Lab 09: Requirement Description

- **ADC**
  - **Video: https://youtu.be/iw8jKujZ1Rc**
  - **HackMD: https://hackmd.io/@microprocessor2023/lab9ADConverter**

- **Basic (70%)**
  - **Description:**
    Use four bulbs as a counter to record the degree of rotation of the variable resistor, when the variable resistor is rotated, the form of the light bulb is sequentially changed to indicate **0~15** in binary. Please use 10-bit resolution and map 0~1023 to 0~15, the oscillator frequency needs to be >= 4 MHz.
  - **Example: https://www.youtube.com/watch?v=sveEmRz5RgY**
- **Advanced (30%)**
  - **Description:**
    Use four bulbs to indicate 0~9. Please light up the bulb while rotating the variable resistor at a constant speed to show **your student ID**, **only the numerical part is needed**. If your student ID is P74101214, your bulbs will light up in sequence in binary: 7, 4, 1, 0, 1, 2, 1, 4.
  - **Example: https://youtu.be/VEG1_rP99-I**
- **Bonus (20%)**
  - **Description:**
    Use a variable resistor to implement a **dimming LED**. Please adjust the PWM duty cycle by rotating the variable resistor.
  - **Example: https://youtu.be/mMMqTt9nGHw**
  - **Hint:**
    - **Please refer to the PWM implementation and setup in Lab 8.**
    - You can configure the crystal oscillator frequency(125kHz, 4MHz, etc.), period, and duty cycle yourself, but please be mindful of the limitations regarding T_{AD}(>= 0.7 μs)and acquisition time(>= 2.4 μs).