CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA
COLLEGE OF ENGINEERING

ECE 3301L Spring 2019 Session 2

Microcontroller Lab **Felix Pinai**

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Grading:

Lab Assignments	80%
Attendance	10%
Lab Report	10%

Hardware:

You and a partner will form a group of two (maximum) to perform the experiments in the lab. Each group is required to acquire the following items:

1. Even though we do have computers in the lab to perform the programming and the debugging of the programs required in the experiments, it is preferred that each group has at least a portable device (laptop, netbook) available to load in the free development software. You will need the software to develop before and after the class some Prelab and/or Postlab assignments. I will be providing links to the software in the Software section below.

2. To program the code onto the microcontroller, you will need to buy the following piece of hardware:

   PICKit4: https://www.microchipdirect.com/product/search/all/pickit4

   or

   PICKit3: http://www.microchipdirect.com/productsearch.aspx?Keywords=PG164130

   I have asked everyone to buy this device on a separate email.

   I will be providing for each group a board that I have designed to be used in the debugging of the experiments. The board has on-board a Microchip processor (PIC18F4321 or PIC18F4620) and a header to connect all the signals to a breadboard. I am attaching a PDF file called 'lab_connector.pdf' that shows the pin definitions of that header for future reference. The board also has a USB port to be used for serial port debugging that I will go over in the class. Hence, I don't expect you to buy the microcontroller chip. However,

your group will be responsible for any damage to any component on the board and the cost to replace any damage part. Beside this board, you will need to have the following items:

a. Breadboard

b. Red, Yellow, Green LEDs

c. Dip-Switches

d. Cables with BNC and Alligator clips

e. Wires

f. Various other discrete components that I will let you know later

All the items above should be available with you or your team on every lab session even though we might not be used every item.

Software:

We will use free software provided by Microchip & TeraTerm

Step 1) Download MPLAB X IDE software:

First software (MPLABX IDE V4.20):

http://ww1.microchip.com/downloads/en/DeviceDoc/MPLABX-v4.20-windows-installer.exe

Note**: There are newer versions of this development software** (up to v5.10) but due to some compatibility issues, I prefer to stay with the older version.

Install this piece of software first.

At the end of the installation, the software will ask whether you want to install some additional software like XC8 compiler, MCC, etc… I do suggest that you deselect the choices (not to install) because we will use another XC8 compiler version (see below) or we don't need to use the additional software (MCC, Harmony).

Step 2) Download MPLAB XC8 compiler version 1.34:

http://ww1.microchip.com/downloads/en/DeviceDoc/xc8-v1.34-full-install-windows-installer.exe

Note: This is an older version of the XC8 compiler and there are newer versions available on the website. Don't use them because of the non-compatible setup that I have in this lab.

Install the second piece of software onto your computer.

Step 3) Download the latest TeraTerm software (version 4.99):

https://osdn.net/projects/ttssh2/downloads/69613/teraterm-4.99.exe/

Again, at the end of the installation of this TeraTerm software, do not install the other options.

Step 4) Perform this task if you have Windows XP or older on your computer (Windows 7/8/10 seems to have the driver preinstalled)

Go to the link:

http://www.ftdichip.com/Drivers/VCP.htm

Choose the version 2.12.28:

http://www.ftdichip.com/Drivers/CDM/CDM%20v2.12.28%20WHQL%20Certified.zip

Download and install that driver.

Next, there is a tutorial that you will need to perform to get used to the software. See the add-on document for that tutorial.

EXPERIMENTS:

Below is a list of tentative experiments. I might modify some of them during the course of the semester:

Lab 1: Introduction to Microcontroller programming using PIC microcontroller/Tutorial
Lab 2: Input / Output Control
Lab 3: Introduction to Assembly Language
Lab 4: A/D Converter / Temperature Sensor
Lab 5: Digital Voltage & Ohm Meters
Lab 6: Traffic Light Controller
Lab 7: Timers/Counters, PWM
Lab 8: System Interrupts
Lab 9: SPI Bus, D/A and Signal Generators
Lab 10: Hardware I2C Bus and Real-Time Clock (RTC)
Lab 11: External Interrupt and Soft I2C Bus
Lab 12: TFT Interface
Lab 13: Special Final Integration Project