**Title: Smart and automatic irrigation systems**

**About the equipment and resources:**

**ESP32**

**IR Sensor**

1. [Beginners guide to IR sensor and How to use Ir sensor with Arduino](https://www.etechnophiles.com/beginners-guide-to-ir-sensor-and-how-to-use-it-with-arduino/)
2. [ESP32 and Infrared receiver example | ESP32 Learning](http://www.esp32learning.com/code/esp32-and-infrared-receiver-example.php)
3. [Infrared Sensor Tutorial for Arduino, ESP8266, and ESP32](https://diyi0t.com/infrared-sensor-tutorial-for-arduino-and-esp8266/)

**Project:**

1. [Arduino with IR Sensor](https://create.arduino.cc/projecthub/Raushancpr/arduino-with-ir-sensor-1579b6)
2. [How to use IR sensor with Arduino? (With full code) || Bihar](https://create.arduino.cc/projecthub/biharilifehacker/how-to-use-ir-sensor-with-arduino-with-full-code-bihar-3f29c3)

**Soil Moisture Sensor**

1. [In-Depth: How Soil Moisture Sensor Works and Interface it with Arduino](https://lastminuteengineers.com/soil-moisture-sensor-arduino-tutorial/)
2. [Soil moisture sensor](https://en.wikipedia.org/wiki/Soil_moisture_sensor#:~:text=Soil%20moisture%20sensors%20measure%20the%20volumetric%20water%20content%20in%20soil.&text=Reflected%20microwave%20radiation%20is%20affected,used%20by%20farmers%20or%20gardeners).
3. [Soil Moisture Sensor for Arduino, ESP8266 and ESP32](https://diyi0t.com/soil-moisture-sensor-tutorial-for-arduino-and-esp8266/)

**Project:**

1. [IoT based Soil Moisture Monitoring System using ESP32](https://iotdesignpro.com/projects/iot-based-soil-moisture-monitoring-system-using-esp32)
2. [Arduino Soil Moisture Sensor : 6 Steps (with Pictures)](https://www.instructables.com/Arduino-Soil-Moisture-Sensor/)
3. [Arduino&Soil Moisture Sensor-Interfacing Tutorial-Circuit Diagram, Applications](https://www.circuitstoday.com/arduino-soil-moisture-sensor)
4. [Soil Moisture Sensor with Arduino Uno](https://create.arduino.cc/projecthub/biharilifehacker/soil-moisture-sensor-with-arduino-uno-2f118b)
5. [ESP32 and Soil Moisture Sensor example | ESP32 Learning](http://www.esp32learning.com/code/esp32-and-soil-moisture-sensor-example.php)

**Additional:**

1. [Soil moisture sensors for irrigation scheduling | UMN Extension](https://extension.umn.edu/irrigation/soil-moisture-sensors-irrigation-scheduling)
2. [Soil Moisture Sensor: Which Soil Sensor is Perfect for You? | METER](https://www.metergroup.com/environment/articles/which-soil-sensor-is-perfect-for-you/)
3. [Soil Moister Sensor - Tech Tips with Vernier](https://youtu.be/CBdlP1IMxLw)

**Pump**

**Relay**

**About the tools:**

**Thingspeak**

[How to SignUp And Create New Channel in Thingspeak IoT || Thingspeak || AM Electrical](https://youtu.be/8fcQuMRSNBw)

**Resources we used during the work:**

* ESP32 to thingSpeak: <https://randomnerdtutorials.com/esp32-thingspeak-publish-arduino/>
* Weather data (openWeather): <https://techtutorialsx.com/2018/03/17/esp32-arduino-getting-weather-data-from-api/>

**modified for weather underground**

* MIT app inventor - Pump control: <https://www.youtube.com/watch?v=V9-qzJ0vwFg&ab_channel=Lucca%27sLab>
* ESP32 + MIT App Inventor Mini-Project Demo! | DIY Wi-Fi RGB LED Controller - Part 1

<https://youtu.be/V9-qzJ0vwFg>