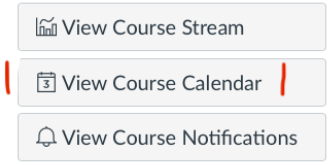
Lab1 assignment (deadline: February 1, 2023)

Note that all students are required to work on this lab assignment individually and must submit their own program on ICON. For this lab, no lab report is required. All software development for Lab1 must be done in assembly language.

Objective
The objective of this lab is to get started with AVR microcontroller programming and assembly language.

Pre-Lab Activity

i) Get the "Embedded Systems Kit" from the Engineering Electronic Shop
ii) All students must read and follow the ECE Lab Safety Guidelines (https://ece.engineering.uiowa.edu/resources/lab-safety-guidelines)
iii) Optional: Install Atmel Studio 7 on your computer
iv) Review hardware and software documentation as well as the data sheets on ICON
v) Sign up for and attend (required!) a 1.5 h Lab1 tutorial session (go to ICON —> Embedded Systems —> View Course Calendar —> Find Appointments —> select "ECE:3360 Spring23 Embedded Systems" and click Submit)



Resources
Starter assembly language program "blinky_v5_lab01.txt" on ICON

Lab Activity
Connect two LEDs with appropriate current limiting resistors to the microcontroller (see "blinky_v5_lab01.txt" for pin selection). Test the circuit by programming the microcontroller with the provided program.

With a 16 MHz external clock, the supplied routine *delay_long* provides a delay of about 4.119424 s. Modify this routine (nothing else) in the supplied assembly language program so that each LED blinks exactly (or as close as possible) 0.542 s long (i.e., 0.542 s ON & 0.542 s OFF). To accomplish this you must analyze *delay_long*, count the number of clock cycles and adjust the loop counters and/or insert 'nop' (no operation) instructions in *delay_long*. When you make these adjustments, account for the overhead of calling delay_long, and the other instructions in the main loop.

A portion (20%) of your score on Lab1 will depend on meeting the above specified requirements *as close as possible*. Note that while a 0.0001 s (100 μs) timing error might seem "small", in terms of microcontroller clock cycles, the result is off by 1600 cycles.

When ready, upload your program to ICON. See a TA before the deadline given above and demonstrate the correct function of your program and setup. Note that this includes successful programming the microcontroller, measuring the timing with an oscilloscope, as well as the simulation of your assembly language program.

If you plan to see a TA on the day the lab is due, a sign up for check off might be required. More details will be provided in lecture.