

**Program: ESE 4009\_2**

**INSTRUCTOR:** Prof**.** Mike Aleshams

# Group# 6

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**Project Proposal**

**Project Title: Automatic Watering System for Plants**

**Description of the latest similar system:**

**Automatic Watering System for Plants**

Gardening is a practice of growing and cultivating plants and is considered by many people as a relaxing activity. Studies also show the positive effects of gardening on mental and physical health in this very hectic world. One of the top concerns for every gardener is how often to water their plants and how much. So here in this project, we are implementing a new system to ensure plants to be watered automatically while making sure the ideal amount of water at the ideal time.

The circuit is built using an Arduino and a soil moisture sensor. The sensor tracks the moisture content in the soil and through Arduino, a pump is controlled which provides water to the plants. The soil is never completely dry or fully wet to avoid over or under-watering. At a reasonable level, the moisture content is maintained. The soil moisture sensors are placed in the pots and a submersible mini water pump(12V) is placed inside a water tank. Its water outlet is provided through a nozzle to the pots. According to the moisture content of the soil in the pots, the water automatically pumps whenever needed. Once the moisture content of the soil reaches an adequate level the pump shuts off. So, this system ensures the plants are properly watered even without human assistance.

Mini Water Pump

Arduino

Nano

Soil Moisture Sensor

Transistor

Relay

12V Battery

Working principle of the project:

The moisture sensor provides analog voltage output; therefore, it has to be connected with Arduino’s analog input pins A0 and A1 which are given 5V Vcc supply from the board. To turn the water pump ON and OFF, the relay is used and is connected between the “NO” (Normally Open) terminal and the circuit ground. Arduino drives the relay through the NPN transistor BC547. The digital pin D2 of Arduino is used to switch ON/OFF the relay by using the transistor. The relay and the water pump operate at 12 V provided by the battery.

Circuit operation:

When the soil begins to get dry the sensor will output to the Arduino board which switches ON the water pump. Once the soil is watered adequately Arduino switches off the water pump. The soil moisture sensor is of variable resistance. Its resistance varies according to the conductivity changes between two sensor rods. The conductivity of these rods changes as per the soil's moisture content when it is inserted into the soil. If the soil is dry, the conductivity is less and the resistance is high, and vice versa. From this, we can say that the sensors resistance changes from high to low as per the moisture content. This change in resistance is converted into an analog voltage output.

The Arduino takes the sensor output voltage as the analog input and then it is converted into a digital value to measure the soil's moisture level from 0 to 100 percent.

A threshold level is set to switch on the relay through the transistor. If the moisture level is less than the threshold level the relay will be turned on which turns on the pump. So, when the soil begins to moisten its moisture level will be monitored by the Arduino from both sensors. When the set moisture level is reached the Arduino switches off the relay which turns off the pump.

**Hardware Requirements**

1. Arduino Nano: It is a small breadboard-friendly board based on ATmega 328P. The Arduino Nano is programmed using the Arduino software (IDE). It has 8 pins from A0 to A7 used to measure analog voltage in the range of 0-5 v. It comes with the same functionality as in Arduino Uno but quite small. They act as input pins while interfacing with sensors but if we are driving some loads, it works as an output.
2. Soil moisture sensor: It consists of probes used to measure the volumetric content of water. These probes allow the current to pass through the soil which gives the resistance value to measure the moisture value. When there is water present, the electrical conductivity of the soil will be more which means that there will be less resistance. On the other hand, the electrical conductivity of the dry soil is poor when there is no water presence which makes the soil conduct less electricity and there will be more resistance. This sensor can be connected in analog and digital modes. It requires an input voltage of 3.3 – 5V.
3. Arduino relay module:

A relay is an electrically operated switch that can be turned ON or OFF letting the current go through or not and can be controlled with low voltages, like the 5V provided by the Arduino pins. The relay modules having one-eight channels are available in the market. This module should be powered with 5 V which is appropriate to use with Arduino. Other relay modules are powered using 3.3V, which is ideal for ESP32, ESP8266, and other microcontrollers.

1. A 12V battery:
2. Mini submersible water pump:

A submersible pump also called an electric submersible pump, is a pump that can be fully submerged in the water pushes water to the surface by converting rotary energy into kinetic energy into pressure energy.

**Software requirements**

Arduino IDE

**Limitations of the latest similar system:**

* Problems in moisture distribution.
* The maximum number of sensors that we can connect to this Arduino is eight since it has pins A0 to A7.
* A plant needs a different amount of water in different seasons, also different plants have different water intakes.
* Lack of IoT technology.
* Less number of sensors in this system.

# References

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**Solution 1 (Block Diagram, Features, Hardware and Software Requirement, Milestones: Deliverables and Time Schedule, References):**

**Solution 2 (Block Diagram, Features, Hardware and Software Requirement, Milestones :Deliverables and Time Schedule, References):**

**More Solutions?**

**Final Solution:**

**(after presentation)**

**Instructor’s Remarks:**