EIM PROJECT REPORT

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SUBJECT: ELECTRONICS INTRUMENTATION AND MEASUREMENTS (EE251)

SUBMITTED TO: Ms. Lavi Tanwar

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November, 2020

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Certificate

I hereby certify that the Project titled "AUTOMATED IRRIGATION SYSTEM" which is submitted by, Department of Electronics & Communication Engineering, Delhi Technological University, Delhi is a record of the project work carried out by the students under my supervision.

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Candidate's Declaration

We, hereby, declare that the work embodied in this project entitled "AUTOMATED IRRIGATION SYSTEM" submitted to the Department of Electronics & Communication Engineering, Delhi Technological University, Delhi is an authentic record of our own bonafide work and is correct to the best of our knowledge and belief. This work has been undertaken taking care of engineering ethics.

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ABSTRACT

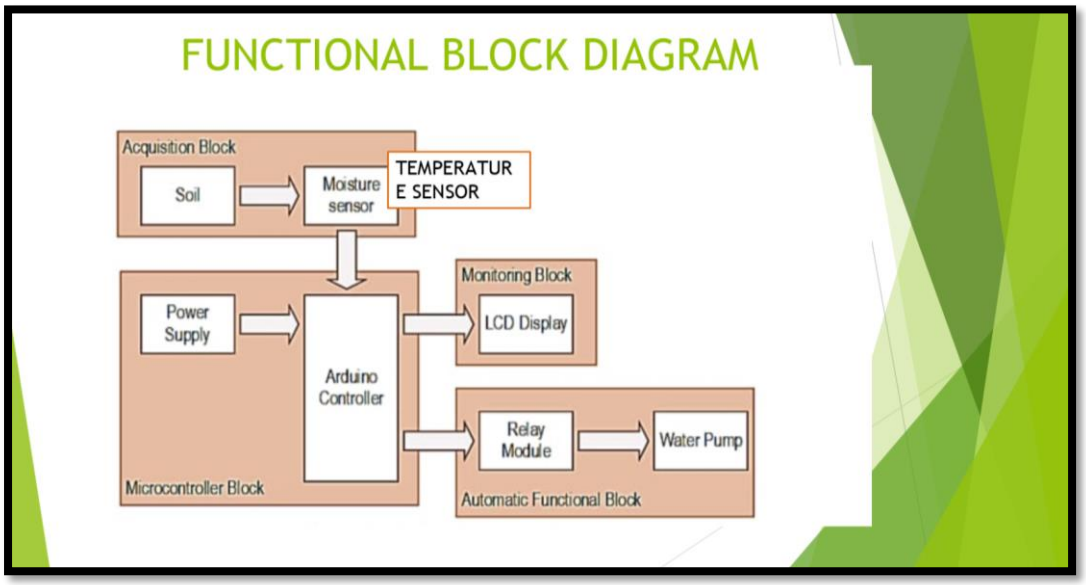
This project aims to prepare an automated model of irrigation system, which senses the moisture content of the soil and accordingly drives the water pump on/off. The surrounding temperature of the plant/soil is sensed too. This project can be implemented to timely water plants in real life without human intervention. This project illustrates the working and use of moisture sensor and temperature sensor and the sensor inputs are processed using Arduino microprocessor and the water pump (for watering the plants) which is the output unit is processed accordingly.

AIM: To prepare an automated model of irrigation system, which senses the moisture content of the soil and accordingly drives the water pump on/off. The surrounding temperature of the plant/soil is sensed too.

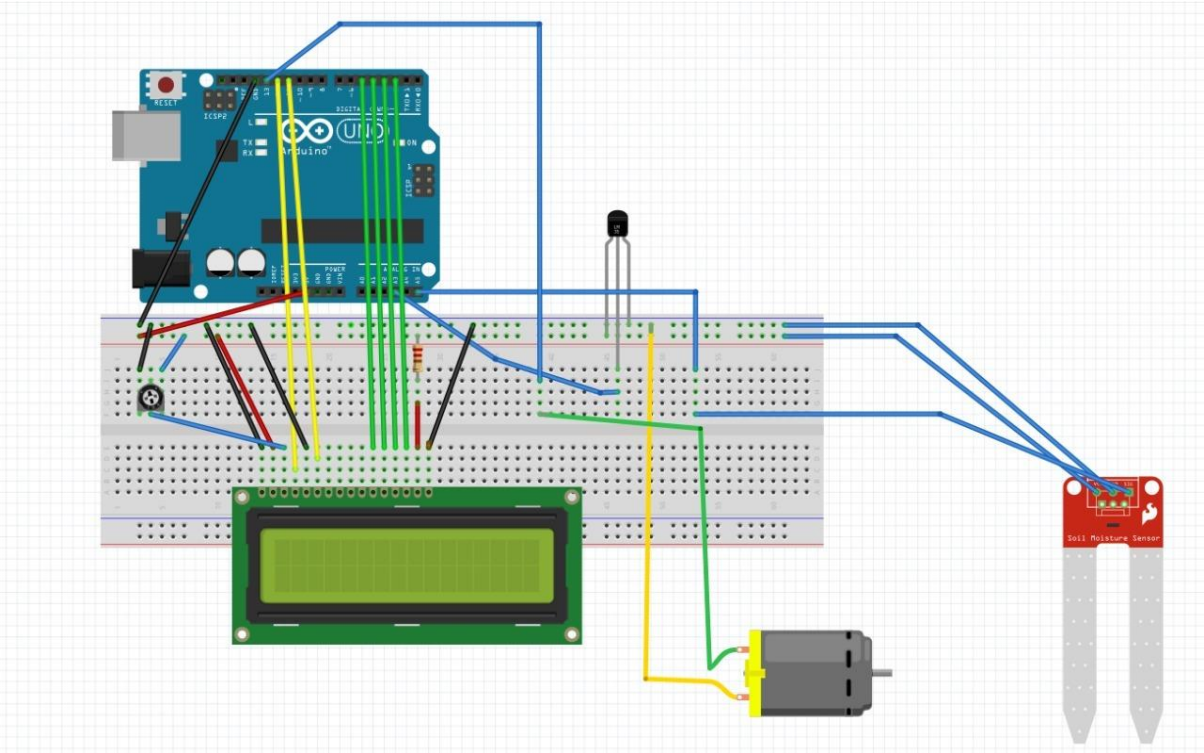
Working Overview:

- The soil moisture sensor senses the moisture content in soil as input.
- Temperature sensor will take the input of temperature.
- This input is fed to Arduino microcontroller for processing the amount of moisture in soil and the surrounding temperature.
- The soil moisture index along with the temperature sensed is displayed on the monitor screen, and through relay module, the water pump is controlled .
- The water pump will be in ON state when the soil is sensed dry, and it'll be in OFF state when soil is wet.

Functional Block Diagram:



Circuit Diagram:



Components Required:

- Arduino UNO
- Jumper wires
- 5V DC relay module
- 5V DC water pump with pipe
- Moisture sensor
- LM35 temperature sensor
- Breadboard
- Laptop

Softwares Required:

- Arduino Ide (For writing code and uploading it to Arduino)
- Circuit.io (online site for making simulations of hardware connections before implementing it physically)

Working of Each Component Used:

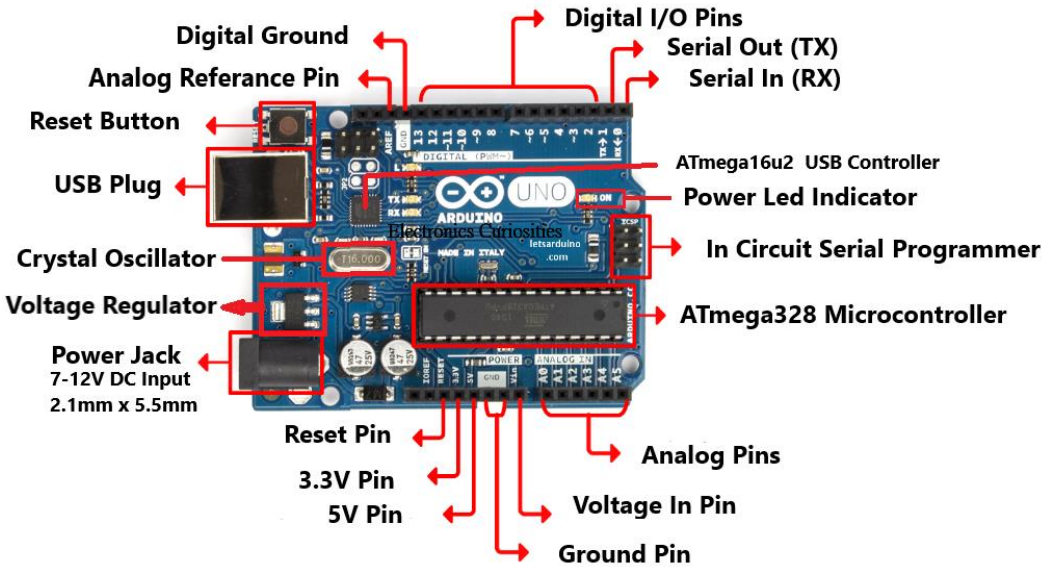
1. **Arduino UNO:**

- The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.

- The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

- The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.

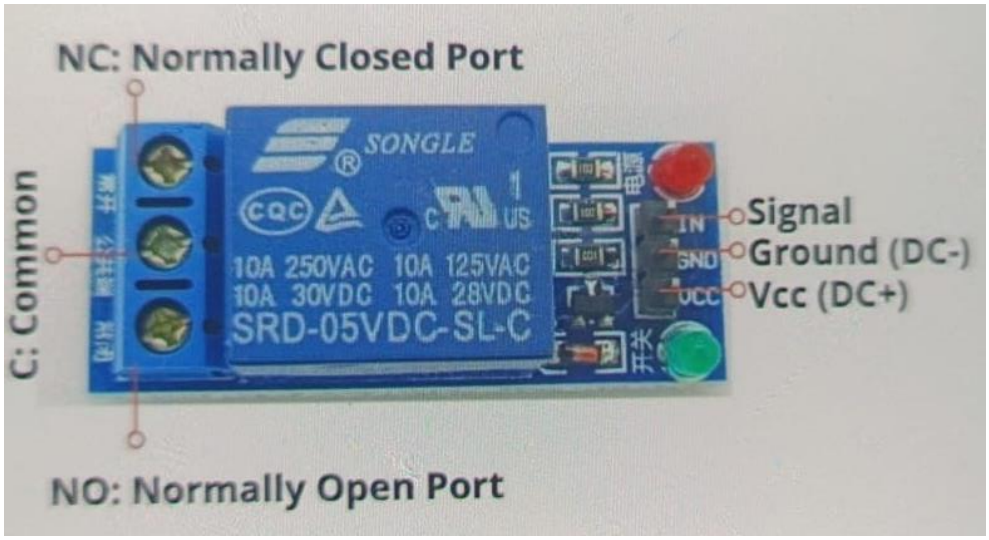
- It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.



2. 5V DC Relay Module

A relay is basically a switch which is operated by an electromagnet. The electromagnet requires a small voltage to get activated which we will give from the Arduino and once it is activated, it will pull the contact to make the high voltage circuit.

This is mainly required in our project because the Arduino alone can't derive enough current to make the pump work. So relay modules are commonly used in these situations as they make an independent high voltage circuit for the external device and then connect it with Arduino.



Normally open state (NO) VS Normally closed state (NC)

The Arduino relay module can be used in two states which are

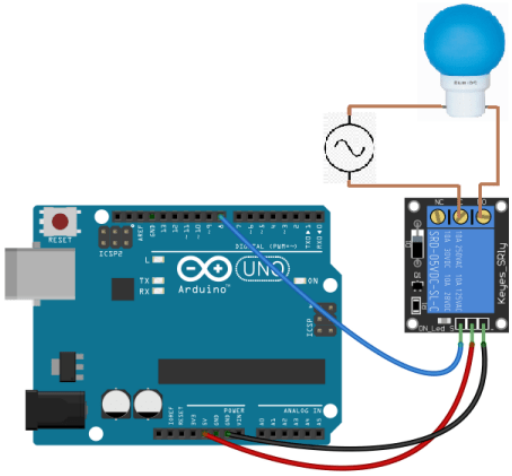
1. Normally open state (NO)
2. Normally closed state (NC)

Normally open (NO)

In the normally open state, the initial output of the relay will be low when it will be powered. In this state, the common and the normally open pins are used.

Normally closed state (NC)

In the normally closed state, the initial output of the relay will be high when it will be powered. In this state, the common and the normally close pins are used.



This circuit diagram demonstrates how to connect an external device (requiring high voltage) with the relay module and Arduino.

In our project we have connected the Normally open terminal to pump's positive terminal, and the common terminal of relay is connected to the main circuit's high voltage line on breadboard, and the negative terminal of pump is connected to main circuit's low voltage line on breadboard.

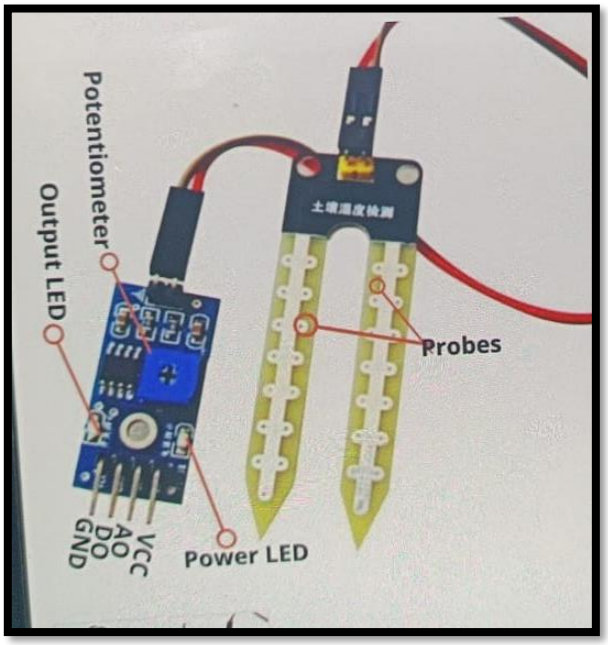
3. Moisture Sensor

The working principle of moisture sensor is as follows:

- We have two electrodes in the sensor between which we create voltage, so that when we place the sensor in dry soil, its resistance will be high, and we will get certain values at the output.

- However, when we place the sensor in more humid soil, the resistance of the soil is going to change, and we are going to get different values at the output.

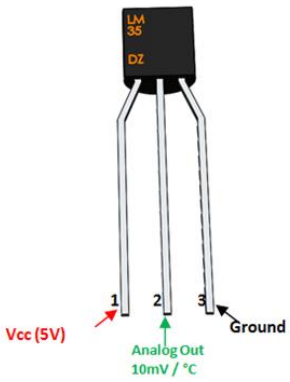
- The value we get at the serial monitor are the analog values for the voltages measured(which vary according to the resistance/moisture content of the soil) , with 5v (max value) calibrated as 1024 and minimum value as 0



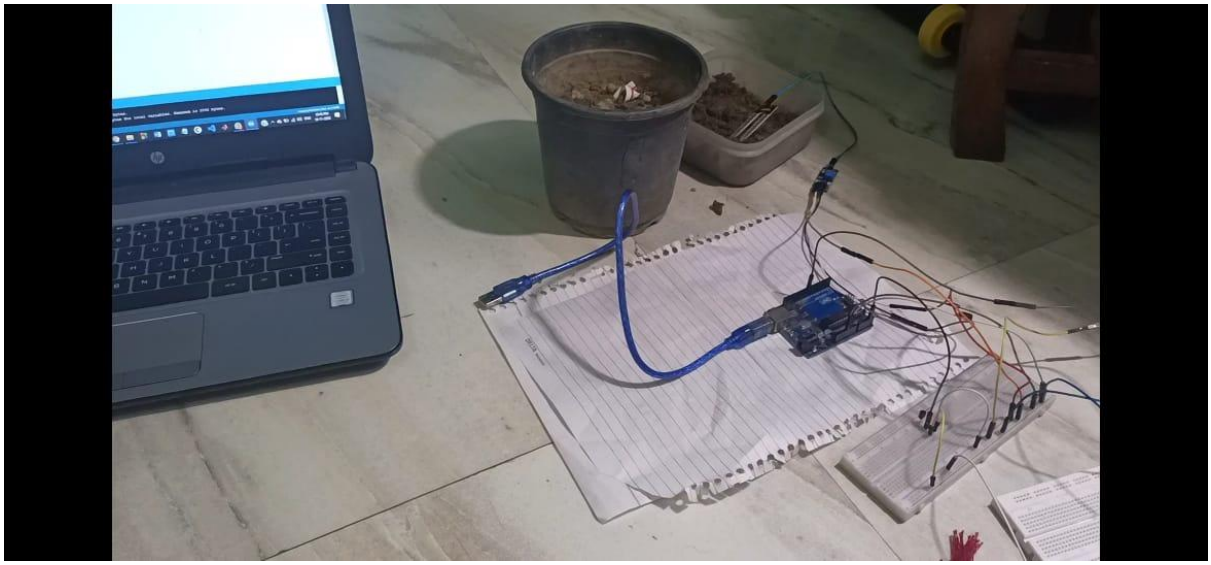
MOISTURE SENSOR

4. LM35 TEMPERATURE SENSOR

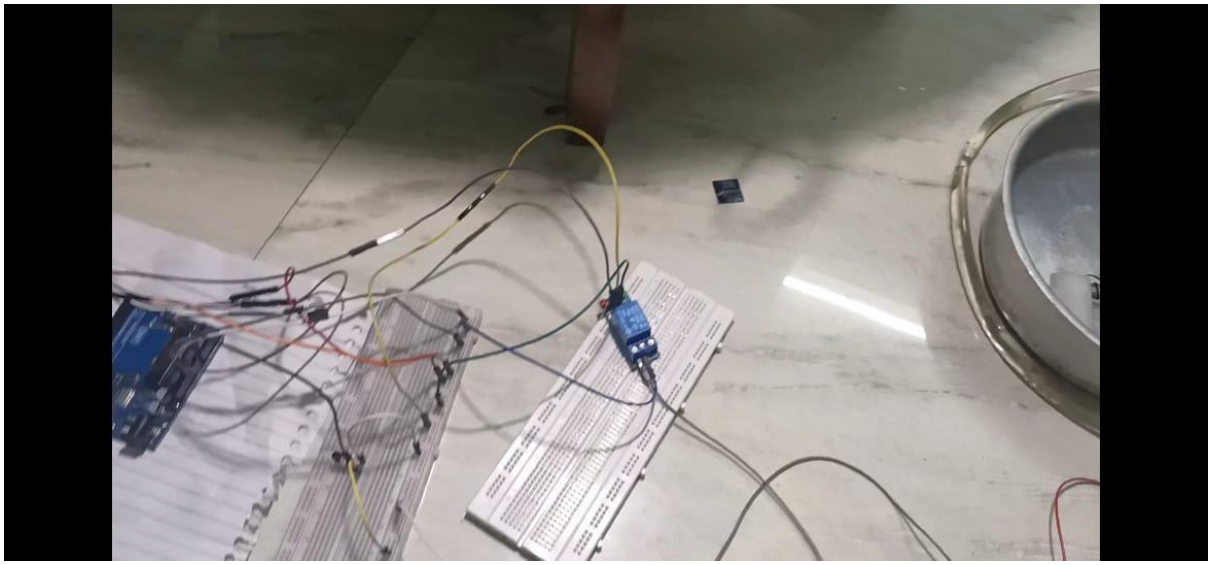
The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in °C).It can measure temperature more accurately than a using a thermistor. The sensor circuitry is sealed and not subject to oxidation. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified. The LM35 has an output voltage that is proportional to the Celsius temperature. The scale factor is .01V/°C.



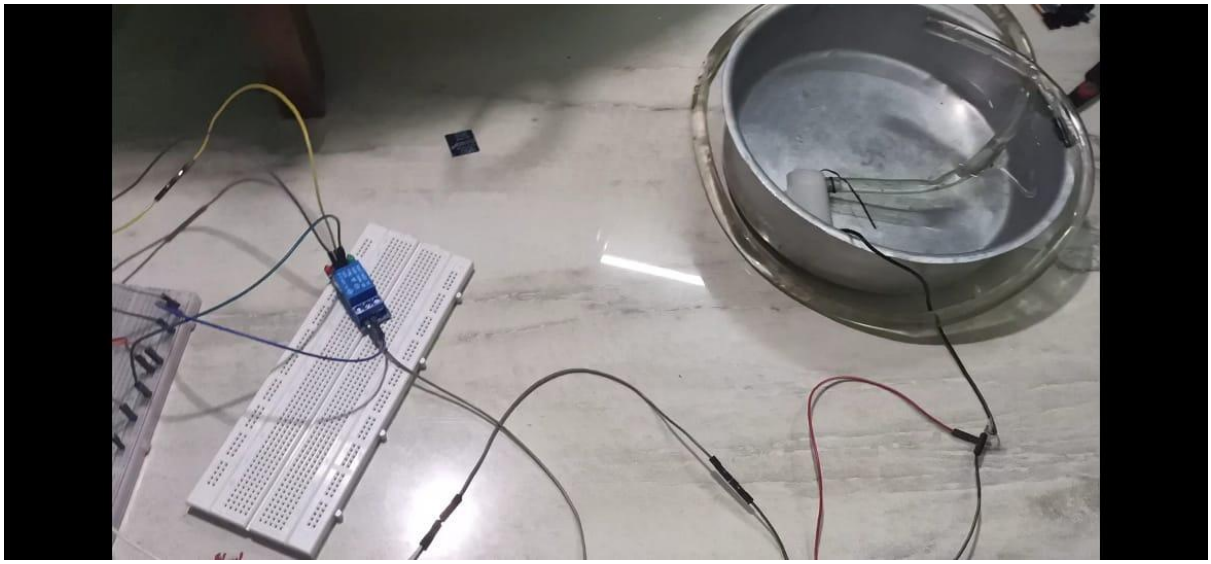
HARDWARE PHOTOS



The input unit

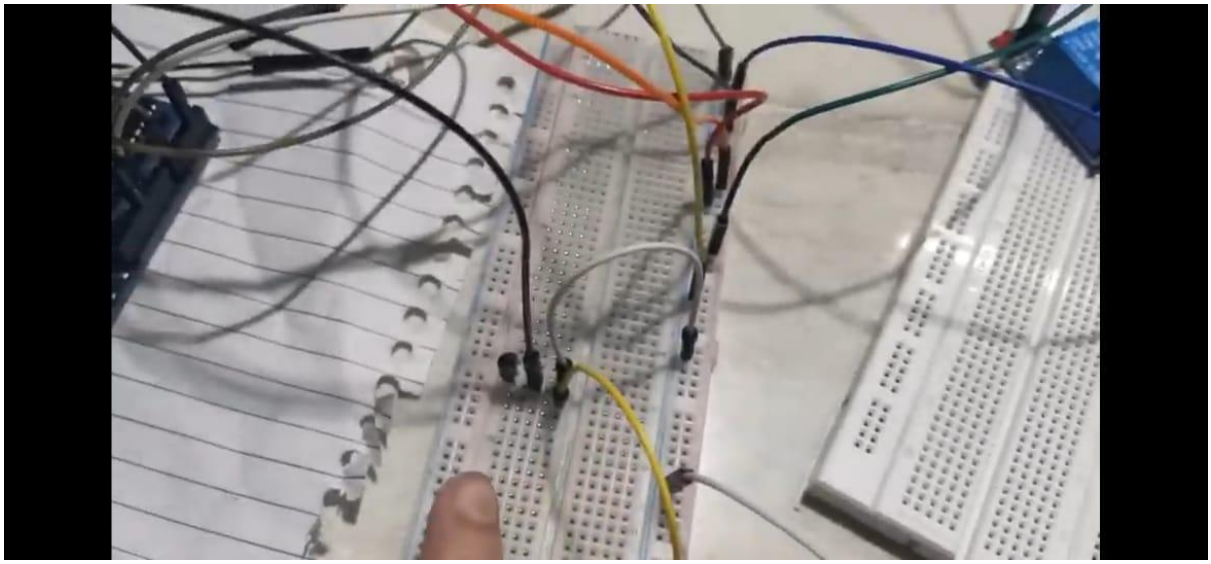


The microprocessor unit with relay

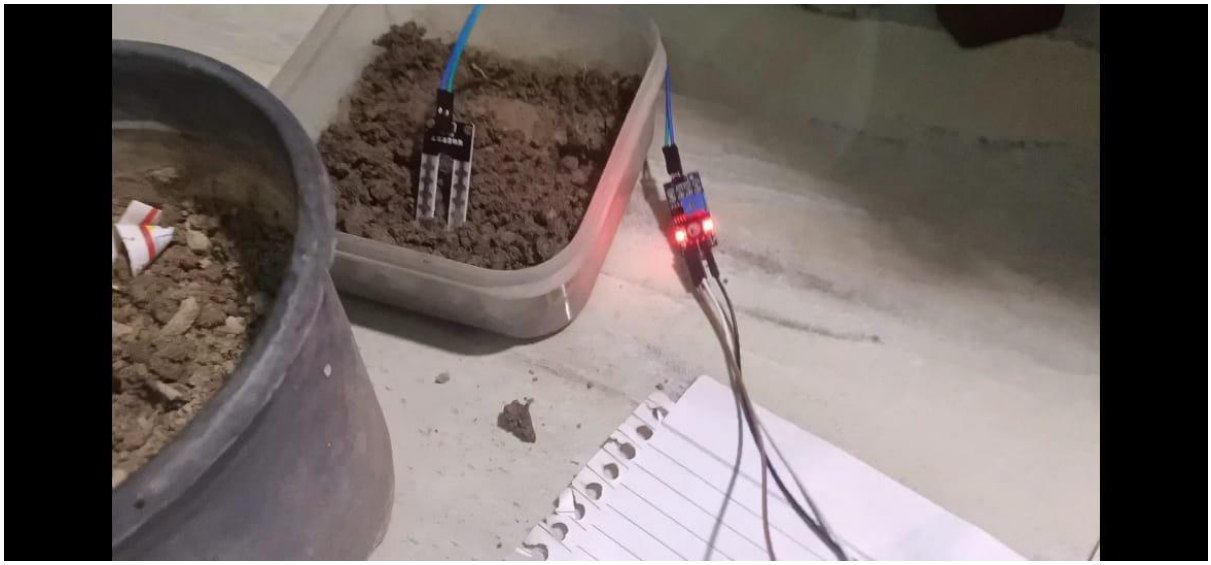


The output unit with water pump

The moisture sensor kept in wet soil

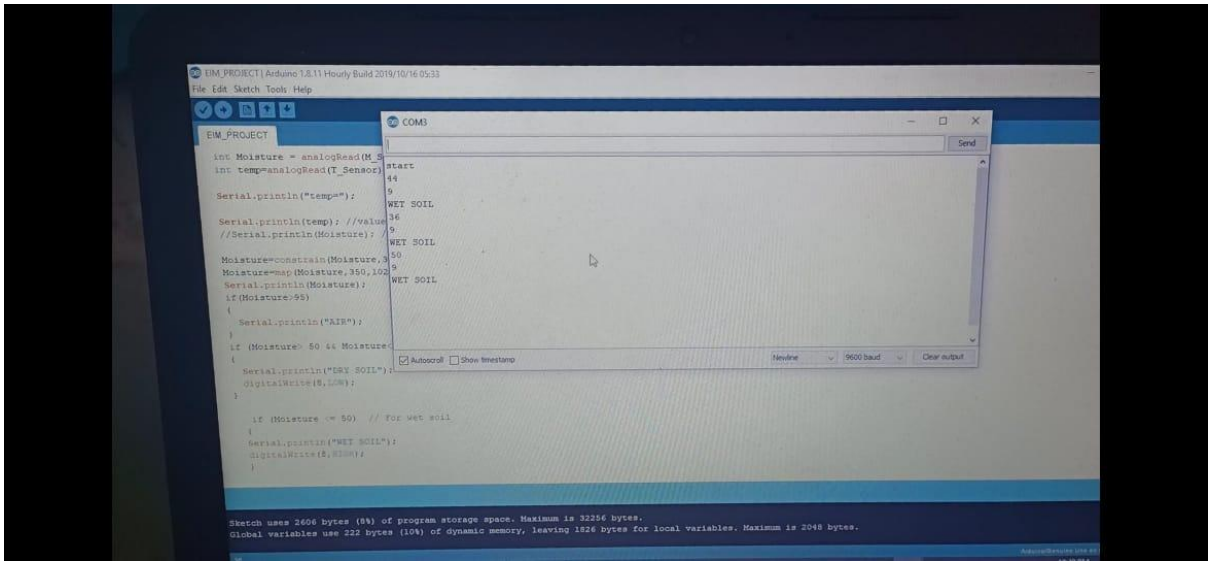


LM35 temperature sensor

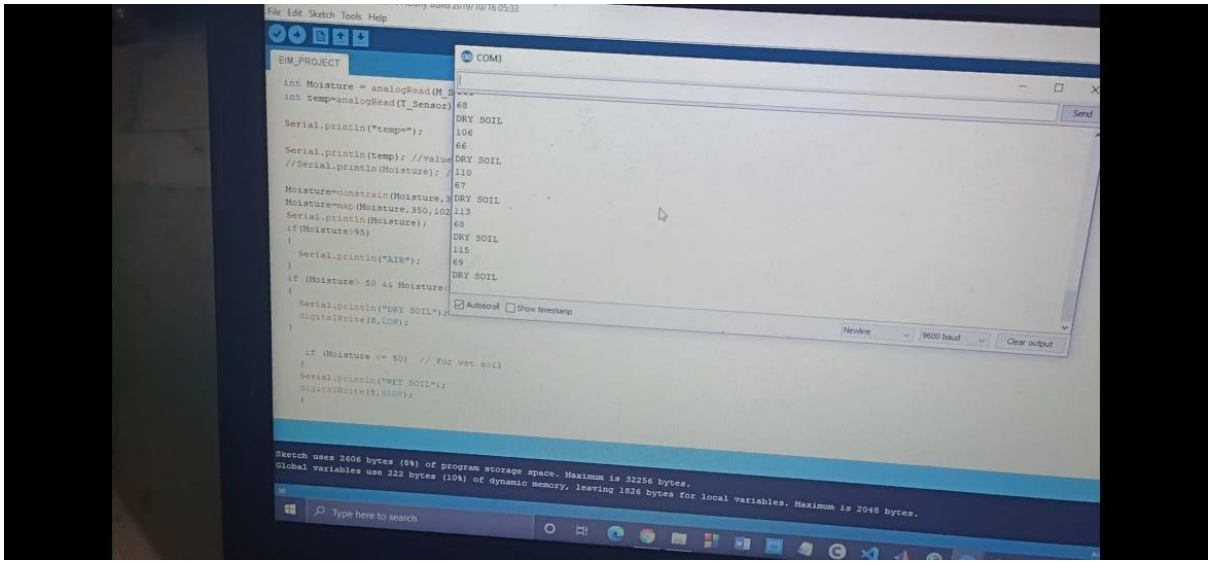


5v power supply ON, the sensor is reading values

The water flowing in the output pump when moisture sensor is kept in dry soil



The sensor values getting displayed on monitor screen (in the photo it is right now indicating WET SOIL)



The sensor values getting displayed on monitor screen when sensor is kept in dry soil.

VIDEO LINK:

https://www.youtube.com/playlist?list=PLINj7QN0_kSliYsc88MjhbsUtj7tLUNlp

This is uploaded as an enlisted video on youtube which contains brief explaination of the project and demonstrates it's working.

CONCLUSION:

- The main purpose of this project is to propose an automated irrigation system that water the plant without any human control.
- Besides the automated irrigation system, the proposed system also provides the monitoring function where users are able to check the soil moisture and temperature on serial monitor.
- For future works, the automated irrigation system can be configured to measure the moisture level (water content) according to the moisture requirement of the different plants.

References:

- https://wiki.eprolabs.com/index.php?title=Temperature_Sensor_LM35#:~:text=The%20LM35%20is%20an%20integrated,than%20a%20using%20a%20thermistor.&text=The%20LM35%20has%20an%20output,The%20scale%20factor%20is%20.
- https://en.wikipedia.org/wiki/Arduino_Uno
- https://electronicshobbyists.com/relay-module-interfacing-with-arduino-arduino-relay-module/
- https://youtu.be/wCJKMFGEuuI