# Objective

In this lab we will work with ​**assembly language**​, practice connecting basic components such as LEDs and buttons to the board, read from / write to them.

# Problems

**Problem 1.**​ Write assembly code that will toggle the on-board LED at a rate of 1 second.

**Problem 2.** ​Connect a button to the board, and turn on the on-board LED when the button is

pressed. When the button is released, the LED should turn off.

**Problem 3.**​ Connect 8 external LEDs to the board, and toggle all the LEDs at the same time at a rate of 1 second.

**Problem 4.** Connect 8 LEDs and 1 button to the board, and implement a shift pattern.​ **Requirements:**

* The pattern should light 3 LEDs at the same time
* These 3 LEDs should shift right or left indefinitely.
* The button should toggle the shift direction when pressed. You can think of this as having two modes (right shift and left shift). The button is used to change modes.
* There should be around 100​ ms delay between transitions. (i.e.​ t3-t2 ~= 100 ms​ )​ ● First 12 patterns are given in Table 1 for one mode.

**Expectations:**

* Add your connection diagram (schematic). (This diagram should have a box for the microcontroller, and any LEDs, resistors for connection.)

○ Someone looking at your design could reproduce your circuit.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | LED1 | LED2 | LED3 | LED4 | LED5 | LED6 | LED7 | LED8 |
| t0 |  |  |  |  |  |  |  |  |
| t1 |  |  |  |  |  |  |  |  |
| t2 |  |  |  |  |  |  |  |  |
| t3 |  |  |  |  |  |  |  |  |
| t4 |  |  |  |  |  |  |  |  |
| t5 |  |  |  |  |  |  |  |  |
| t6 |  |  |  |  |  |  |  |  |
| t7 |  |  |  |  |  |  |  |  |
| t8 |  |  |  |  |  |  |  |  |
| t9 |  |  |  |  |  |  |  |  |
| t10 |  |  |  |  |  |  |  |  |
| t11 |  |  |  |  |  |  |  |  |
| t12 |  |  |  |  |  |  |  |  |

**Table 1.** Pattern on LEDs. Rows represent time steps, and columns represent each LED for right​ shift mode operation.