ECE4144 – Timers Hands On

1. The objective of this hands on assignment is to create a PWM signal output using 16 bit Timer1 on the 32U4 processor. We wish to set up a PWM output at a frequency of 1kHz on either pin OC1A or OC1B. Since this is a 16 bit timer, some of the register settings are different than the example we did in class.
    a. Review the Timer1 registers starting on page 131 of the datasheet.
    b. Be sure to set the relevant pins to outputs.
    c. Set up TCCR1A,B, and C for Fast PWM (decide what you will use for TOP, clock prescaler etc.) Try to optimize tick resolution time.
    d. Set up OCR1A/B appropriately. Note: These are 16 bits, so they have a high and a low byte. The PWM duty cycle should initially be 50%.
    e. Write the loop function that updates the duty cycle counting from 0% to 100% then back down to 0% (repeating). The delay between duty cycle changes should be 100ms.
    f. Implement a #define that allows the developer to change the max duty cycle to any value between 0% and 100%
    g. Use the Digilent Discovery Waveform Application in Oscilloscope Mode to screen capture your PWM signal and attach it to the assignment. Verify your design by observing the measurements (DutyCycle, Average etc.) using the Add Measure feature of Waveforms like we did in class.