Microcontrollers
Simple tasks

Developed by STSFV

A Trainers Toolkit To Foster STEM Skills Using Microcontroller Applications

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

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TRAFFIC LIGHTS

Connecting LEDs

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Aim

Learn Arduino UNO – inputs /outputs,

The goal is to acquire basic theoretical and practical knowledge in the field of microcontrollers management

To connect and apply this knowledge with scientific fields such as electrical engineering, computer science, mechanical engineering ....

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Description

- Connect three leds to the microcontroller - red, yellow and green. Write a program that will turn the diodes on and off as follows - at the beginning the red light is on and it lasts for three seconds. Then the red and yellow lights shine together for one second. After that, only the green light illuminates for three seconds. In the end, only the yellow light illuminates for one second. At the end of the cycle, it starts from the beginning.
- Connect two additional LEDs to the microcontroller - one red and one green which represent a pedestrian traffic light. The traffic light for cars works in the same way as in the previous part. The green light at the pedestrian traffic light only comes on when only the red light is on at the car traffic light. In all other cases, the red light at the pedestrian traffic light.

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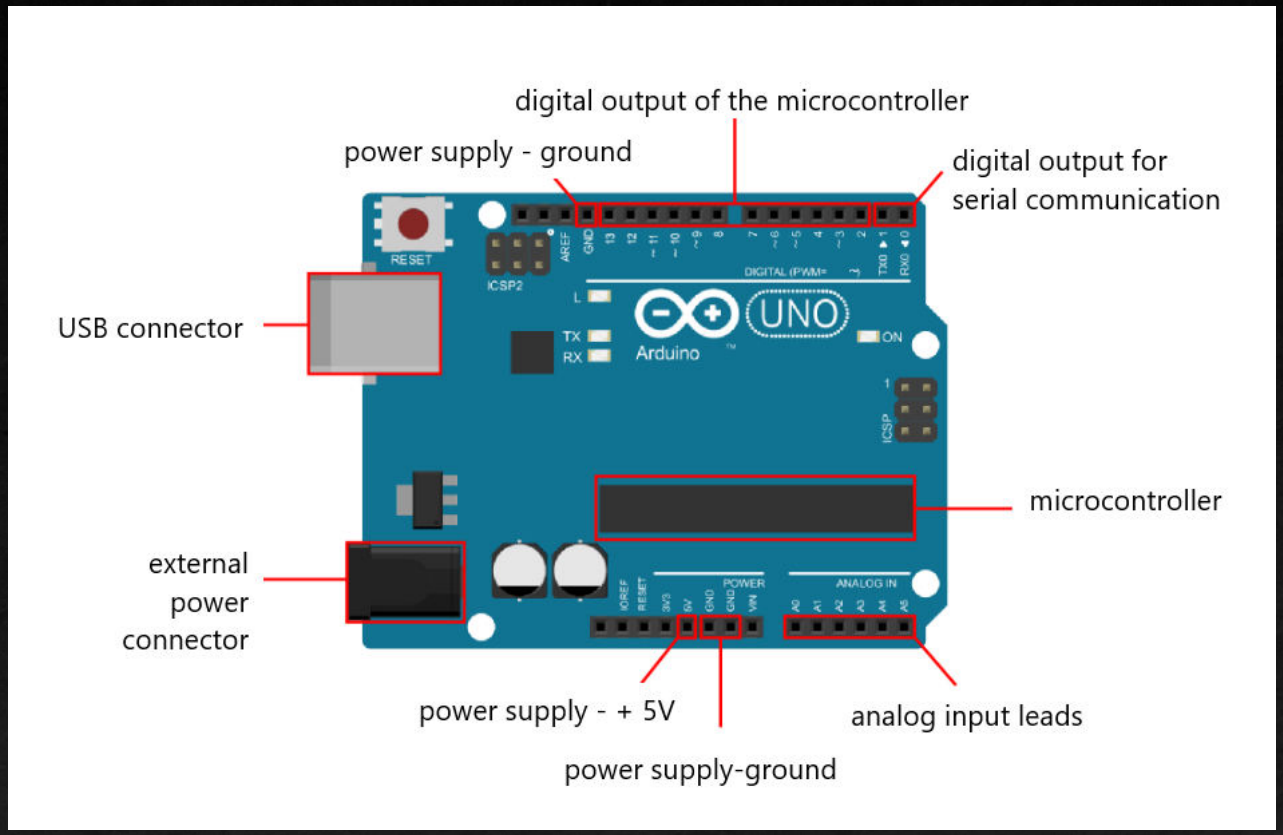
Learning Goals

- To Learn and to understand how does the Arduino UNO is made of ….



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Learning Methodologies

- Teaching this topic is performed through lectures and laboratory exercises. These two forms of teaching are complemented and only as a single whole can give the expected result in the acquisition of the necessary knowledge and skills. This requires that teaching in the laboratory be performed by the same teacher who performs other forms of teaching this subject. The performance program should provide for one hour of theoretical classes and one hour of classes for independent work in the laboratory, but the fund of hours can be expanded to two or three hours per week.

- The minimum laboratory equipment includes student desks equipped with mains voltage connections and stabilized DC voltage sources. The management of student desks should be through the central management position of the teacher

- Each student workplace should have: universal instrument, oscilloscope, function generator, panels with components and assemblies (LEDs, transistor switches, relays, 7-segment LED displays, LCDs, EEPROMs, sensors), computer, test tiles, microcontroller programmer, microcontrollers

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Target Group

The target group is formed of VET trainers and students and professionals from the profile companies.

- members of the project teams of all partner organizations;
- STEM teachers from partner schools
- 200 students who will pilot the platform in the 3 schools
- 150 users enrolled on the platform
- 60 STEM teachers in project countries, who will join the platform during the dissemination stage
- 120 participants at the Multiplication Events

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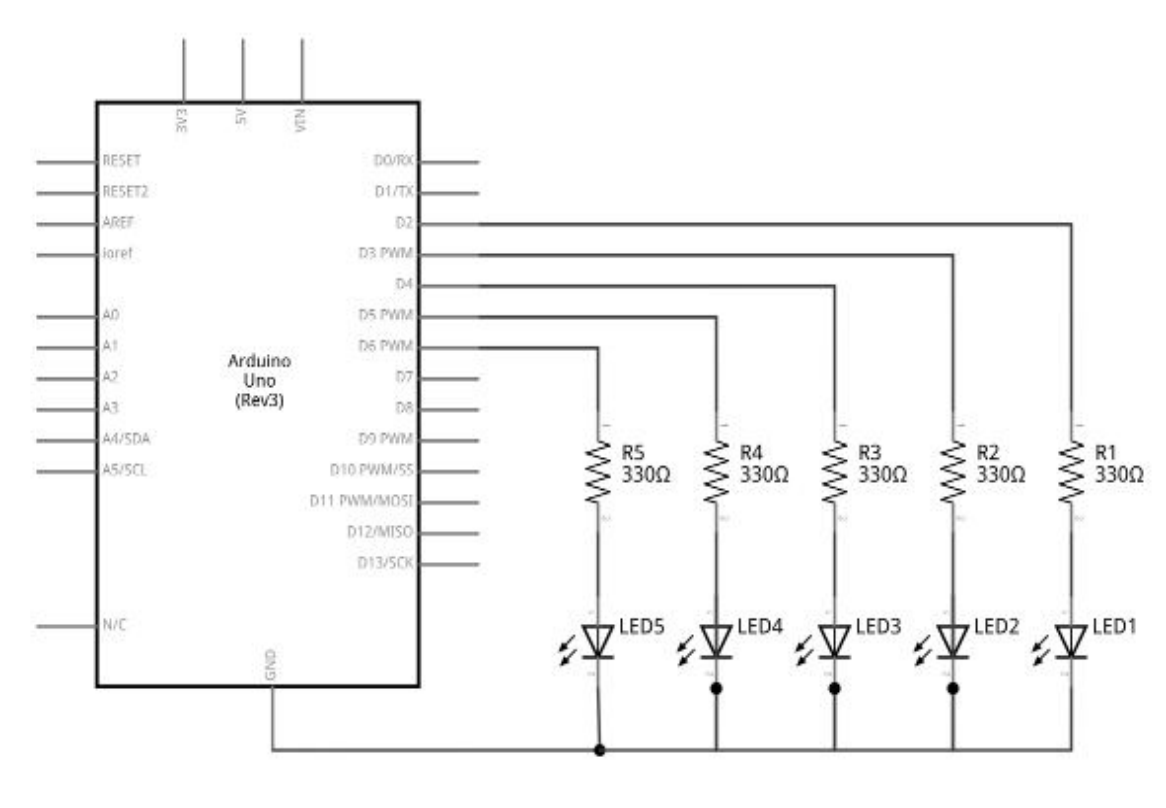
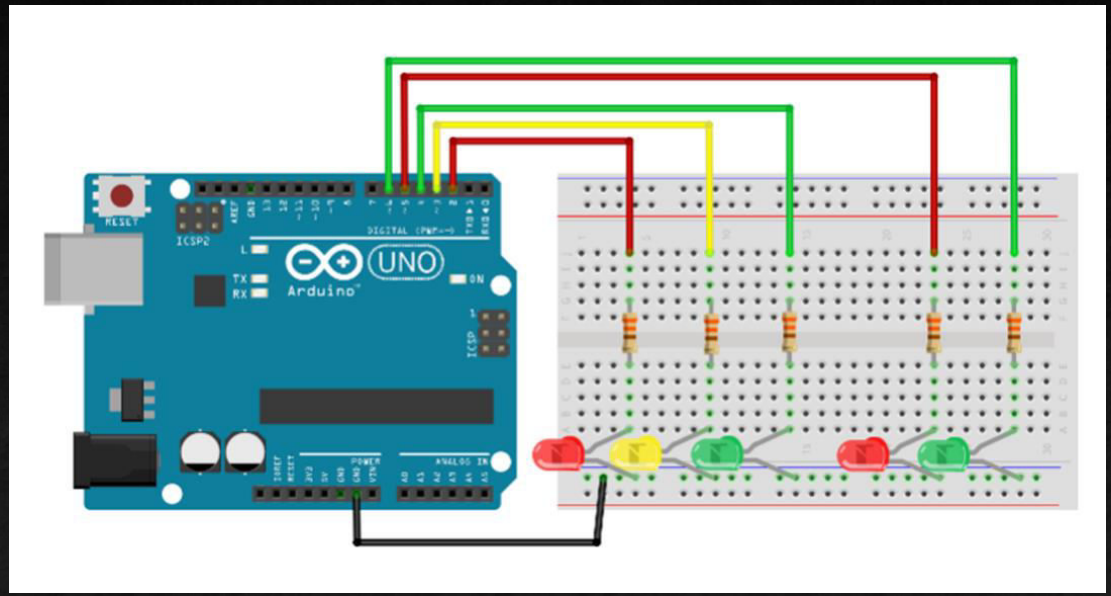
Learning Schema





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Solution 1/2

```
int ledRed = 2;                 //define ledRed = 2
int ledYellow = 3;              //define ledYellow = 3
int ledGreen = 4;               // define ledGreen = 4
int ledCrvenaP = 5;             //define ledRedP = 5
int ledZelenaP = 6;           //define ledGreenP = 6

void setup() {

    pinMode(ledRed, OUTPUT);  //set statement ledRed
as output
    pinMode(ledYellow, OUTPUT);  //set statement
ledYellow as output
    pinMode(ledGreen, OUTPUT); //set statement
ledGreen as output
    pinMode(ledRedP, OUTPUT);   //set statement
ledRedP as output
    pinMode(ledGreenP, OUTPUT);  //set statement
ledGreenP as output
```

```
  digitalWrite(ledRed, LOW);   //turn off the ledRed -
initial state
     digitalWrite(ledYellow, LOW);  // turn off the
ledYellow - initial state
     digitalWrite(ledZelena, LOW);  // turn off the
ledGreen - initial state
     digitalWrite(ledRedP, LOW);   // turn off the
ledRedP - initial state
    digitalWrite(ledGreenP, LOW);  //turn off the
ledGreenP - initial state
}
```


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Solution 2/2

```
void loop() {
 digitalWrite(ledRed, HIGH);          //turn on the ledRed
 digitalWrite(ledGreenP, HIGH);       // turn on the ledGreenP
delay(3000);                        //wait 3 s - bright R+GP
 digitalWrite(ledGreenP, LOW);        // turn off the ledGreenP
digitalWrite(ledRedP, HIGH);         // turn on the ledRedP
digitalWrite(ledYellow, HIGH);       // turn on the ledYellow
delay(1000);                         //wait 1 s - bright R+Y+RP
digitalWrite(ledRed, LOW);           // turn off the ledRed
digitalWrite(ledYellow, LOW);        // turn off the ledYellow
digitalWrite(ledGreen, HIGH);        // turn on the ledGreen
delay(3000);                         //wait 3 s - bright G+RP
digitalWrite(ledGreen, LOW);         // turn off the ledGreen
digitalWrite(ledYellow, HIGH);       // turn on the ledYellow
delay(1000);                         //wait 1 s - bright Y+RP
digitalWrite(ledYellow, LOW);    // turn off the ledYellow
digitalWrite(ledRedP, LOW);          // turn off the
ledRedP
}
```


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Scientific Areas Covered

–Mathematics

–Logic

–Mechanical Engineering

–Electrical Engineering

–Computer science

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Assessment

- When creating a learning program, time should be planned for repetition and shorter checks of knowledge acquisition (shorter tasks, several questions or tasks of objective type) after each unit.
- Tasks and questions should cover the area from simpler questions and tasks at the level of knowledge of basic phenomena and laws to tasks that should show the ability to apply knowledge in more complex and new situations.

- In addition to written and oral examination of student achievement, the performance of laboratory exercises and the development of skills should be taken into account. The success of students in performing the exercise is assessed on the basis of the application of the student's knowledge in performing the exercise, demonstrated knowledge and skills, independence, application of protection measures and the preparation of relevant documentation.

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