

Course: ECE372A  
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Project Name: Lab1

### Description

In this lab, you will use SFR Macros and bit operations to manipulate several LEDs as well as use a switch to change the rate at which the LEDs blink.

### Expected Outcome

8 LED Lights should turn on and off starting with the outer two LEDs first followed by the adjacent 2 LEDs inward until it reaches the two most internal LED pairs, each pair being on for 100ms. When the last 2 most inward pair of LED lights turn off, the pattern should invert turning on the next adjacent pair of LEDs until it reaches the the two most outer LEDs in groups of two. (see demo of expected outcome on D2L Lab 1 section). Holding down the switch should slow the speed of the lights turning on and off by a factor of 10.

### Instructions

1. Complete led.c, led.h, switch.cpp, and switch.h to fulfill the requirements.

### Requirements

#### Overall

1. The program must compile. This can be tested using the checkmark icon.
2. The project must use good coding practices and be well commented.

#### led.cpp

1. A function implementation that returns void and has no parameters called initLED must be present and is used in the main function to initialize all LED pins as outputs.
2. Pins 4-11 on the development board must be used to control the LEDs.
3. A function implementation called turnOnLED that returns void and has a parameter called led of type unsigned int must be present.
4. The turnOnLED function must turn \*on\* the LED corresponding to the pin on the development board and \*not affect the state of other LEDs\*.
5. A function implementation called turnOffLED that returns void and has a parameter called led of type unsigned int must be present.
6. The turnOffLED function must turn \*off\* the LED corresponding to the pin on the development board and \*not affect the state of other LEDs\*.
7. A function implementation called testLED that returns void and has a parameter call led of type unsigned int.
8. The testLED function that implements both turnOnLED and turnOffLED. The function testLED turns the current LED on and the previous LED off in ascending order across the board so that only one LED is lit at any time.

#### switch.cpp

1. A function implementation that returns void and has no parameters called initSwitch must be present and is used in the main function to initialize \*pin 22\* on the development board as an input.

#### main.cpp

1. A call to initLED() and initSwitch() must be present in the main function.
2. An infinite while loop must be present.
3. A call to testLED must be present in the main loop.
4. While the switch is not pressed, the LEDs must change every 100 ms and while the switch is pressed, the LEDs must change with a rate \*1/10 th\* as fast.
5. In this lab you will use the Arduino library function: void \_delay\_ms(unsigned int) to perform a delay of (unsigned int) milliseconds. Use the include statement #include <util/delay.h>

#### delay

The built-in function \_delay\_ms(unsigned int) may be used for this project \*only\* to cause a delay between LEDs blinking. It is important to note that this function requires a \*constant\* value. Therefore, to do a long delay, you can use #define LONG\_DELAY 1000 and \_delay\_ms(LONG\_DELAY) for a long delay. For a short delay, you can use #define SHORT\_DELAY 100 and \_delay\_ms(SHORT\_DELAY).