Mechatronics Microcontroller Project MXEN2002

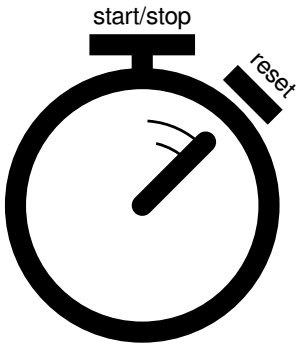
Laboratory E: Timers, interrupts and the LCD display

Before the lab:

- Review the use of the LCD using the HD44780 Library if necessary: http://community.atmel.com/projects/hd44780-library.
- Review the use of harware interrupts.
- Research how to configure and use hardware **timers** (section 17 of the ATmega datasheet: http://www.atmel.com/Images/Atmel-2549-8-bit-AVR-Microcontroller-ATmega640-1280-1281-2560-2561_datasheet.pdf).
- Begin planning your program.

Task: Design a simple stop-watch, using the LCD display to show the elapsed time.

- You should set up a hardware timer (e.g TIMER1) to time a suitable interval (say 1 or 10msec), and program variables to maintain counts of milliseconds, seconds and minutes. You will need to calculate suitable values for the prescaler and for the timer compare register.
- Hardware interrupts should be used for button control.
- This lab task is described in fairly broad terms. It is up to you to determine the detailed scope.
- As a minimum, you should implement a toggle button which will “start” and “stop” the timer **(E1)**, and a second button which will “reset” your stopwatch **(E2)**. A debounce strategy will be needed for the toggle function to work properly.



Some factors to consider:

- What precision will you record and display?
- Do you need to debounce one or more of the buttons?
- Is there any additional functionality which would be useful?

Your documentation should include:

- A clear specification of the scope of your task
- All relevant calculations, including prescaler and comparison values. **(E3)**
- All relevant circuit diagrams. **(E4)**
- Some pseudocode or flowcharts (preferred) showing the implementation of the logic. **(E5)**
- A description of any tests conducted to verify functionality.