# EXP.No.9: INTERFACE SOIL MOISTURE SENSOR WITH ESP8266

## OBJECTIVES:

1. To interface a soil moisture sensor with the ESP8266 NodeMCU board.
2. To measure soil moisture levels using the soil moisture sensor.
3. To display the soil moisture readings on the Blynk IoT app.

## MATERIALS REQUIRED:

- ESP8266 NodeMCU board
- Soil moisture sensor module
- Breadboard
- Jumper wires
- USB cable
- Computer with Arduino IDE installed
- Blynk app installed on a smartphone or tablet

## THEORY:

The soil moisture sensor measures the volumetric water content in soil. It consists of two probes that are inserted into the soil, which act as a variable resistor (more water makes the soil conduct electricity more easily). This sensor outputs an analog signal that varies with the soil moisture level.

The ESP8266 NodeMCU board is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability, designed to provide access to Wi-Fi networks or to act as an access point.

Blynk is a platform with iOS and Android apps to control Arduino, Raspberry Pi, and similar devices over the Internet. It provides a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets.

## CIRCUIT DIAGRAM:

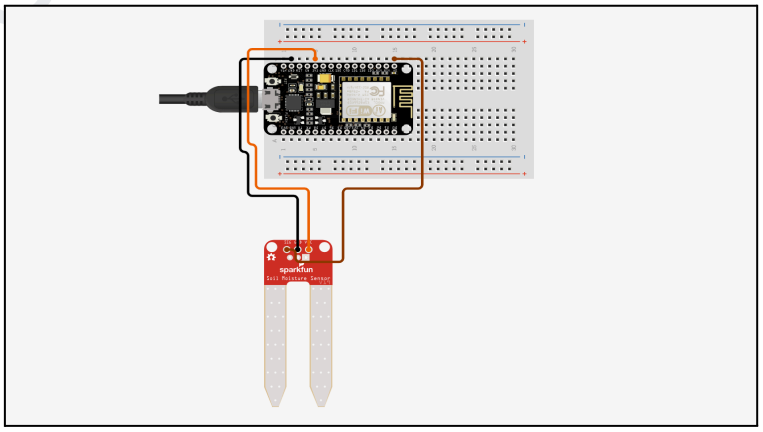


*Fig.9.1 Connections between the ESP8266 NodeMCU and the soil moisture sensor*

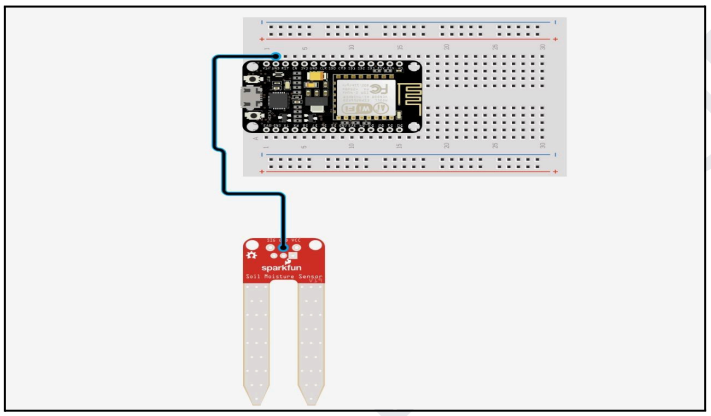
**Soil Moisture Sensor Pin Configuration:**

- $V_{CC}$: 3.3V
- GND: GND
- Analog Output: A0 on ESP8266

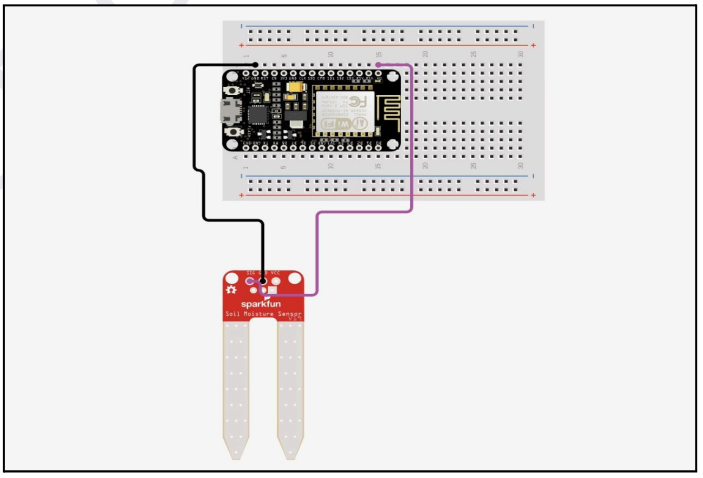
**PROCEDURE:**

**1. Hardware Setup:**

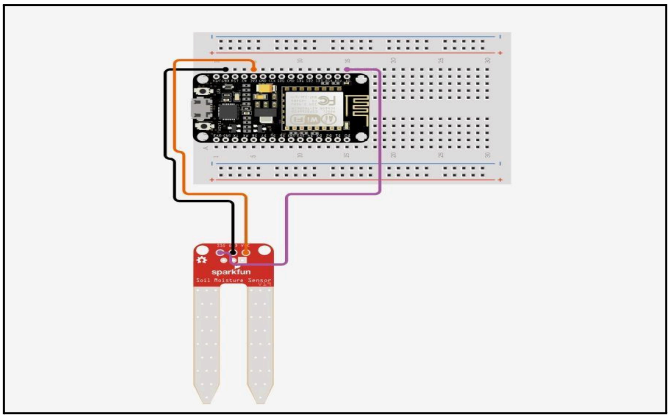
- Connect the GND pin of the soil moisture sensor to a GND pin on the ESP8266.



- Connect the Analog Output pin of the soil moisture sensor to the A0 pin on the ESP8266 using jumper wires.



- Connect the $V_{CC}$ pin of the soil moisture sensor to the 3.3V pin on the ESP8266.



**2. Software Setup:**

- Open the Arduino IDE on your computer.
- Install the necessary libraries: Adafruit Unified Sensor library and any required dependencies.
- Install the Blynk library by navigating to Sketch -> Include Library -> Manage Libraries and searching for “Blynk”.

**3. Blynk App Setup:**

- Open the Blynk app on your smartphone/tablet.
- Create a new project and note the Auth Token.
- Add a Value Gauge widget and set it to Virtual Pin V0.
- Add a Value Label widget and set it to Virtual Pin V1.

**4. Programming:**

- Connect the ESP8266 to your computer using a USB cable.
- In the Arduino IDE, write the following code:

```
#define BLYNK_TEMPLATE_ID "__"
#define BLYNK_TEMPLATE_NAME "__"
#define BLYNK_AUTH_TOKEN "__"
#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>
const char* ssid = "WIFI_NAME";
const char* password = "Password";
#define SOIL_MOISTURE_PIN A0

void setup() {
  Serial.begin(115200);
```

```
  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println("Connected to WiFi");

  Blynk.begin(BLYNK_AUTH_TOKEN, ssid, password);
}

void loop() {
  int sensorValue = analogRead(SOIL_MOISTURE_PIN);

  Serial.print("Soil Moisture Value: ");
  Serial.println(sensorValue);

  Blynk.virtualWrite(V0, sensorValue);  // For Gauge
  Blynk.virtualWrite(V1, sensorValue);  // For Label
   Blynk.run();
  delay(2000);
}
```

- Replace "YourAuthToken", "YourNetworkName", and "YourPassword" with the actual values.
- Upload the code to the ESP8266.

**5. Running the Experiment:**

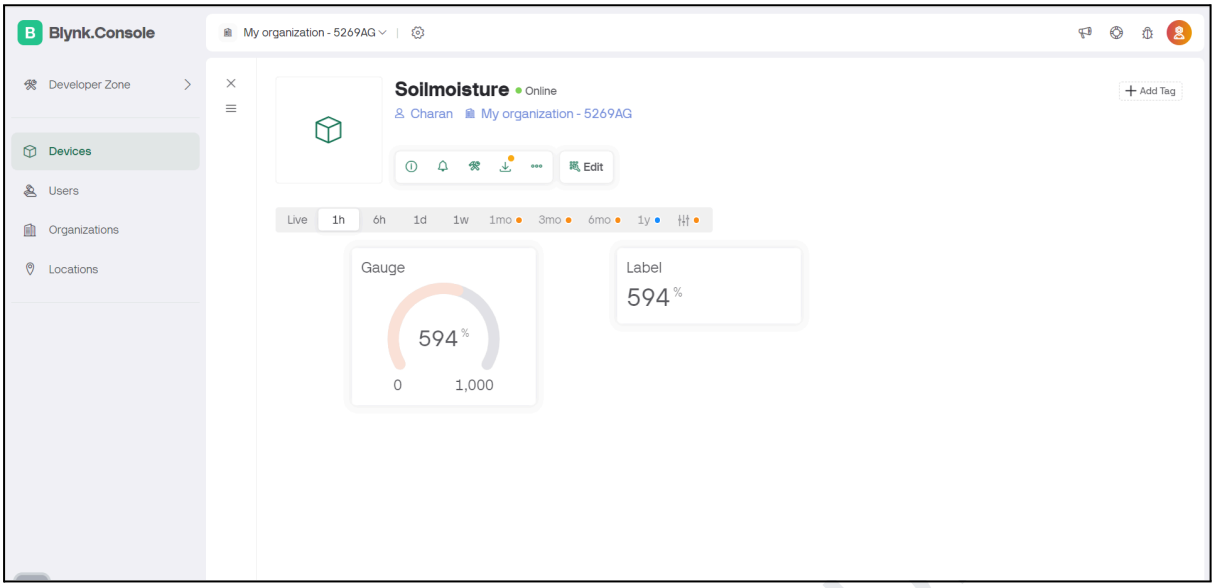
- Open the Serial Monitor in the Arduino IDE to observe the soil moisture readings.
- Open the Blynk app to view the live soil moisture data on the Value Display widget.

**OBSERVATIONS:**

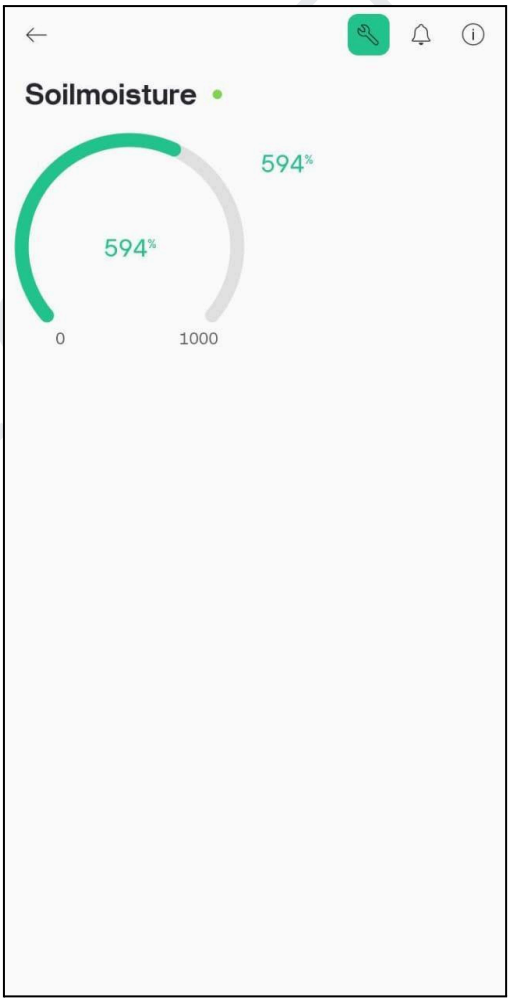
Record the soil moisture readings displayed on the Blynk app at different intervals.

| S.No | Time(HH:MM) | Percentage(%) |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

## Observation in Blynk website:




## Observation in Blynk IoT mobile app:



**Result:**

The soil moisture levels were successfully measured using the soil moisture sensor and displayed on the Blynk app.

**Conclusion:**

This experiment demonstrates how to interface the soil moisture sensor with the ESP8266 board and use the Blynk IoT platform to remotely monitor soil moisture levels. The successful implementation confirms the practicality of using ESP8266 and Blynk for IoT applications.

**Appendix:**

**A. Symbols, Units, and Abbreviations:**

- V: Voltage (Soil Moisture Level)
- $V_{CC}$: Voltage Common Collector
- GND: Ground
- GPIO: General Purpose Input/Output

**B. Tools Required:**

- ESP8266 NodeMCU board
- Soil moisture sensor module
- Breadboard
- Jumper wires
- USB cable
- Computer with Arduino IDE installed
- Blynk app installed on a smartphone or tablet

**C. Additional Resources:**

- ESP8266 Documentation
- Arduino IDE Installation Guide
- Blynk Documentation
- Soil Moisture Sensor Guide

**D. Reference link with QR code**

https://www.youtube.com/watch?v=-so4mBhLFBs

This format provides a clear and comprehensive guide for conducting the experiment, ensuring students can follow along and achieve the desired outcomes.