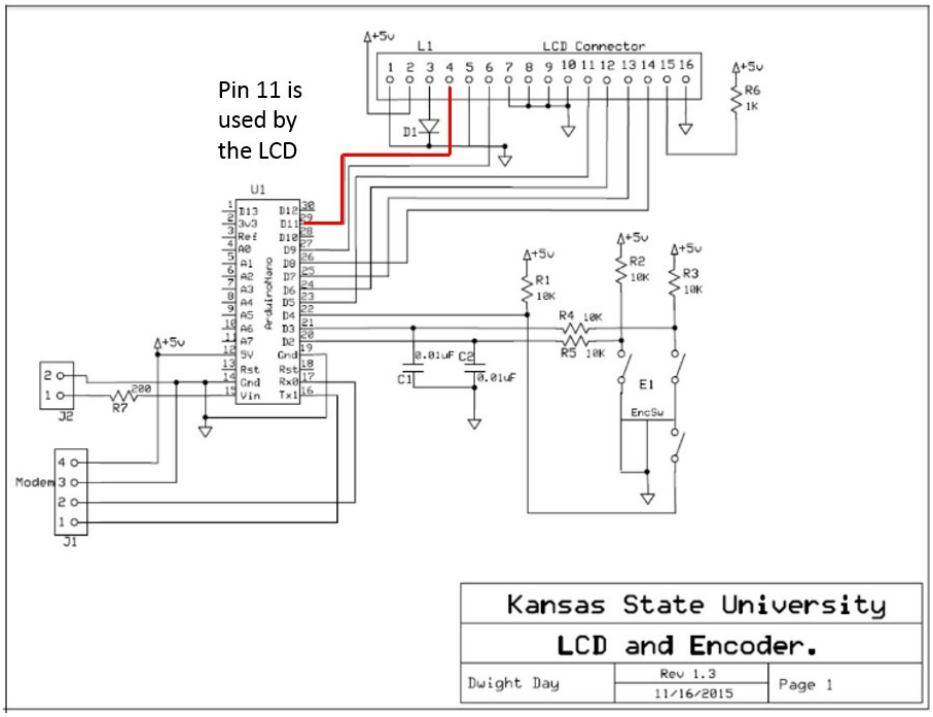
Lab 8 – Part I: Creating a time and temperature display.

Objective: Gain experience programming, emphasizing use of code developed thus far in the class. This lab will lead into the second part, where a thermostat will be built, employing time and temperature.

Description of Lab 8 – Part I:

In this lab we will be combining the LCD (Lab 4) and Thermocouple (Lab 7) to create a Time and Temperature display. Now the real problem here is that the SPI hardware on the Arduino, which the SPI library uses, controls pin 11, but pin 11 is used by our LCD (see below figure). Therefore, the first task will be to emulate the SPI system using software.



Tasks:

1) Write two functions that will **read data** via the SPI standard using software, instead of hardware. . The SPI library within the Arduino infrastructure has the ability to read and send data. However, since we are only interested in receiving data from the thermocouple, our SPI function only needs to be able to read data, not send it. Therefore, the basic functional form will not require any inputs. This is similar to functions such as millis(), which only returns a number and does not require any input parameters. The following specifications are also required for these functions.

A) The Clock is to be on pin A5, the Data In is pin A4, and Chip Select is pin A3.
B) Use masking to control all of the pins. The use of bitSet and bitClear is acceptable.

The basic functions will be something like the following pseudo-code.

```
void SW_SpiInitialize()
        Set Chip Select and Clock pins to be outputs
        Set Data In pin to be an input

int SW_Spi16( void )
        Set Chip Select Low
        Set Clock low
        Loop for k = 15 to 0
                Set Clock high
                Read input and place in bit k
                Set Clock low
        Set Chip Select High
```

2) Use the function written in part 1 to read the temperature from a thermocouple. Then create a program that will display the time and temperature on the LCD.

As always, a clock that can't be set is worthless. Thus you will need to be able set the clock, using the encoder and button on your board.

Grading: TA submission that documents the SPI functions will be half the points, then the demonstration of the full program will represent the rest of the points.