Republic of the Philippines
Polytechnic University of the Philippines
College of Engineering
Computer Engineering Department

CMPE 30094
Embedded Systems
BSCOE _____

Laboratory Exercise 4: Bluetooth-Based Soil Moisture Monitoring

Name	Signature	Date Submitted	Group Grade	Individual Grade (Q&A)	Total
1.					
2.					
3.					
4.					
5.					
6.					

Group Grade

Criteria		**Points**					**SCORE**
Quality of the report activity	25	Very Untidy (5 points)	Untidy With erasures (10 points)	Untidy wo erasures (15 points)	Neat With erasures (20 points)	Neat no erasures (25 points)	
Correctness on the questions of the activity	25	No answer (0 point)	Incorrect (10 points)	Some are correct (15 points)	Mostly correct (20 points)	Correct (25 points)	
Promptness	25	more than 1 week late (5 points)	3 to 5 days late (10 points)	2 days late (115points)	One day late (20 points)	On time (25 points)	
TOTAL	75						-

Individual Grade

Criteria		**Points**					**SCORE**
Q & A	25	No answer (0 point)	Wrong answer (10 points)	Slightly correct (15 points)	Mostly correct (20 points)	Correct answer (25 points)	

Laboratory Objectives

- To understand the principles of embedded systems and their applications in environmental monitoring.
- To learn about soil sensing technologies and their integration into embedded systems.
- To design and implement a sensor interface circuit for soil sensors.
- To analyze and interpret soil data to gain insights into environmental conditions.

Materials Required:

Arduino UNO R3 board	- Jumper wires
USB cable	- LEDs (2 or more)
Breadboard	- Resistors (220 ohms or similar)
Temperature Sensor	Soil moisture sensor

Activity Procedure:

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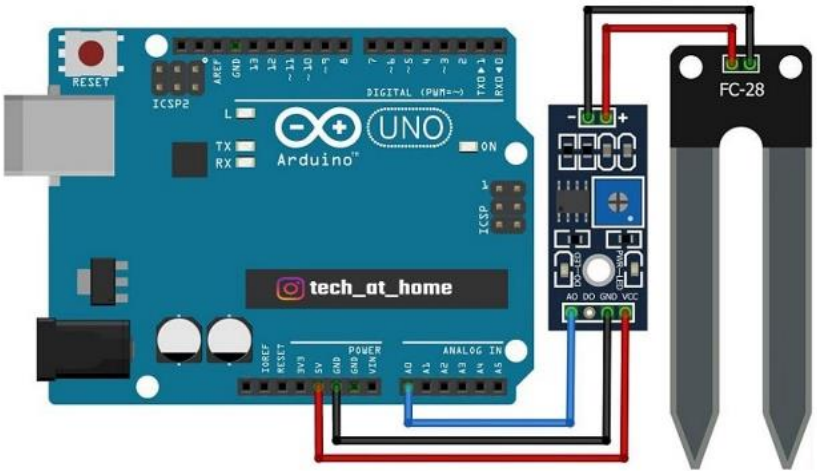

Procedure (Soil Sensor)

1. Identify the pins on the soil moisture sensor. Typically, it will have three pins: VCC (power supply), GND (ground), and SIG (signal output).
2. Insert the soil moisture sensor into the breadboard, with the pins spanning two different rows.
3. Connect a jumper wire from the VCC pin of the soil moisture sensor to a positive rail (e.g., red rail) on the breadboard.
4. Connect another jumper wire from the GND pin of the soil moisture sensor to a negative rail (e.g., blue rail) on the breadboard.
5. Connect a jumper wire from the SIG pin of the soil moisture sensor to any of the analog input pins on the Arduino Uno (A0). Insert the wire into the same row as the SIG pin of the sensor.
6. Connect a jumper wire from the positive rail on the breadboard to the 5V pin on the Arduino Uno.
7. Connect a jumper wire from the negative rail on the breadboard to any of the GND pins on the Arduino Uno.
8. Once the connections are made, open the Arduino IDE on your computer.
9. Create a new sketch by clicking on "File" > "New" in the Arduino IDE.

Simulation : Arduino Code for Soil Sensor

```
const int soilPin = A0;
void setup() {
  Serial.begin(9600);
}
void loop() {
  int soilMoisture = analogRead(soilPin);
  Serial.print("Soil moisture: ");
  Serial.println(soilMoisture);
  delay(1000);
}
```

Experiment and Extend:

a. Using the learning from the previous laboratory activity, modify/enhance the sketch to add additional functionalities. Document/write your observations, results, and any modifications made during the experiment. Draw the schematic diagram of the enhancement done.

Schematic diagram :

Questions:

1. Discuss the significance of environmental monitoring using temperature and soil sensors in the context of agriculture, environmental conservation.

2. Can you suggest any additional applications where temperature and soil sensing could be beneficial beyond the ones explored in the laboratory activity?

3. In the context of agriculture, suppose you have collected temperature and soil moisture data from a field over a period of time. How can you use this data?

4. Discuss the successes and difficulties you encountered during the laboratory activities.