Experiment 3

Student Name: Abhiraj Patel **UID:22BCS11329**
Branch: CSE **Section/Group:KRG IOT 1 A**
Semester: 6th **Date of Performance:30/01/25**
Subject Name: IOT LAB **Subject Code: 22CSP-367**

1. Aim:

Monitor air quality using a gas sensor (MQ135) and display the data on ThingSpeak.

2. Objective:

Monitor air quality using the MQ135 gas sensor and send the data to ThingSpeak for visualization and analysis.

3. Hardware Used:

- Hardware Required:
- MQ135 gas sensor
- ESP8266/NodeMCU (or any microcontroller with Wi-Fi capability)
- Breadboard and jumper wires
- Power supply (5V for the sensor and microcontroller)
- ThingSpeak account (free API key)

4. Procedure:

1. Connect the Hardware:

- MQ135 Pinout:
- VCC: Connect to 5V.
- GND: Connect to GND.
- AO (Analog Output): Connect to the analog pin of the ESP8266 (e.g., A0 on NodeMCU).

Wiring:

- MQ135 VCC → NodeMCU 3V3 or 5V (depending on module support)

- MQ135 GND → NodeMCU GND
- MQ135 A0 → NodeMCU A0

2. Set Up ThingSpeak:

- Go to ThingSpeak and create a free account.
- Create a new channel and add a Field (e.g., "Air Quality").
- Note down the Write API Key from the API Keys tab.

3. Install Required Libraries:

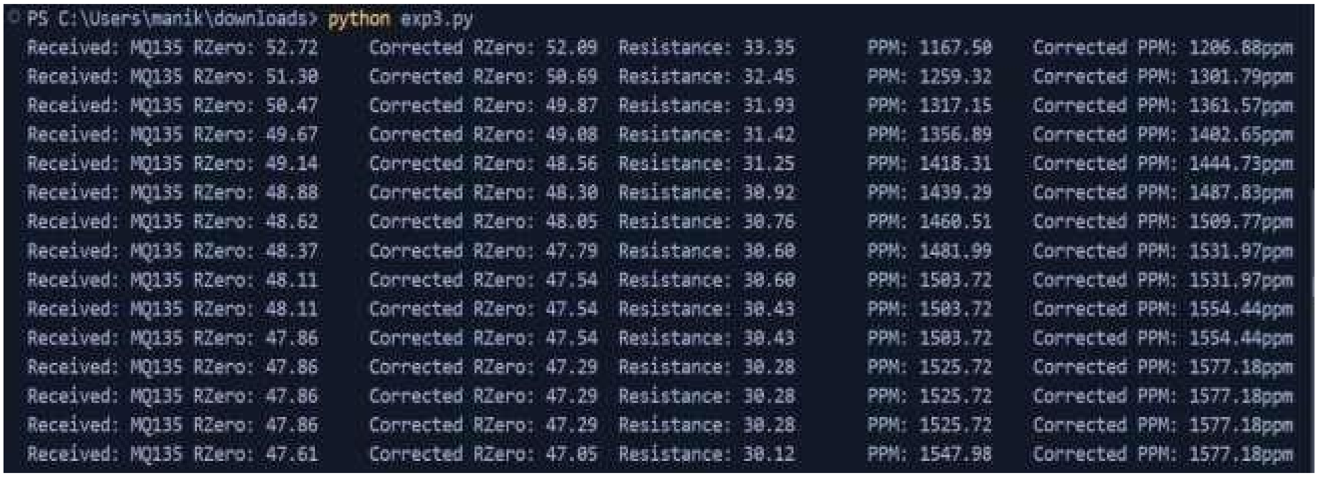
- Ensure the ESP8266 library is installed in your Arduino IDE:
- Go to Tools > Manage Libraries.
- Search for ESP8266 and install it.

-

5. Code:

```
#include <ESP8266WiFi.h>
#include <ESP8266HTTPClient.h>

// Replace with your network credentials const
char*   ssid   =   "Your_SSID";   const   char*
password = "Your_PASSWORD";
// ThingSpeak settings
const char* server = "http://api.thingspeak.com";
String apiKey = "YOUR_API_KEY";
//   MQ135   connected   to   A0   int
mq135Pin = A0;

void setup() {
  Serial.begin(115200);
  WiFi.begin(ssid,        password);        while
  (WiFi.status() != WL_CONNECTED) {
  delay(1000);
   Serial.println("Connecting to WiFi...");
  }
  Serial.println("Connected to WiFi");
}
void loop() {
  // Read analog value from MQ135 int
  airQuality = analogRead(mq135Pin);

  Serial.println("Air Quality Value: " + String(airQuality));
  // Send data to ThingSpeak
  if (WiFi.status() == WL_CONNECTED) {
    HTTPClient http;
    String url = server + "/update?api_key=" + apiKey + "&field1=" +
String(airQuality);
    http.begin(url);

    int httpCode = http.GET(); if
    (httpCode > 0) {
      Serial.println("Data sent to ThingSpeak successfully.");
    } else {
      Serial.println("Error sending data.");
    }
    http.end();
  }
  // ThingSpeak limits updates to every 15 seconds delay(15000);
}
```

6. Output:



```
PS C:\Users\manik\downloads> python exp3.py
  Received: MQ135 RZero: 52.72    Corrected RZero: 52.09  Resistance: 33.35      PPM: 1167.50    Corrected PPM: 1206.88ppm
  Received: MQ135 RZero: 51.30    Corrected RZero: 50.69  Resistance: 32.45      PPM: 1259.32    Corrected PPM: 1301.79ppm
  Received: MQ135 RZero: 50.47    Corrected RZero: 49.87  Resistance: 31.93      PPM: 1317.15    Corrected PPM: 1361.57ppm
  Received: MQ135 RZero: 49.67    Corrected RZero: 49.08  Resistance: 31.42      PPM: 1356.89    Corrected PPM: 1402.65ppm
  Received: MQ135 RZero: 49.14    Corrected RZero: 48.56  Resistance: 31.25      PPM: 1418.31    Corrected PPM: 1444.73ppm
  Received: MQ135 RZero: 48.88    Corrected RZero: 48.30  Resistance: 30.92      PPM: 1439.29    Corrected PPM: 1487.83ppm
  Received: MQ135 RZero: 48.62    Corrected RZero: 48.05  Resistance: 30.76      PPM: 1460.51    Corrected PPM: 1509.77ppm
  Received: MQ135 RZero: 48.37    Corrected RZero: 47.79  Resistance: 30.60      PPM: 1481.99    Corrected PPM: 1531.97ppm
  Received: MQ135 RZero: 48.11    Corrected RZero: 47.54  Resistance: 30.60      PPM: 1503.72    Corrected PPM: 1531.97ppm
  Received: MQ135 RZero: 48.11    Corrected RZero: 47.54  Resistance: 30.43      PPM: 1503.72    Corrected PPM: 1554.44ppm
  Received: MQ135 RZero: 47.86    Corrected RZero: 47.54  Resistance: 30.43      PPM: 1503.72    Corrected PPM: 1554.44ppm
  Received: MQ135 RZero: 47.86    Corrected RZero: 47.29  Resistance: 30.28      PPM: 1525.72    Corrected PPM: 1577.18ppm
  Received: MQ135 RZero: 47.86    Corrected RZero: 47.29  Resistance: 30.28      PPM: 1525.72    Corrected PPM: 1577.18ppm
  Received: MQ135 RZero: 47.86    Corrected RZero: 47.29  Resistance: 30.28      PPM: 1525.72    Corrected PPM: 1577.18ppm
  Received: MQ135 RZero: 47.61    Corrected RZero: 47.05  Resistance: 30.12      PPM: 1547.98    Corrected PPM: 1577.18ppm
```

Fig 1: Simulated Cloud Air Quality Variations

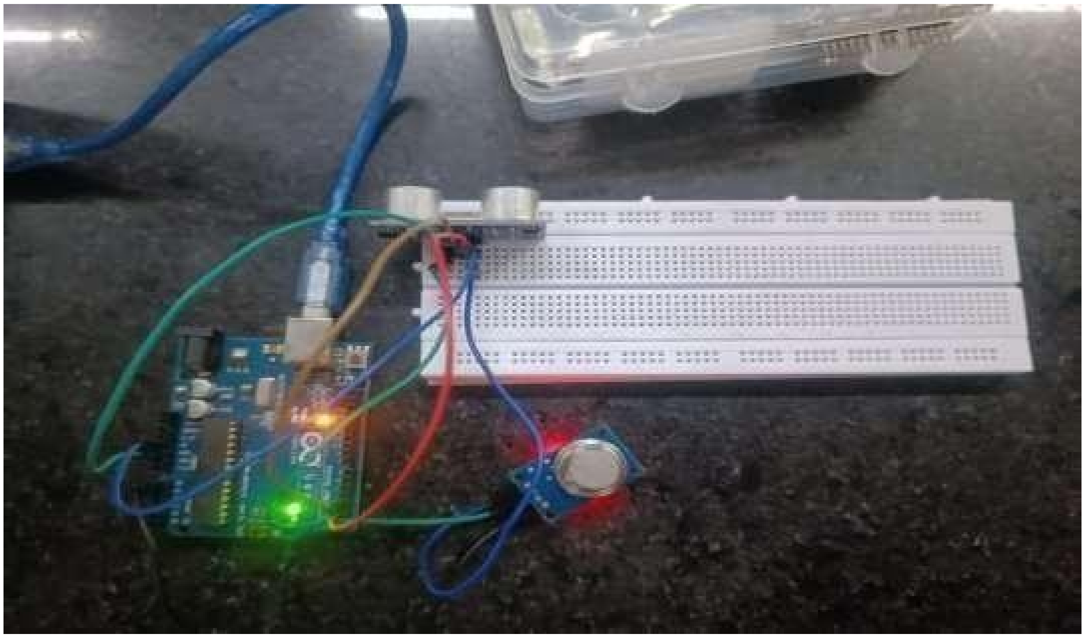


Fig 2: Hardware

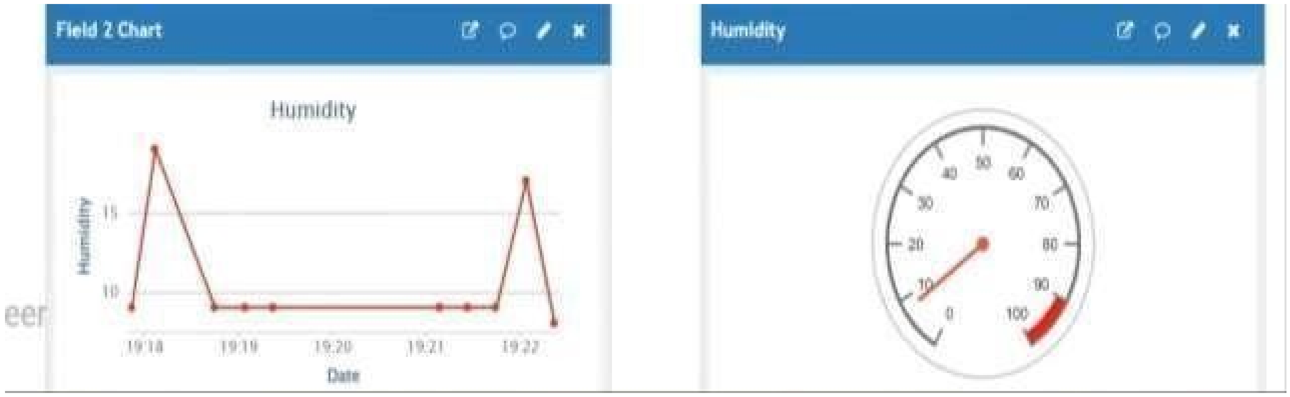


Fig 3: Think speak Visualization

7. Learning Outcome:

- Understanding how to interface and calibrate the MQ135 gas sensor with microcontrollers such as Arduino or ESP32.
- Collecting sensor data efficiently and reading analog values for air quality monitoring.
- Learning how to set up wireless communication protocols (Wi-Fi, MQTT) to connect with cloud platforms.