

# UNIVERSITY OF SAINT THOMAS – SAINT PAUL – MN

## Electrical and Computer Engineering

### ENGR 331: DESIGNING WITH MICROPROCESSORS

#### LAB 4: INTERFACING WITH AN LCD .

(Two Lab Sessions)

**Spring 2022**

**The Demo/Video Demo is due on March 17**

Most likely when using embedded systems, you will be talking to peripherals that you might never have used before. How do you connect the peripheral, how do you communicate with it? These questions can be answered by carefully reading the datasheet for the peripherals. Please pay attention to timing information, data transfer protocols etc. **The goal of this lab is to help you figure out (on your own) how to interface to a peripheral that you have never used before based on the documentation you find (either datasheet or other available sources/examples online). ENJOY!!! (and I really mean it!)**

#### **Task #1**

**Hardware wiring:**

**For this lab, you will need an LCD, Male Header pins, Breadboard, Jumper wires, and a potentiometer. You need to solder the pins to the LCD. Time to put your soldering skills to practice!**

1. Wire your LCD according to the wiring specifications of Lecture Set 6.
2. Download **LCDLab.c** file from Canvas. Move it to your Project Folder and add it to your project. It provides a rough skeleton of the LCD code.

#### **Task #2**

Your goal in Task #2 is to figure out how to write messages to the LCD screen:

- READ the HD44780LCD Datasheet (PDF is also available on Canvas).
- **Write a message on the two lines (remember that although it is a 1 line LCD, you treat the 9<sup>th</sup> character as being line 2 of the LCD).** You will need to complete the following functions:
  - a. `void LCD_port_init(); // Initialize the PORT connections for use with LCD`
  - b. `void LCD_init(); // Initialize the LCD for 4-bit mode`
  - c. `void place_lcd_cursor(char lineno); // Place LCD cursor at either line 1 or Line 2. Line 1 starts at address 0x80; Line 2 starts at address 0xC0.`
  - d. You will also need to think about one or more `FUNCTIONS THAT ALLOW` you to send actual message to be printed on the screen. For example you need to print these four types of messages:  
***Individual characters: H***  
***String: HELLO ENGR***  
The string should be able to accommodate the size of the LCD (16 characters)  
***Numbers in decimal : 331***

### **Task #3**

Your goal for Task#3 is to write a C program that does the following:

- 1- Displays a message on the LCD all at once.
- 2- Reverses the message and displays it on the LCD.
- 3- Displays one character after the other of the message  
e.g. H  
He  
Hel  
Hell  
Hello
- 4- Capitalizes every vowel and then displays the modified message.
- 5- Display a number in decimal.

**Note: Your program should work for any message.**

**What to hand in? (DUE 03/29/2022).**

- **Write a summary (no more than 4 pages) on how you accomplished all the three tasks. The summary should clearly explain the approach of the functions.**
- **Upload a WELL COMMENTED C code.**