

ECE 5530 MICROCONTROLLER APPLICATIONS
SPRING 2012
Design Project

Total: 50 pts. (5% of the course grade)
Due 4:30pm, Tuesday, February 28, 2012

The theme of the project is to interface a **16-by-2** (16 characters by 2 rows) **LCD Display Module** to the **Adapt9S12DP512 Board** used in the Lab and to develop a software driver to write a message of up to 32 alphanumeric characters on the LCD screen. The message should be **one out four** pre-stored character strings that can be selected by the status of **two** DIP switches. Data Sheets for the LCD interface and the Adapt9S12DP512 Board are posted on the Class Web Page. You should demonstrate your design by running your code from the **Flash memory**.

Tasks:

1. Summarize the key points of your design. That should include a discussion of your approach to implement the required functions by hardware and software means. You should clearly indicate what internal peripheral modules of the 9S12DP512 microcontroller are used. That includes a list of ports and register bit maps, as well as timing issues. The latter should include the consideration of CPU clock rates with, or without the BDM Module. **Explain** your design steps. (6 pts.)

2. Give a detailed schematic diagram for the whole system. The Adapt9S12DP512 Board should be represented by its interface connector signals (H1 and H2, respectively). All 9S12DP512 signals used in this Project should be buffered. All parts should have pin numbers and all traces should have signal names assigned. (6 pts.)

3. Write a C program that sets up the LCD Module interface, initializes the LCD Module, and displays a string of up to 32 characters (stored in memory starting at **0x4400**) on the LCD screen. Create the string in memory such that it will be terminated by an **EOS (0x00)** character. Your program should be documented by **flow charts** and be extensively **commented on**. **You are also required to verify** whether your program would work by **logic analyzer screen shots of the LCD interface and memory dumps**, as appropriate. Those screen shots and memory dumps **must** be included in your project report. Use the **ICC12 IDE** tools to develop the software segment of the LCD interface. Turn in your **.lst files** for the **compiled C code** along with a **hard copy of the C source code**, respectively, as well as the **screen shots with comments**. (18 pts.)

4. Build the interface hardware on your breadboard and demonstrate the **working LCD display interface that runs from the Flash** to your lab instructor, or the course instructor. (18 pts.)

5. Give a conclusion of your project. (2 pts.)

Each team should submit a **joint Project Report**. It should have three major sections as follows: Introduction, Design, and Conclusion. Use a schematic capture program to plot

your circuit diagram. **Note:** you will lose **5 pts. by each day** your project is tardy. **No** credit will be given if the project is late by more than five days.

Bonus credit opportunity

In addition to completing the tasks as described above, you may earn **up to 10pts** bonus credit at the instructor's discretion by developing the software segment of this project as **an application using u/COS-II**. This bonus assignment is also due when the base project is due. Your separate report for the bonus assignment should include a **discussion** of the **OS functions** your code invokes, an **overview** of the **changes** you have made in your code to use the services of uC/OS-II, a hard copy of your **.c** file along with **comments**, and the **.lst** file of your compiled C code.