ECE 3567 Microcontrollers Lab

Lecture #3 – Code Composer Studio v 8.1.0



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Before doing ANYTHING, make a folder on the **U: Drive** that will be your Workspace.

Never place more than one project in the same workspace.

Invoke the Code Composer Studio version 9.1.0 software by double clicking on the CCS ICON



If you are beginning with the Getting Started screen, select **New Project:**



If only Project Explorer is open, select View -> Getting Started

💱 New CCS Project			×
CCS Project Create a new CCS Project.			
Target: MSP430FRoox Family ~ MSP430FR6989			~
Connection: TI MSP430 USB1 [Default]	~	Identify	·
😭 MSP430			
Project name: Lab2			
Use default location			
Location: U:\ECE3567\Lab2	B	rowse	
Compiler version: TI v16.9.3.LTS ~		More	
 Advanced settings Project templates and examples type filter text Empty Assembly-only Project Empty RTSC Project Empty RTSC Project Basic Examples Blink The LED Hello World FRAM Utilities MSP430 DriverLib Empty Project with DriverLib Source MSP430 DriverLib 	iP430 ur proj h. Eve verLib	ject and rything 9 in a	<
Open <u>Resource Explorer</u> to browse a wide selection of example projects			

< Back

Next >

Finish

Cancel

In the **CCS Project** window, configure the following fields:

- 1. Target: MSP430FRxxx Family
- 2. MSP430FR6989
- 3. Connection: Leave at Default
- 4. Project Name (e.g. Lab 2)
- Uncheck use default location and browse to your workspace (e.g. U:\ECE3567\Lab2)
- 6. Leave Compiler at Default
- 7. In Project templates and examples, you must SCROLL DOWN to MSP430 Driverlib, select the down arrow v and SCROLL DOWN AGAIN. Highlight:
 Empty Project with DriverLib Source
- 8. Select Finish

?



ALTERNATIVELY: If you are beginning with another project already open in Project Explorer:

- 1. Select File -> Switch Workspace and navigate to your new workspace
- 2. Select File → New → Project → Code Composer Studio → CCS Project

Browse For Folder X	
Select the location directory.	Select a wizard
 chapman (U:) jxbrowser-data metadata ECE 2050 ECE 2060 ECE 3567 ECE3567 Lab1 Lab2 	Wizards: type filter text > General > C/C++ > Code Composer Studio (a) CCS Project (b) Target Configuration File > Energia > Git > Remote System Explorer > RTSC > RTSC
Make New Folder OK Cancel	Sack Next > Finish Cancel

3. This should open the **New CSS Project** window. Proceed as previously described.

💱 New CCS Project – 🗆 🗙			
CCS Project I Project name must be specified	112 MSP430		
Target: <select filter="" or="" text="" type=""> MSP430FR6989</select>	Project name:	lab_03b_button	
Connection: TI MSP430 USB1 [Default] V Identify	Use <u>d</u> efault loca	ition	
T MSP430	Location:	C:\ti\workspace2\lab_03b_but	ton
Project name:	Compiler version:	TI v4.3.2	
Location: C:\Users\gchap\Desktop\development - Copy - Copy Browse Compiler version: TI v16.9.3.LTS More	 Advanced setting Project template 	gs s and examples	
Advanced settings	type filter text		Initial starting point for
 Project templates and examples type filter text Empty Projects Empty Project (with main.c) Empty Assembly-only Project Empty RTSC Project Basic Examples Blink The LED Hello World FRAM Utilities 	 Empty Pro Basic Exan Blink T Haller MSP430 D Empty 	ojects nples The LED Modd riverLib Project with DriverLib Source	DriverLib. Copies DriverLib source and adds the appropriat Everything you need to DriverLib in a new proje
Open Resource Explorer to browse a wide selection of example projects	Don't F	orget to select this te	mplate.

The FIRST time you use the workspace, CCS MAY open the Eclipse Launcher.

Browse to the workspace that you have created, then select OK

💱 Eclipse Launcher			\times
Select a directory as workspace			
Code Composer Studio uses the workspace directory to store its preferences	and development ar	tifacts.	
Workspace:	~	Browse	
Recent Workspaces			
Copy Settings			
?	ОК	Cancel	

Code Composer Studio – Adding Code

- 1. Select File \rightarrow New \rightarrow Source File
- 2. Enter Code
- 3. Save the File
- 4. Select Project \rightarrow Rebuild Project
- 5. You may also COPY files into your project folder then add them to the project with a Right-Click on your **Project Name [Active-Debug]**. Then select **Add Files**...

Getting Started imain.c S 1#include "driverlib.h" 3 int main(void) { 4 5 WDT_A_hold(WDT_A_BASE); 6 7 return (0); 8 } 9	NOTE: It's better to copy in the standard file header and edit it than starting with the default main.c	Getting Started
<pre>1#include "driverlib.h" 2 3 int main(void) { 4 5 WDT_A_hold(WDT_A_BASE); 6 7 return (0); 8 } 9</pre>	NOTE: It's better to copy in the standard file header and edit it than starting with the default main.c	<pre>2//</pre>

Code Composer Studio – Running the Project Code

- 1. At this point it is essential to connect the hardware
- 2. Make sure that the Project is selected as [Active Debug]
- 3. You can check to see if the code compiles by selecting the hammer ICON $\sqrt[6]{5}$
- 4. Select the Debug ICON ***** (NOTE: This will also recompile the project)
- 5. Once the GREEN ARROW comes up you can run the code
- 6. Halt execution with the RED SQUARE



Code Composer Studio – To Open an Existing Project (Automatic Method)

- This doesn't always work
- Make sure that the Workspace is set to your project location. To change it, select File → Switch Workspace, and navigate to the project location
- Double-click the **.ccsproject** ICON in the project folder
- If it doesn't work, try the Manual Method



Code Composer Studio – To Open an Existing Project (Manual Method)

If your project does not appear

👽 d	evelop	ment -	Copy - Copy	- CCS Ed	it - Lak	2/main.o	: - Code C	Composer Studio
File	Edit	View	Navigate	Project	Run	Scripts	Window	Help
	- II	0	Resource Expl	orer				• <> •
68 0	Getting	<u> </u>	Resource Expl	orer Clas	SIC			_
1	#incl		Grace Snippet	ts				
2		3	Getting Starte	d				
3	int m	V	CCS App Cen	ter				
5	h	Θ	GUI Compose	er TM			:	>
7	۲ ۱	6	Project Explor	er				
9	r		Show View	(Project E	xplore) Alt+Sł	nift+Q, X	
			Console			Alt+Sh	ift+Q, C	
		8	Advice					
		☆	Debug					
		0	Memory Brov	vser				

Code Composer Studio – To Open an Existing Project

If you still don't see anything in Project Explorer

Select File
 → Switch Workspace, and navigate to the project location

🐨 development - Copy - Copy - CCS Edit - Autumn 2019/main.c - Code Composer Studio

File	Edit View Navigate Project Run Scripts Wir	ndow Help
	New Alt+Shift+N > Open File	
Ċ,	Open Projects from File System	
	Close Ctrl+W	
	Close All Ctrl+Shift+W	
	Save Ctrl+S	
	Save As	
r	Save All Ctrl+Shift+S	
	Revert	_
	Move	
2	Rename F2	
\$	Refresh F5	
	Convert Line Delimiters To >	
ß	Print Ctrl+P	
	Switch Workspace >	C:\Users\gchap\Desktop\development - Copy - Copy\2018
	Restart	C:\Users\gchap\Desktop\Lab3\development - Copy
r la	Import	C:\Users\gchap\Desktop\development - Copy
è.	Export	U:\ECE 3567\development
	Provention Alternation	U:\ECE 3567\development\Lab 2
	Alt+Enter	U:\ECE 3567
	1 main.c [Autumn 2019]	U:\
	Exit	$\label{eq:c:Users} C:\Users\gchap\Desktop\Downloaded\development$
_	🔏 x2main.c	C:\Users\gchap\Desktop\Workspace
	X3main.c	Other
	🗶 xmain.c	

Code Composer Studio – To Open an Existing Project

If you **STILL** don't see your project in Project Explorer, re-open the file:

• File → Open Project Files from File System . . .



Transferring a Project to a New Location

If you move the location of your CCS project files , you must do **two things** before your project will function normally:

1. Change the Workspace

2. Update the path for the Include Options paths under the Complier settings

Change Workspace

- 1. Select File → Switch Workspace → Other
- 2. Enter the new workspace. Always select the file ABOVE your Project file that CCS created.

When you select OK, Code Composer will restart

Change Include Options

- 1. Right Click on your Project Name [Active-Debug]. Select Properties (all the way at the bottom of menu)
- 2. Go to Include Options under MSP430 Compiler
- 3. You will need to add the proper path to all three of the following :

"U:\<your path>\<your project name.\driverlib" "U:\<your path>\<your project name.\driverlib\MSP430FR5xx_6xx" "U:\<your path>\<your project name.\driverlib\MSP430FR5xx_6xx\inc" NOTE: DON'T copy my path format, this is on my computer at home.

4.	Use the 🔨 ICON to add path	Properties for Autumn 2019 type filter text	Include Options	
5.	Delete old paths to same folders using ICON	 Resource General Build MSP430 Compiler Processor Options 	Configuration: Debug [Active]	Manage Configurations
6.	When finished, click OK	Optimization Include Options ULP Advisor Advice Options Predefined Symbols Advanced Options MSP430 Linker MSP430 Hex Utility [Disabled] Debug	Add dir to #include search path (include_path, -I) "\${MSP430_DRIVERLIB_INCLUDE_PATH}" "\${CCS_BASE_ROOT}/msp430/include" "U:\Users\gchapman\ECE 3567\Autumn 2019\driverlib" "U:\Users\gchapman\ECE 3567\Autumn 2019\driverlib\MSP430FR5xx_6xx" "U:\Users\gchapman\ECE 3567\Autumn 2019\driverlib\MSP430FR5xx_6xx\inc"	🛃 <table-of-contents> 🚡 샷 샷 </table-of-contents>
			Specify a preinclude file (preinclude)	🛃 🗿 🖓 🖓 🖓 । 🖓 ।

Code Composer Studio Common Error Messages

ERROR: Unable to Launch. The selection cannot be launched, and there are no recent launches

Solution: Switch Workspace : File => Switch Workspace => Other Always select the folder that is ONE LEVEL ABOVE your project folder as the workspace.

ERROR: Cannot open source file "driverlib.h"

Solution: Change the paths to the following folders -

1. Right click the project set as [Active-Debug] and open Properties

2. Under MSP430 Compiler options, select Include Options

3. Delete old paths to driverlib

Add <u>ALL THREE</u> new paths:

.../ driverlib

.../ driverlib/MSP430FR5xx_6xx

.../ driverlib/MSP430FR5xx_6xx/inc

Code Composer Studio - Watch Window

Note that, unlike the TI C2000 series there is not a dynamic debugger for the TI MSP430 LaunchPads. Expressions and Variables are only updated after a Breakpoint is reached, and NOT available of the Debugger is halted.

1. Select View \rightarrow Expressions

2. Right click to add registers or variable names.

3. Set breakpoints

4. Run the Debugger

Troubleshooting - Breakpoints

- 1. Double click the line number to set a breakpoint
- 2. You must re-compile to incorporate the breakpoint
- 3. Click twice more to clear a breakpoint



Serial Communications via UARTs Setting up the Terminal Window

Code Composer Studio – The Terminal Window

1. View \rightarrow Terminal

- 🧬 Terminal 🔀
- 2. Click on the ICON to launch the terminal. The Launch Terminal window should open:

Choose the Serial Terminal to switch to the proper settings

- 3. The pulldown menu for Port should list the available COM ports. If these end up not working, you will have to resort to the process on the following slide to discover the COM ports
- 5. If not already the default settings, select: Baud Rate 9600, Data Bits – 8, Parity – None, Stop Bits – 1, Flow Control – None, Timeout – 5 secs, Encoding - Default (ISO-8859-1)
- 6. Select OK

Ø	Launch Termin	al		—	I		×
C	Choose terminal: Settings	Serial Terr	minal				~
	Port:	COM4				~	
	Baud Rate:	9600				~	
	Data Bits:	8				~	
	Parity:	None				~	
	Stop Bits:	1				~	
	Flow Control:	None				~	
	Timeout (sec):	5					
	Encoding: Defa	ault (ISO-88	359-1)			``	/
(?		0	К	(Cancel	

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Finding an Available COM Port

• The list of available COM ports should update in the CCS Terminal menus.

😵 Launch Te	rminal		—		×
Choose term	inal: Serial Te	rminal			~
Settings					
Serial port:	COM3				~
Baud rate:	COM4 COM3				
Data size:	8				~
Parity:	None				\sim
Stop bits:	1				\sim
Encoding:	Default (ISO-	3859-1)			\sim
3					
?		ОК		Cance	el

Finding an Available COM Port

- If the list of COM ports is not available in CCS, you can look at available COM ports in the Command window. This procedure should only be necessary if you suspect CCS is not updating the list.
- Each lab computer uses numerous COM ports. To identify:
- 1. type CMD in the search window to bring up the Command Line Prompt
- 2. type MODE and write down the communication port numbers that are available (e.g. COM4, COM12, COM13). The first listed is usually already in use.
- 3. Close the Command window

NOTE: COM port numbers are **DYNAMIC**. When you unplug your LaunchPad and plug it back in, the COM port numbers WILL be different. Check the Terminal list of COM ports, or run the CMD/MODE again to document the NEW list of available COM ports.

Status for device COM4:Baud:9600Parity:NoneData Bits:8Stop Bits:1Timeout:OFFXON/XOFF:OFFCTS handshaking:OFFDSR handshaking:OFFDSR sensitivity:OFFDTR circuit:OFFStatus for device COM12:Baud:460800Parity:NoneData Bits:8Stop Bits:1Timeout:OFF
Baud: 9600 Parity: None Data Bits: 8 Stop Bits: 1 Timeout: OFF XON/XOFF: OFF CTS handshaking: OFF DSR handshaking: OFF DSR sensitivity: OFF DTR circuit: OFF RTS circuit: OFF Status for device COM12: Baud: 460800 Parity: None Data Bits: 8 Stop Bits: 1 Timeout: OFF
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Data Bits: 8 Stop Bits: 1 Timeout: OFF
Stop Bits: 1 Timeout: OFF
Timeout: OFF
XON/XOFF: OFF
CTS handshaking: OFF
DSR handshaking: OFF
DSR sensitivity: OFF
DIR circuit: ON
RIS circuit: ON
Status for device COM13:
Baud: 0
Parity: None
Data Bits: 8
Stop Bits: 1
Timeout: OFF
XON/XOFF: OFF
CTS handshaking: OFF
DSR handshaking: OFF
DSR sensitivity: OFF
DTR circuit: OFF
RTS circuit: ON

Communication

THIS IS PART OF A LATER LAB. It is introduced now for completeness in presenting Code Composer Studio. Once the Command Structure has been added to your code:

• When you run the ECE 3567 Project program, You should receive the following message from the ECE 3567 software:

ECE 3567 Microcontroller Lab Please enter a Command Code:

• You can test the transmit with any valid two-character command, which must be capitalized. If they are not programmed, you will receive:

UNKNOWN COMMAND Please enter the next Command Code:

You will add this functionality to the code later in the semester

Introduction to Lab 1

Lab 1 – Blinking LEDs

Goals:

1) Learn to set-up a new Project in Code Composer Studio

- 2) Lear to code, compile and run a project in Code Composer Studio
- 3) Gain experience with the Bitwise C operators to control external hardware.
- 4) Learn how to re-configure your project when the code is moved to a different path.

Lab 1 – Blinking LEDs

- Write a program that will illuminate the red and green LEDs on the MSP430FR6989 Launchpad board.
- Which LED is illuminated should alternate at approximately one second intervals.
- For this lab, we will not use timers or interrupts. Write delay code in the main loop and manipulate the proper output pins to the LEDs using generalized I/O ports 1 and 9 (see schematic).
- We will not use TI macros to control the I/O ports in this lab.
- Once your project is working. You will be asked to change the location of your code and make the necessary changes to get the code running again
- You will NOT be prepared to write the Lab 1 code or pass the quiz at the end of the lab session (this is a single class lab) if you do not watch and understand the Lab 1 Video.

Lab 1 - Schematic

