

# EE443 Experiment-4

## EEPROM and ADC

1. In this experiment, we will continue our progress on Analog-to-Digital Converter (Experiment-3) by adding EEPROM read and write functionality. Therefore, you need to initialize your ADC registers inside a macro as you do in the previous experiment according to the following requirements:
  - The analog input will be taken from pin **ADC3** using a potentiometer
  - Internal 2.56V reference voltage should be selected
  - Prescaler should be Clk/128
  - Single conversion mode should be selected instead of Free Running
  - ADC Conversion Complete Interrupt should be activated
2. Read the Register Description of AVR Memories Section in the datasheet. This time we will read the data stored in r30-r31 registers from EEPROM. Registers r30-r31 will be used to compare the output of ADC. Therefore, you need to write macros for EEPROM\_read and EEPROM\_write operations. At the beginning of the main program, the content of the processor's 0x0001H - 0x0002H EEPROM addresses will be read and high byte will be stored in R31 and low byte will be stored in R30.
3. Potentiometer value will be read from ADC interrupt service routine and loaded to r14(low) r15(high) registers to display on 7-seg display.
4. In the main routine, you should continuously compare the value read from the potentiometer and the value determined in the r30-r31 registers. If the 10-bit value we read from the potentiometer is smaller than the 16-bit value from the r30-r31 registers the LED connected to PORTB1 will turn on. If it is greater than the LED will turn off.
5. Inside the main routine, if both button are pressed:
  - Turn off the LED (comparison process is suspended)
  - Wait for the both button to be released
  - Display R30-R31 register pair on 7-seg display.
  - While R30-R31 registers are displayed:
    - By pressing the left button once (falling edge), the number in the display will increase by one.
    - By pressing the right button once (falling edge), the number on the display will decrease by one.
    - When both buttons are pressed, the r30-r31 register pair on the display will be saved to 0x0001H - 0x0002H addresses of the EEPROM. 7-seg display will start displaying the ADC value (r14-r15 register pair). The comparison process will be active again.

**Hint:** Be careful with the high byte and low byte limits while increasing and decreasing r30-r31 register pairs. Increment and decrement operations should work on all possible 10 bit numbers that can be displayed on your 7-segment display.