### AUTOMATED IRRIGATION CONTROL SYSTEM BASED ON ENVIRONMENT SENSING

### TEAM MEMBERS

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### Aim

To design and implement an automated irrigation system using an ESP8266 microcontroller that monitors environmental conditions. The system will use a soil moisture sensor to determine the water content in the soil and a DHT11 sensor to measure ambient temperature and humidity. Based on a predefined moisture threshold, a relay module will automatically control a water pump to ensure plants receive the necessary amount of water, with all data and system status displayed in real-time on an OLED screen.

### Apparatus Required

* ESP8266 (NodeMCU) Microcontroller
* Capacitive Soil Moisture Sensor
* 5V Single Channel Relay Module
* Mini Submersible Water Pump
* Breadboard
* Jumper Wires

### PIN TABLE

|  |  |
| --- | --- |
| **Component Pin** | **ESP8266 (NodeMCU) Pin** |
| Soil Moisture Sensor VCC | 3.3V |
| Soil Moisture Sensor GND | GND |
| Soil Moisture Sensor AOUT | A0 |
|  |  |
|  |  |
|  |  |
| Relay Module VCC | 5V (Vin) |
| Relay Module GND | GND |
| Relay Module IN | D6 (GPIO12) |
| OLED Display VCC | 3.3V |
| OLED Display GND | GND |
| OLED Display SDA | D2 (GPIO4) |
| OLED Display SCL | D1 (GPIO5) |

### COMPONENT DESCRIPTIONS

### ESP8266

The ESP8266 is a low-cost Wi-Fi-enabled microcontroller. Its powerful processing capabilities and onboard Wi-Fi make it an excellent choice for Internet of Things (IoT) projects. The NodeMCU development board provides easy access to its GPIO pins, including an analog-to-digital converter (ADC) which is essential for reading data from the analog soil moisture sensor.

### Capacitive Soil Moisture Sensor

Unlike resistive sensors, a capacitive soil moisture sensor measures water content by detecting changes in the capacitance of the soil, which acts as a dielectric. This method is more resistant to corrosion and provides a more stable and accurate reading of the soil's moisture level over time.

### SUBMERSIBLE PUMP

A submersible pump is an electric pump designed to operate while fully submerged in water or other fluids. It pushes liquid to the surface by converting rotary energy into kinetic and then pressure energy. These pumps are commonly used in wells, drainage, sewage handling, and industrial fluid transfer.

### Relay Module

A relay is an electrically operated switch that allows a low-power signal from a microcontroller to control a much higher-power circuit. In this system, the ESP8266 sends a signal to the relay module to switch the high-voltage water pump on or off without drawing significant current from the microcontroller itself.d

### FLOW CHART

### PROGRAM

#define SENSOR\_PIN A0 // Moisture sensor analog output

#define RELAY\_PIN 5 // GPIO5 (D1 pin on NodeMCU)

int dryValue = 800; // Calibrate: ADC value when soil is dry

int wetValue = 400; // Calibrate: ADC value when soil is wet

void setup() {

Serial.begin(115200);

pinMode(RELAY\_PIN, OUTPUT);

digitalWrite(RELAY\_PIN, LOW); // Pump OFF initially

}

void loop() {

int sensorValue = analogRead(SENSOR\_PIN);

int moisturePercent = map(sensorValue, dryValue, wetValue, 0, 100);

if (moisturePercent < 60) {

digitalWrite(RELAY\_PIN, LOW); // Turn pump ON

Serial.println("Soil Dry → Pump ON");

} else {

digitalWrite(RELAY\_PIN, HIGH); // Turn pump OFF

Serial.println("Soil Wet → Pump OFF");

}

Serial.print("Moisture: ");

Serial.print(moisturePercent);

Serial.println("%");

delay(2000);

}

### EXECUTION

