

# NPTEL-WEL Summer Workshop on Micro Controller

## Lab-2: LCD Display

In this set of experiments, we develop display and other utilities which will be useful to us for the later experiments. For these experiments, you will have to attach the LCD unit to the Pt-51 board. Please remember that the display has to be plugged in such a way that it extends *outside* the board and *not* over it. Plugging in the display in the wrong orientation may damage it! Please refer to the tutorial on Liquid Crystal Display Control, which was put up on the WEL LAB site.

For this lab, a subroutine which writes characters to the LCD display is being supplied to you. Study it to see how it works, so that you can write variations of it in your future programs yourself.

1. In this experiment, you will learn how to display characters on the LCD connected to the Pt-51 kit. Download the lcd.asm file and lcd-control-made-easy.pdf from webpage. The latter has general information about LCD operation which is helpful in understanding the code in lcd.asm.

Compile lcd.asm and load the hex file on to the kit. Make sure the output on the LCD screen is as shown below:

Pt-51  
IIT Bombay

2. Using the supplied routine for writing characters to the LCD, Write a program which will display "SUMMERSCHOOL-21" on the first line and "BY NPTEL AND WEL" on the second line. Pad the display lines with spaces such that these are centered on the LCD when displayed. You should assemble, debug, download and run this program on the supplied kit before coming to the lab.

3. using the packnibbles and binary to ascii conversion programs of first lab exercise, write a program to take single byte input from switches and display it on LCD.
4. Additional problem: using the packnibbles and binary to ascii conversion programs of first lab exercise, write a program to perform BCD addition and display it on LCD as follows:

$$\text{BCD1} + \text{BCD2} = \text{RESULT}$$

Pad the display lines with spaces such that these are centered on the LCD when displayed.

The first step will be to read two BCD numbers (each number consists of two BCD digits) from the ports using packnibbles sub routine with delay of 5 seconds between two numbers and perform addition. please note here result that should be displayed on LCD should also be of BCD type. you can also append carry as a separate nibble before result.

