

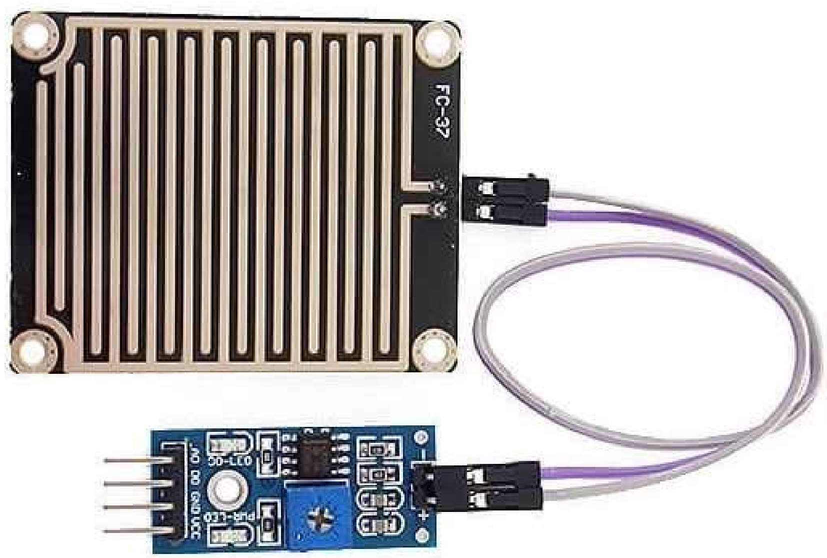

Fig.3.23 Picture of Rain sensor

C. DHT11 sensor:

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin. Its fairly simple to use, but requires careful timing to grab data. The digital signal is fairly easy to read using any microcontroller.

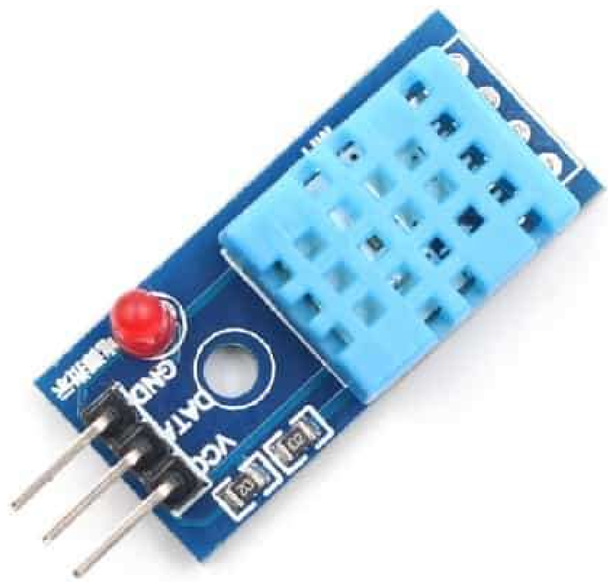

Fig.3.24 Picture of DHT11 sensor

Features of DHT11:

- Ultra low cost
- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 20-80% humidity readings with 5% accuracy
- Good for 0-50°C temperature readings ±2°C accuracy
- No more than 1 Hz sampling rate (once every second)
- Body size 15.5mm x 12mm x 5.5mm
- 4 pins with 0.1″ spacing

D. BMP180 sensor:

The BMP180 is the new digital barometric pressure sensor of Bosch Sensortec, with a very high performance, which enables applications in advanced devices such as smartphones, tablet PCs, and sports devices. It follows the BMP085 and brings many improvements, like the smaller size and the expansion of digital interfaces. The ultra-low power consumption down to 3 µA makes the BMP180 the leader in power saving for your devices. BMP180 is also distinguished by its very stable behavior (performance) with regard to the independence of the supply voltage.

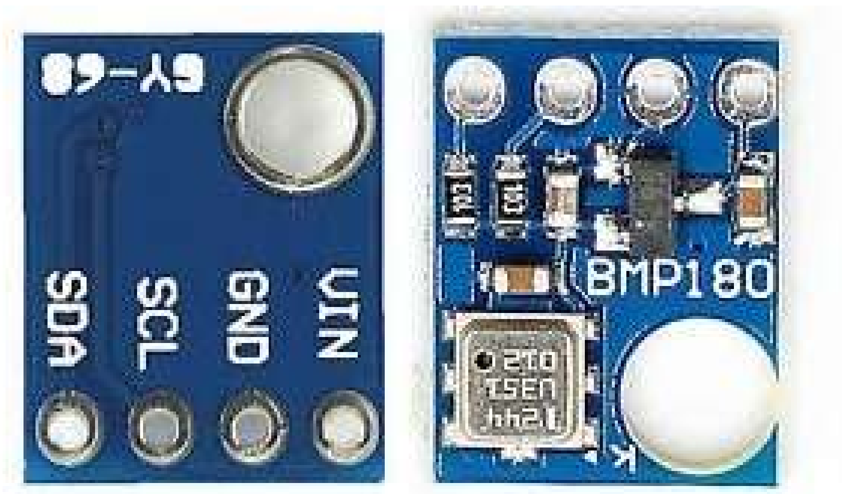

Fig.3.25 Picture of BMP180 sensor

Features of BMP180:

- Vin: 3 to 5VDC
- Logic: 3 to 5V compliant
- Pressure sensing range: 300-1100 hPa (9000m to -500m above sea level)
- Up to 0.03hPa / 0.25m resolution
- -40 to +85°C operational range, +-2°C temperature accuracy

- This board/chip uses I2C 7-bit address 0x77.

E. 4.7k ohm Resistors:

A **resistor** is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

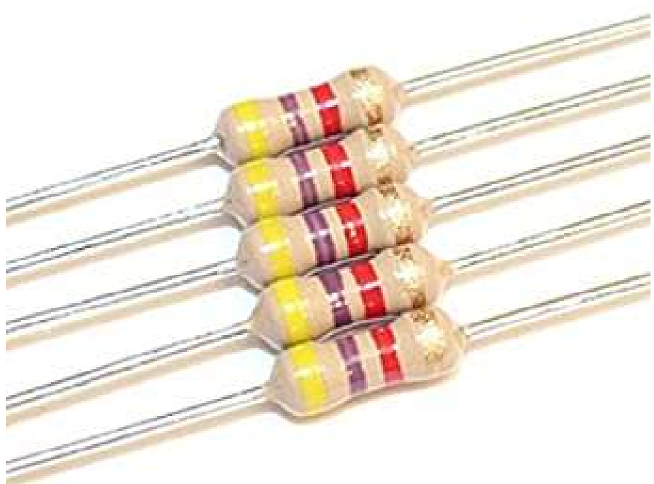

Fig.3.26 Picture of 4.7k ohm Resistors

F. Connecting Wires:

Connecting wires allows an electrical current to travel from one point on a circuit to another, because electricity needs a medium through which to move.

Fig.3.27 Picture of Connecting wires

G. Bread board:

A breadboard is a solderless device for temporary prototype with electronics and test circuit designs. Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate.

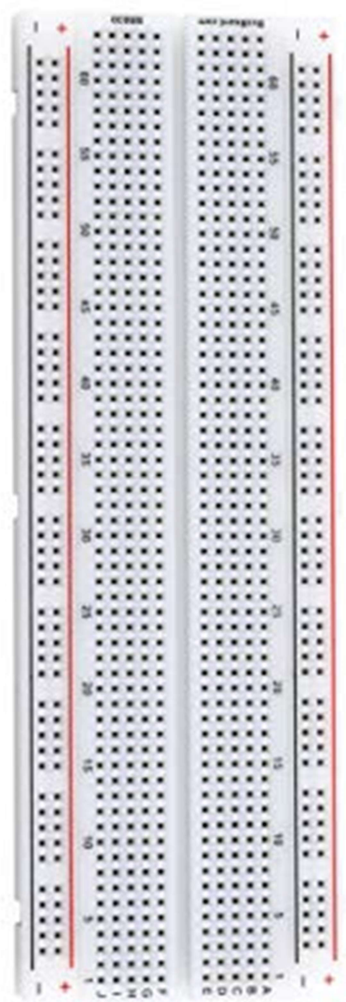

Fig.3.28 Picture of Bread board

3.2.2 PROJECT IMAGE AND WEBPAGE IMAGE:

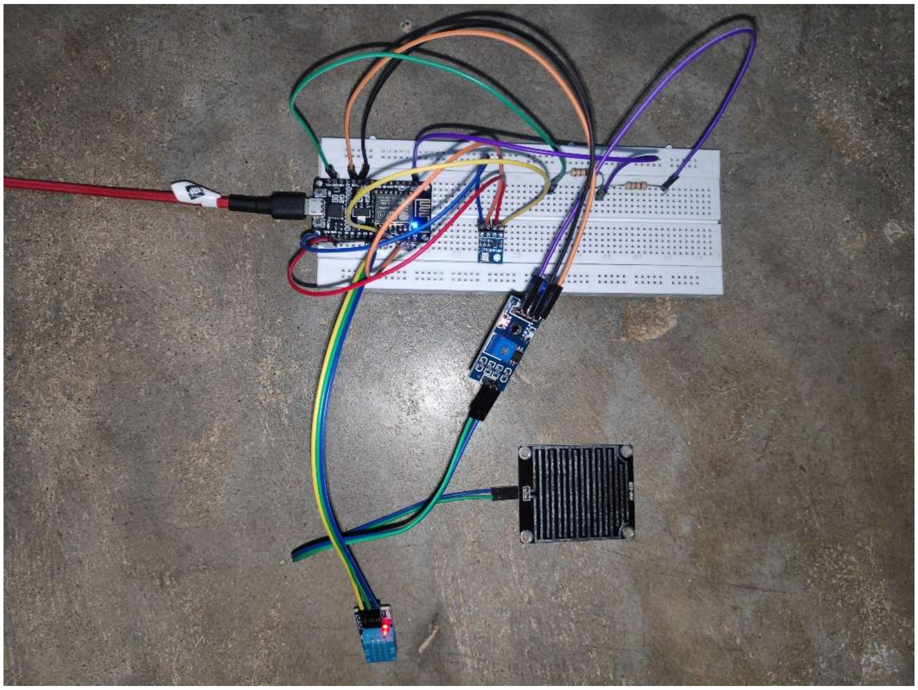

Fig.3.29 Project Image

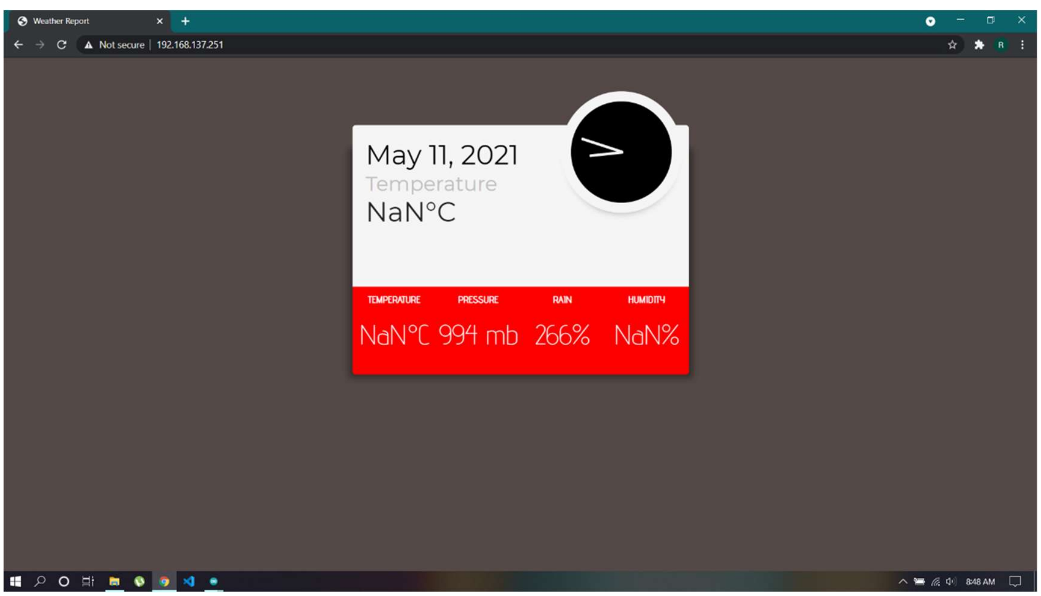

Fig.3.210 Picture of Webpage

3.3 SOURCE CODE:

```
#include <ESP8266WiFi.h>
#include <WiFiClient.h>
#include <ESP8266WebServer.h>
#include <ESP8266mDNS.h>

#include <ESP8266WiFi.h>
#include <WiFiClient.h>
#include <ESP8266WebServer.h>
#include <SFE_BMP180.h>
#include <Wire.h>
#include "DHTesp.h"
#define LED 2 //On board LED
#define DHTpin 14 //D5 of NodeMCU is GPIO14

SFE_BMP180 pressure;

#define ALTITUDE 1655.0 // Altitude in meters

DHTesp dht;

#ifndef STASSID
#define STASSID "BRV2 1355"   //Wifi User ID
#define STAPSK  "88X705h<"   //Wifi Password
#endif

const char* ssid = STASSID;
const char* password = STAPSK;

ESP8266WebServer server(80);
```

```
const int led = 13;
```

4. RESULTS AND DISCUSSION:

- After sensing the data from different sensor devices, which are placed in particular area of interest.
- The sensed data will be automatically sent to the web server, when a proper connection is established with sever device.The web server page which will allow us to monitor and control the system.
- The web page gives the information about the temperature, humidity and the CO level variations in that particular region, where the embedded monitoring system is placed.
- The data stored in cloud can be used for the analysis of the parameter and continuous monitoring purpose.

5. CONCLUSION:

High-temperature forecasts are used by Value Company to approximationexact over pending days. There is a diversity of end users to weather forecasts. Weather warnings are important forecasts since they are used to keep life and possessions. We know the how install remote conditions were sensing technology on vehicles. All this has been through possible by advances in satellite technology, a full acceleration in worldwide communication, and crushing increases in computing power.

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