PRACTICAL 8 : Temperature Data Logging to ThingSpeak Cloud

Aim : To send temperature sensor data to the ThingSpeak cloud using Arduino and NodeMCU.

Overview :

In this project, a temperature sensor is used to collect data, which is then sent to the ThingSpeak cloud platform using Arduino and NodeMCU. This experiment introduces cloud-based data storage, remote monitoring and IoT communication protocols.

Materials Required :

- Arduino Uno R3
- 2 x 1 kΩ Resistor
- Temperature Sensor (TMP36)
- Wifi Module (ESP8266)
- Jumper Wires
- Arduino IDE (Installed on your Computer)

Circuit Connection and Steps :

1. **Power Connections :**
   - TMP36 VCC → 5V (Arduino), GND → GND (Arduino)
   - ESP8266 VCC & CH_PD → 3.3V (Arduino), GND → GND (Arduino)
2. **Sensor & ESP8266 Wiring :**
   - TMP36 VOUT → A0 (Arduino)
   - ESP8266 TX → RX (Arduino) via 1kΩ resistor
   - ESP8266 RX → TX (Arduino) via voltage divider (two 1kΩ resistors)

Circuit Diagram :
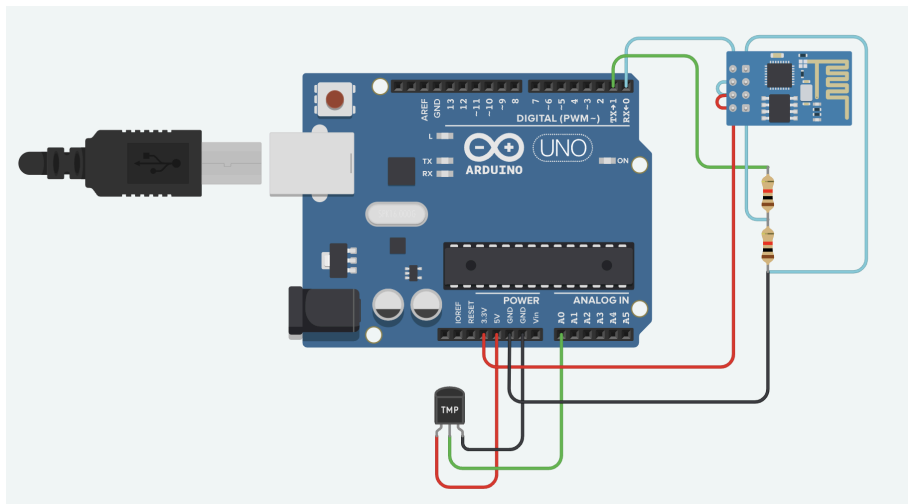
Schematic Diagram :
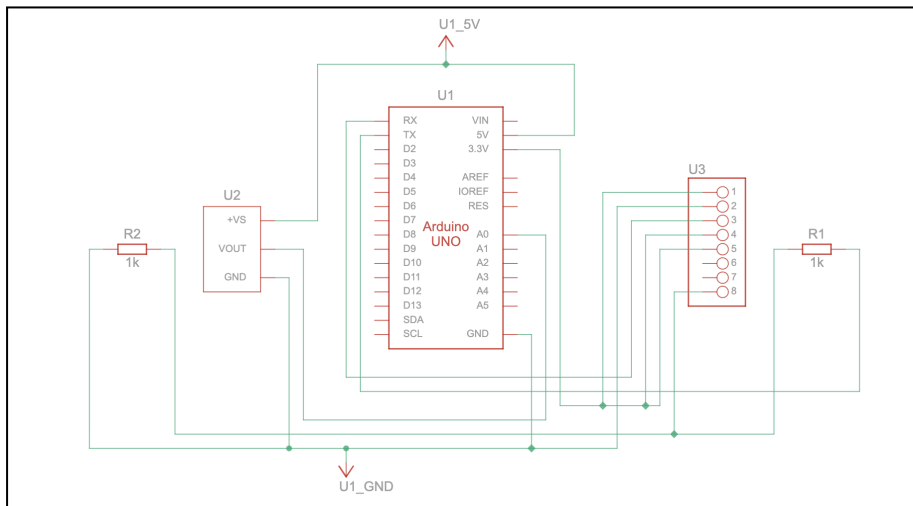
Code :

```
String ssid = "Simulator Wifi"; // SSID to connect to
String password = ""; // No password in virtual WiFi
String host = "api.thingspeak.com";
const int httpPort = 80;
String apiKey = "6VXJKID8U5GRES8B"; // Your ThingSpeak API key
const int tempPin = A0; // LM35 connected to A0
int setupESP8266(void) {
    Serial.begin(115200); // Serial communication with PC
    Serial.println("AT");
    delay(1000); // Wait for ESP8266 response
    if (!Serial.find("OK")) return 1;
    // Connect to WiFi
    Serial.println("AT+CWJAP=\"" + ssid + "\",\"" + password + "\"");
    delay(5000);
    if (!Serial.find("OK")) return 2;
    // Open TCP connection to ThingSpeak
    Serial.println("AT+CIPSTART=\"TCP\",\"" + host + "\"," + httpPort);
    delay(2000);
    if (!Serial.find("OK")) return 3;
    return 0;
}
void sendTemperatureData() {
    int sensorValue = analogRead(tempPin);
    float temperature = (sensorValue * 5.0 / 1023.0) * 100.0; // LM35
formula
    Serial.println("Temperature: " + String(temperature) + "°C");
    // Construct HTTP request
    String httpPacket = "GET /update?api_key=" + apiKey + "&field1=" +
String(temperature) +
```

```
                        " HTTP/1.1\r\nHost: " + host + "\r\n\r\n";
    int length = httpPacket.length();
    // Send message length
    Serial.print("AT+CIPSEND=");
    Serial.println(length);
    delay(1000);
    if (!Serial.find(">")) return;
    // Send HTTP request
    Serial.print(httpPacket);
    delay(2000);
    if (!Serial.find("SEND OK")) return;
    Serial.println("Data sent to ThingSpeak!");
}
void setup() {
    setupESP8266();
}
void loop() {
    sendTemperatureData();
    delay(1000); // Send data
}
```
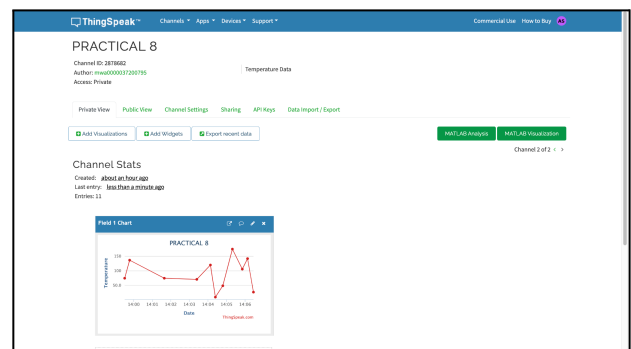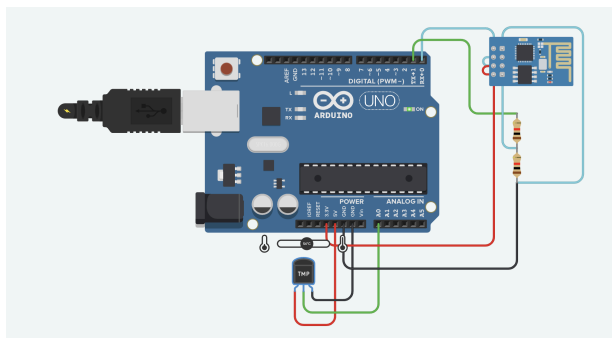
Results :

Conclusion :

This project successfully collects and uploads temperature data to the ThingSpeak cloud platform using Arduino and NodeMCU. It introduces cloud-based IoT applications and remote data monitoring, forming the basis for more advanced smart environment solutions and predictive analytics.