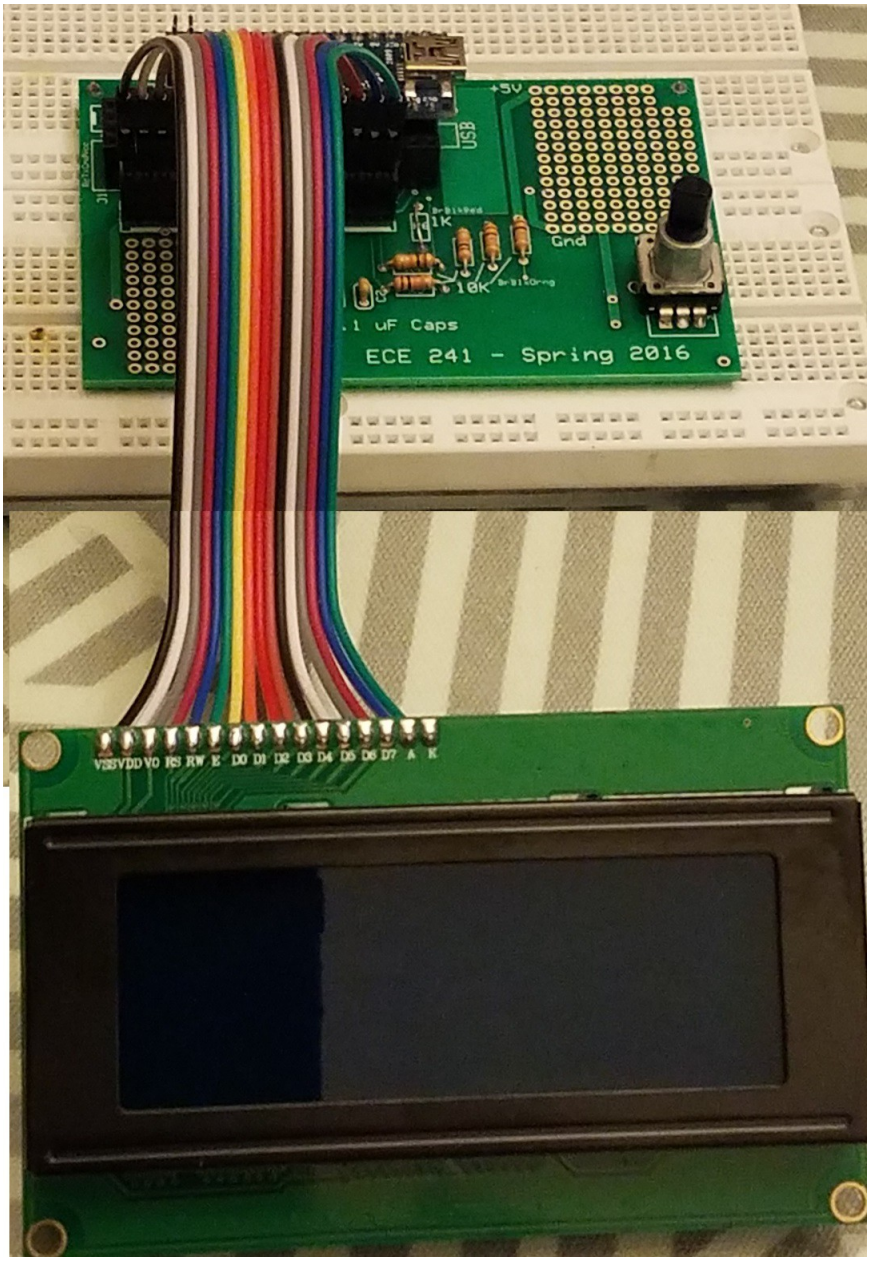
ECE 241 **Lab 10 – LCD Game** **Spring 2018**
Due: April 9-13, 2018 **30 points**

Objective: Develop an understanding of how to manage the data on an LCD.

Description of Lab 10: In this lab we will hook up the 4 x 20 LCD to the arduino board and program it to have a random and scrolling display.

A) Connect the 4 x 20 LCD to the Arduino, which involves soldering the connector onto the LCD and then attaching the ribbon cable to go between the Arduino board's LCD connector and the LCD display. An image is included here of the entire system.



In this image we can see the large LCD, the multicolored ribbon cable and the 241 Arduino board.

B) Code the Arduino to do the following. Every 200 milliseconds, move all the characters to the right one space, and then based on random( ) place * in the first column. The algorithm for this should look something like

```
for( int k = 0: k < 4; k++)
       if( random( 0, 100 ) < 20 ) // true approximately 20 % of the time.
             // load column 0, row k, with a *.
```

I recommend using an array of character strings that hold the values on the display, which can be shifted by one, and new values filled in and all displayed to the LCD. The character strings will keep track of where "objects" are on the display and allow easier control of other parts of the game.

C) Connect the digital lines to the ADisc's to the control lines on the LCD, (pins 11, 9, 5, 6, 7, 8). Then capture the transfer of data over to the LCD. This should be occurring approximately ever 200 milliseconds. **A screen shot of the ADisc's Logic Analyzer is required.**

Questions:

1) What percentage of the time is used to transfer data to the display?