

SOPHIA U

## Science Experiments

“Microcontroller Programming for LED Lighting Control”

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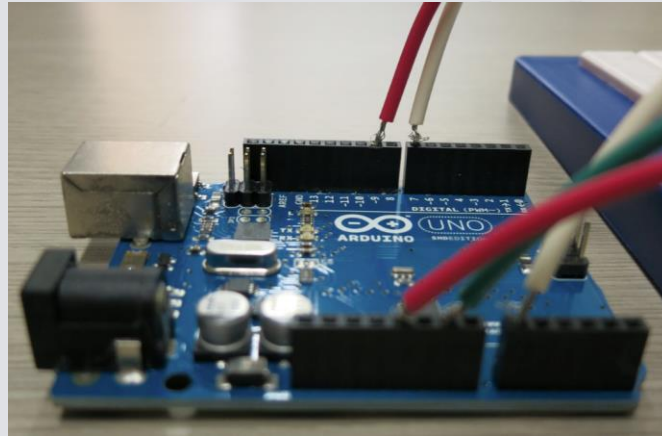
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Online Sophia University Visit



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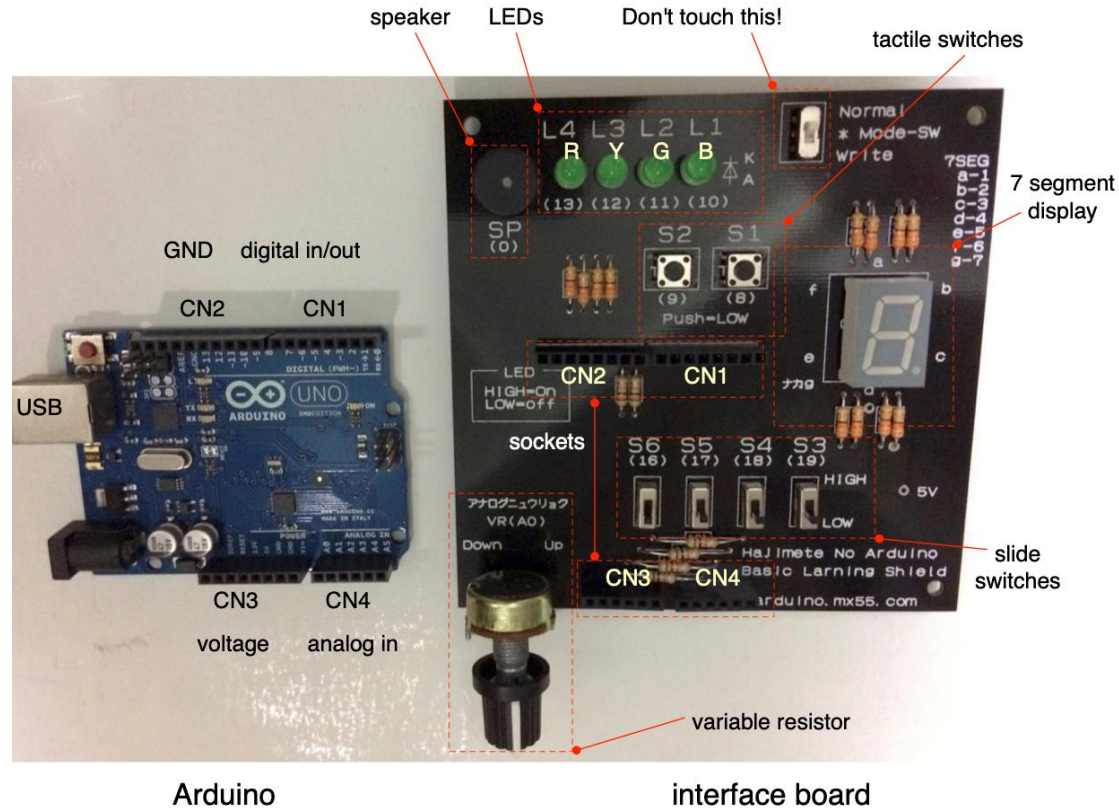
# 1. Explanation of the course “Green Engineering Lab. 3”

- For 3<sup>rd</sup> grade of Green Engineering Program students
  - 6 professors teach this course.
  - Master/PhD students teach undergraduate students as teaching assistants.
- Topics about electrical and electronics engineering
  - Circuit Theorems
  - **Introduction to Microcontroller Programming**
  - Electrostatic Fields
  - Characteristics of Magnetic Materials
  - AC Circuits and Transient Phenomena



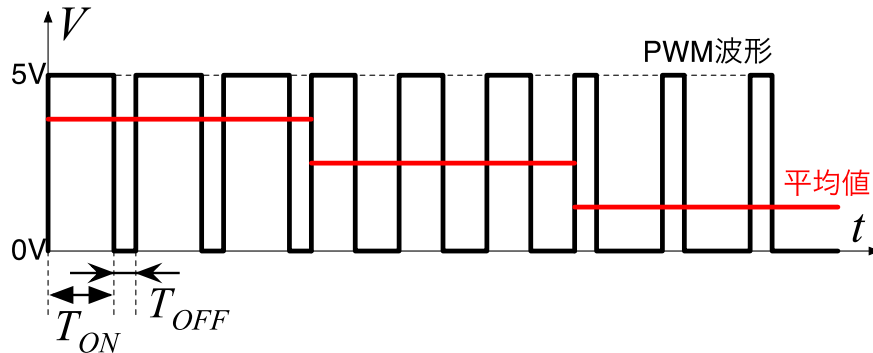
## 2. Introduction to Arduino microcontroller

- What is Arduino?
  - Low-priced controller suitable for education
  - Easy programming environment
  - Convenient to control everything by using various sensors
    - LED, buzzer, motor, etc.
- An interface board is attached to Arduino in this demonstration.



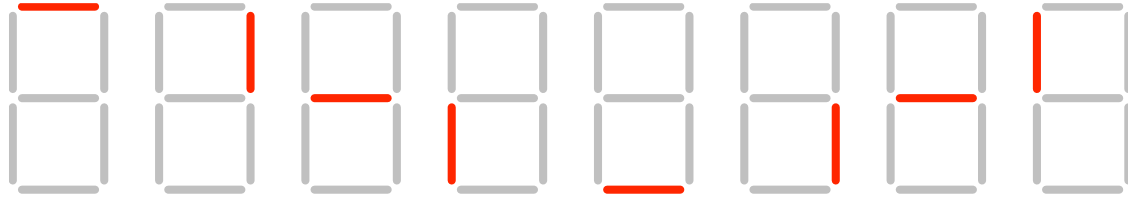
### 3. Task A: Continuous LED brightness control by PWM technique

- The program controls the brightness of a blue LED by turning a variable resistor.
- The PWM waveform with variable duty ratio is applied to the LED.
- The LED is blinking at 490Hz which is invisible.
- The human eyes can recognize only the average value of the PWM waveform.
  
- The program was already implemented in Arduino.
- We can measure the waveform of the output voltage with an oscilloscope.



## 4. Task B: Speed control of roulette in a 7-segment display

- The 7-segment display traces 8-shape like a roulette.



- The program controls the rotating speed of the trace by a variable resistor.
- A slide switch can change the rotating direction.
- You can see the program for this demonstration.
- It is compiled and uploaded to Arduino. It is immediately executed.



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