Arduino Indoor Hydroponic Farming System

Proposed by
Arsakeio High School of Patras

A Trainers Toolkit To Foster STEM Skills Using Microcontroller Applications

Co-funded by the Erasmus+ Programme of the European Union

Project No. 2019-1-RO01-KA202-063965

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Contents

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Aim

Use the Arduino Indoor hydroponic farming to explain and help students as educational tool towards a sustainable future.

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Description

- Composting and Indoor hydroponic farming offer a valuable interdisciplinary teaching tool covering areas of the curriculum with many learning outcomes.
- An Arduino system oriented towards the implementation of environmentally friendly practices encourages students to understand what sustainable development means and how we all, as global citizens, can contribute.
- Given concerns of feeding a growing human population in a changing climate, scientists believe hydroponic technology may be able to mitigate impending food shortage by serving the UN SDG 2: “End hunger, achieve food security and improved nutrition, and promote sustainable agriculture”.

A typical hydroponic system

Arduino Indoor hydroponic farming

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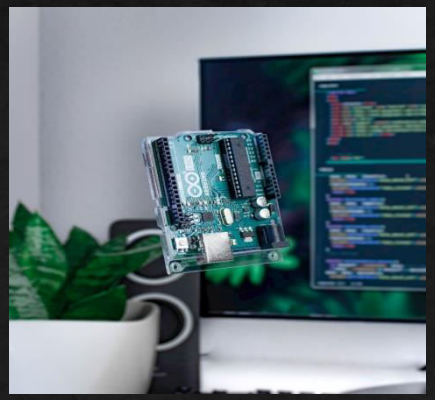
Description

- Step 1: Creation of a simple hydroponic system with the help of an agricultural technician.
- Arduino indoor pharming system consists of microcontroller, relay, temperature sensor, pump and power source .
- With these components, you can easily build a system powered by Arduino. In combination with the preparation of vegetable nutrition solution, the system responds to planting seeds in perlite and placement in a protected environment for primary growth.
- In this simplest way, students will learn how microcontrollers can be used in placement of plants in the indoor hydroponic system and monitoring their growth.



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Learning Goals

- Students understand the basic principles of indoor farming
- Students understand the role of monitoring of plants growth by using arduino measuring system.

1			Indoor farming			
2			Monitoring of plants growth			
3			Species 1	Species 2	Species 3	Species 4
4	Date	Plant height				
5		pH of nutrition solution				
6		Temperature of nutrition solution				
7		Electrical conductivity of nutrition solution				
8		Day duration in hours				
9		Night duration in hours				
10		Notes				
11						

- Students will understand how electronics can automate everyday activities in a chemical lab.

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Learning Methodologies

- Links classroom learning to the real world by creating an opportunity for sustainable gardening for the future.
- The teacher assigns groups to measure the indoor hydroponic parameters (e.g. temperature)
- At the end of the project, the project supports healthy eating choices.

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Target Group

Secondary school students

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Learning Schema

- Students are divided into groups. After the groups talk for about 2 minutes, the leader of each group announces their views which are the initial assumptions - forecasts about the necessity of farming.

- Temperature measurements are taken of the respective arduino indoor farming system.

- Each group is asked to count the temperature of the solutions in different ways and compare it with the expected value.

- Define temperature as a quantity that serves to achieve the plants growing.

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Solution

A particularly important element of this course is that it transforms the school laboratory to a researcher laboratory of the future, thus stimulating the interest of the student who may become the researcher of tomorrow.

It also emphasizes the relationship science and technology since technology is called to find solutions, offers opportunities for significant water savings and eliminates the use of pesticides, fertilizers and herbicides .

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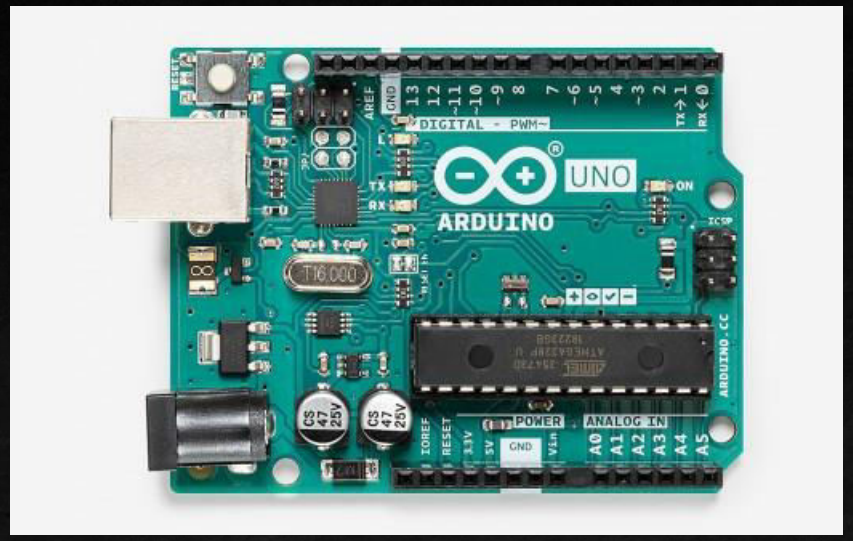
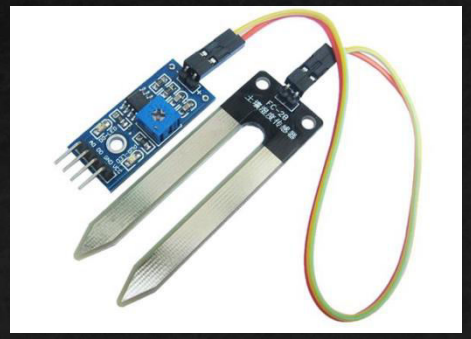
Solution

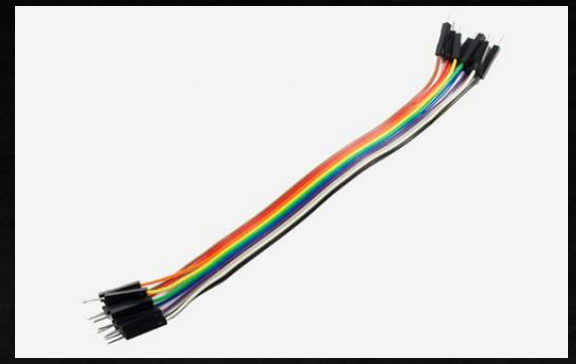
- The following components are required for preparation:



- ARDUINO UNO
- Relay
- Soil Moisture Sensor



- 12V water pump with hose
- Jumper Wires
- 12V power source



Source: Store.arduino.cc

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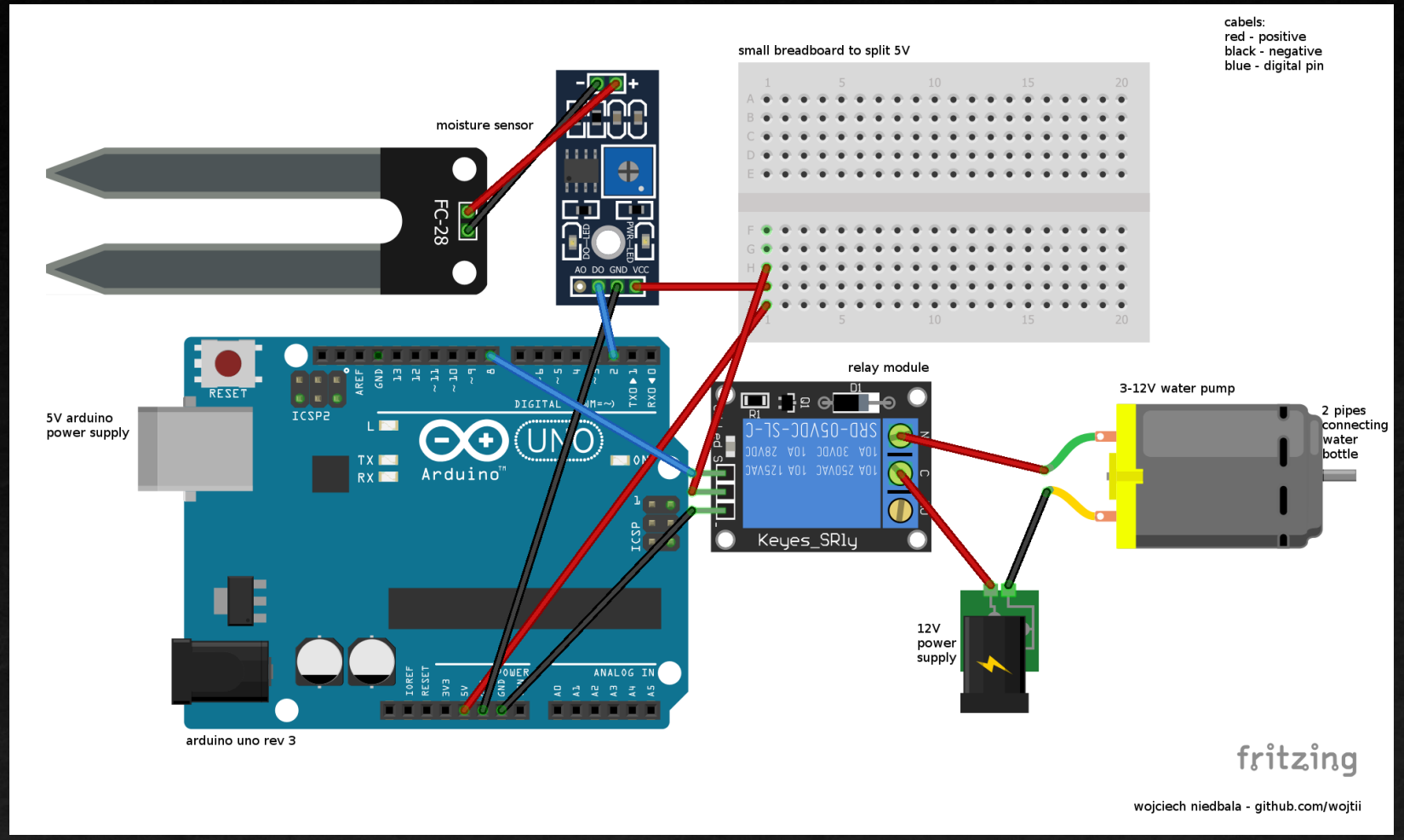
Solution



Source: Github

<- Wiring diagram of all circuit components.

You can easily write the software to control the circuit yourself by reading the manual or look for a ready-made project on the Internet.

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Scientific Areas Covered

Chemistry / Technology / Biology

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Assessment

- The evaluation should be achieved through long-term student engagement.
- During the discussion, students can be debriefed on basic issues.
- The student should be able to identify basic relationships between physical sciences.
- Finally, promotes the idea of interdisciplinarity, since during the implementation and completion of it, students deal in parallel with more than one cognitive objects.

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