University of North Texas, College of Engineering
Department of Electrical Engineering

EENG 3910: Project V - Digital Signal Processing System Design

Assignment 1

Lab Session: Monday, 01/25/2016
Due: Monday, 02/01/2016

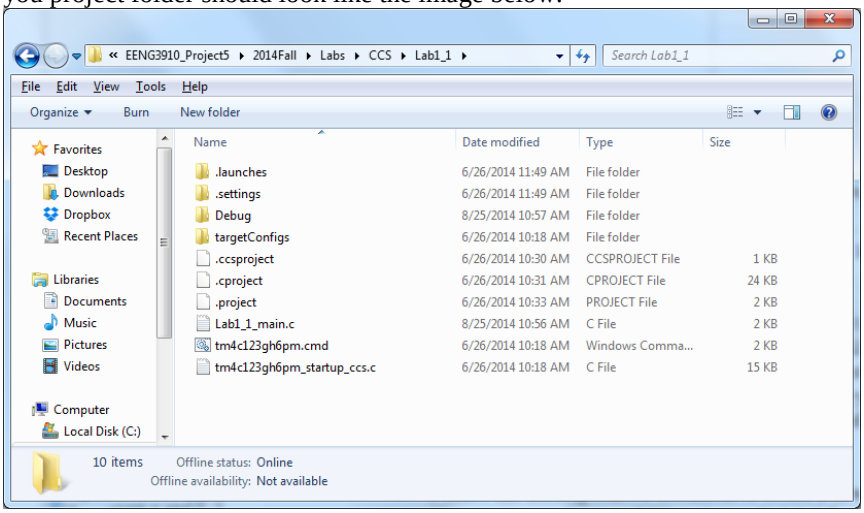
Student Name: _____

Important:

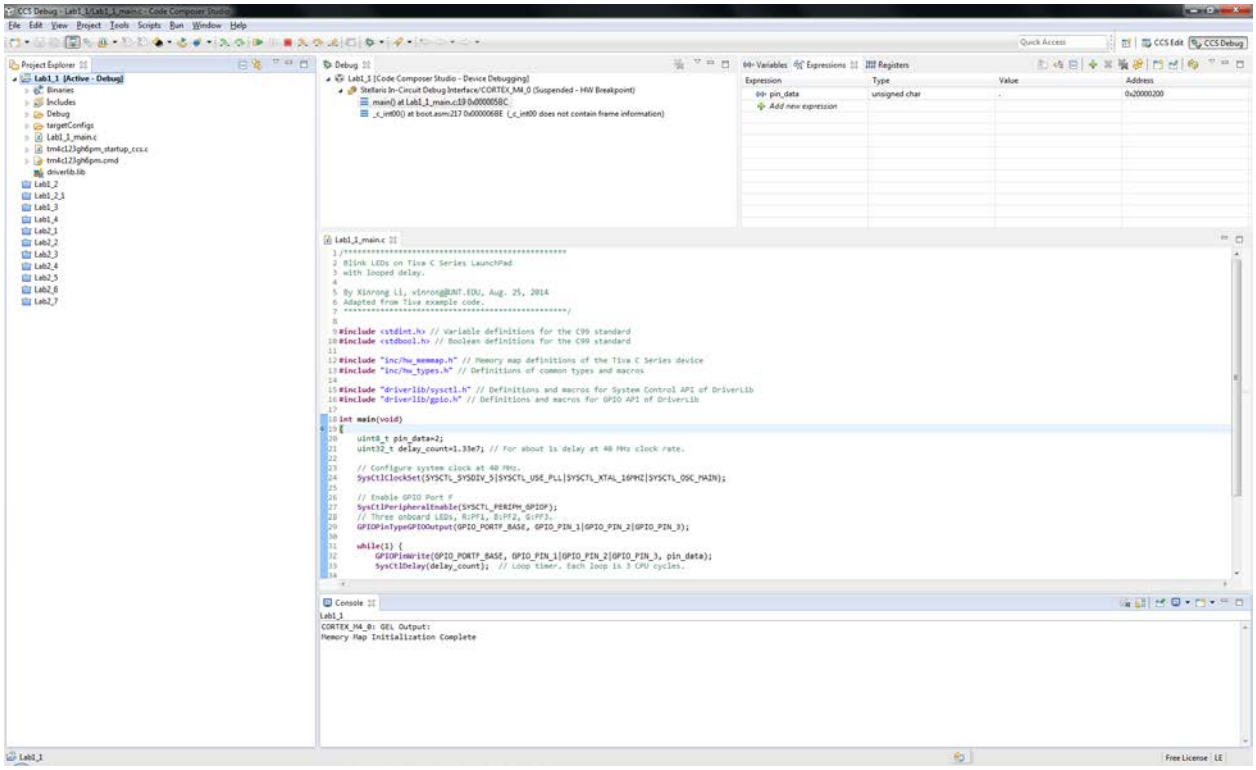
- Please pick a workbench to use during the first class and you need to stick with the same workbench for the entire semester.
- In the lab workbench computer, create a folder on the desktop with the naming convention of "Firstname_Lastname". This will be your own working directory and you should save all your assignment files there.
- Please create a new assignment folder in your working directory for each assignment, and a new problem folder in the assignment folder for each problem.
- Please backup your files in your own USB drive or your own network drive at the end of each class because the workbench computers may be reimaged without prior notice.

Problem 1

- Follow the Getting Started document "Getting_Started_CCS6.pdf" to create a new CCS project for Tiva C Series LaunchPad. You may name the new CCS project as Lab1_1.
- Delete the "main.c" file if you have generated that file automatically when you are creating your new CCS project. You can delete the file from CCS, or you can delete it by navigating to the folder location with Windows Explorer.
- Copy the source code file "Lab1_1_main.c" into your project folder. You can copy it in Windows Explorer or you can add the file (but use the Copy file option, not Link to file) in CCS. After that, you project folder should look like the image below:



- Build your project by clicking the icon  on the toolbar. Fix any problems that may appear accordingly. The error messages will appear in the Console window at the bottom.
- Build and load your project to the Flash memory on your Tiva LaunchPad by clicking the icon  on the toolbar. Then, your CCS will go into the CCS Debug interface, which looks like the image below:



- You should notice that your LaunchPad board has stopped. For example, if the LEDs on your board were blinking, it has stopped blinking now.
- Click the icon  on the toolbar to run your program on the board.
- Observe what happens on the board. You CCS is now in the debugging mode. You can stop the debugging mode anytime by clicking the icon  on the toolbar, then your CCS will go back to the programming mode.
- After your CCS has gone back to the programming mode, your Tiva LaunchPad will run on its own. For example, if your program is blinking LEDs, you can see that the LEDs keep blinking as you have programmed.

Problem 2

Your LaunchPad is basically a small computer just like the desktop computer. But one major difference between your LaunchPad and desktop computer is that LaunchPad is under total control of the program that you wrote. In contrast, when you write a program or software for desktop computer, your program will run on top of an operating system (OS) such as Windows 7, so your program will control only part of the behavior of your desktop computer.

In this problem, you will study the source code "Lab1_1_main.c" line by line to understand what it does. Then, in the next problem, get a better understanding of embedded systems by looking into the clock configuration of LaunchPad.

- Study the source code "Lab1_1_main.c", and in your report explain the source code line-by-line. The references that you will need to read are listed on the page titled Programming Resources in the lecture note. You will need to develop a habit of keeping those references handy and look up information frequently from those files. What you need to explain in your report include what the code in that line does, where the function is defined, what is the definition of the function, what are the input parameters, why the parameters are given the values as in the source code.

Problem 3

- The source code configures the clock of LaunchPad to run at 40 MHz. Change the clock rate to 20 MHz, 50 MHz, and 80 MHz. Observe the LEDs to see the differences resulted from different clock rates.
- Determine the values of the variable "delay_count" for each one of the clock rate (20 MHz, 40 MHz, 50 MHz, and 80 MHz) to make the delay caused by the function call "SysCtlDelay(delay_count);" to be exactly 1 second.
- Change the value of "delay_count" in the program to the ones that you just calculated and verify the delay between blinks is always 2 seconds. Please explain why delay between blinks is 2 seconds, instead of 1 second.

Problem 4

- Read the following documents:
  "spmy010.pdf"
  "SW-TM4C-DRL-UG-2.1.1.71.pdf", Chapters 1, 2, 15, 27
  "tm4c123gh6pm.pdf", Chapter 1
- Briefly summarize what you have learned from reading each one of the documents listed above.
- Read the document "Z-EK-TM4C123GXL Rev A Schematic.pdf", and explain how the three onboard LEDs are connected to the microcontroller chip. Then, with reference to the schematic, explain how the LEDs are programmed in the source code.

Assignment Deliverables:

- Compile your report with pictures, plots, and the codes that you have written or modified.
- Explain in detail what you have done, why you have done in that way, and what you have learnt. Follow the report format outlined in the Introduction lecture notes.
- Email your source codes for grading. For source code submission, you will need to zip your working directory and send the zipped file to your TA at VeenaChidurala@my.unt.edu.
- Printout of your source code should be attached to the printout of your lab report as appendix. If your source code goes beyond two pages, please only print the part of the source code where you have newly written or modified.