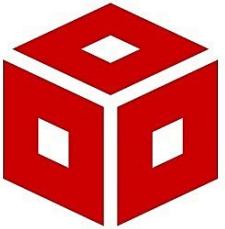


ECE 3567 Microcontroller Lab

Lecture #3 – Code Composer Studio



Spring 2025

Dr. Gregg Chapman

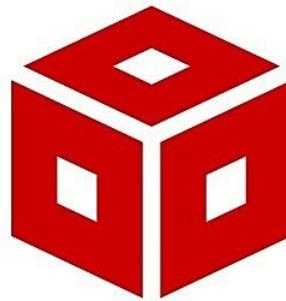
Project Set-up

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

- You may create more than one project in the same workspace.
- I recommend having a separate workspace for each lab. Code Composer creates the PROJECT folder. You define the WORKSPACE.
- **NEVER** have more than one project in a project folder!!!!

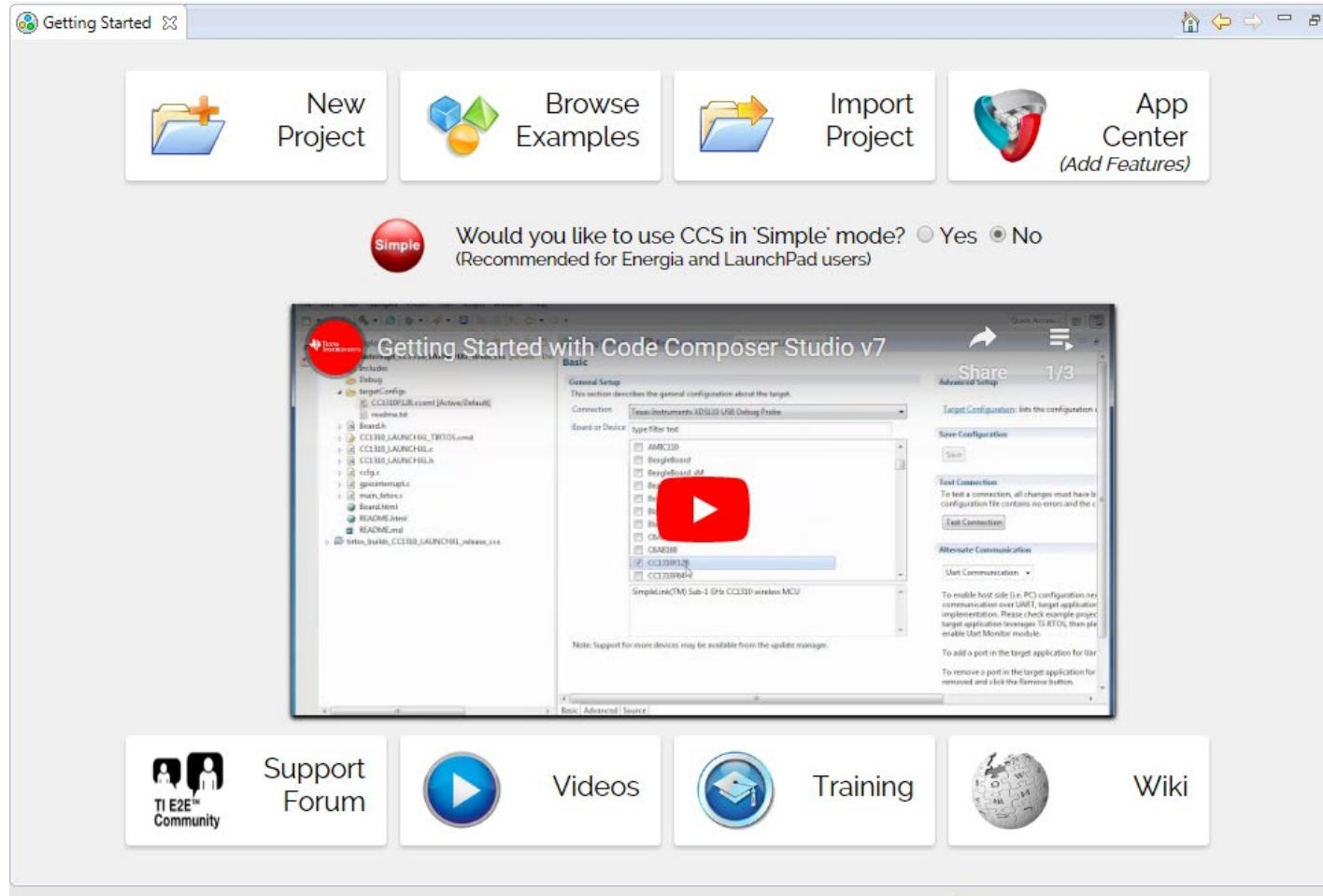
Project Set-up

Invoke the Code Composer Studio version 10.1.0 software by double clicking on the CCS ICON



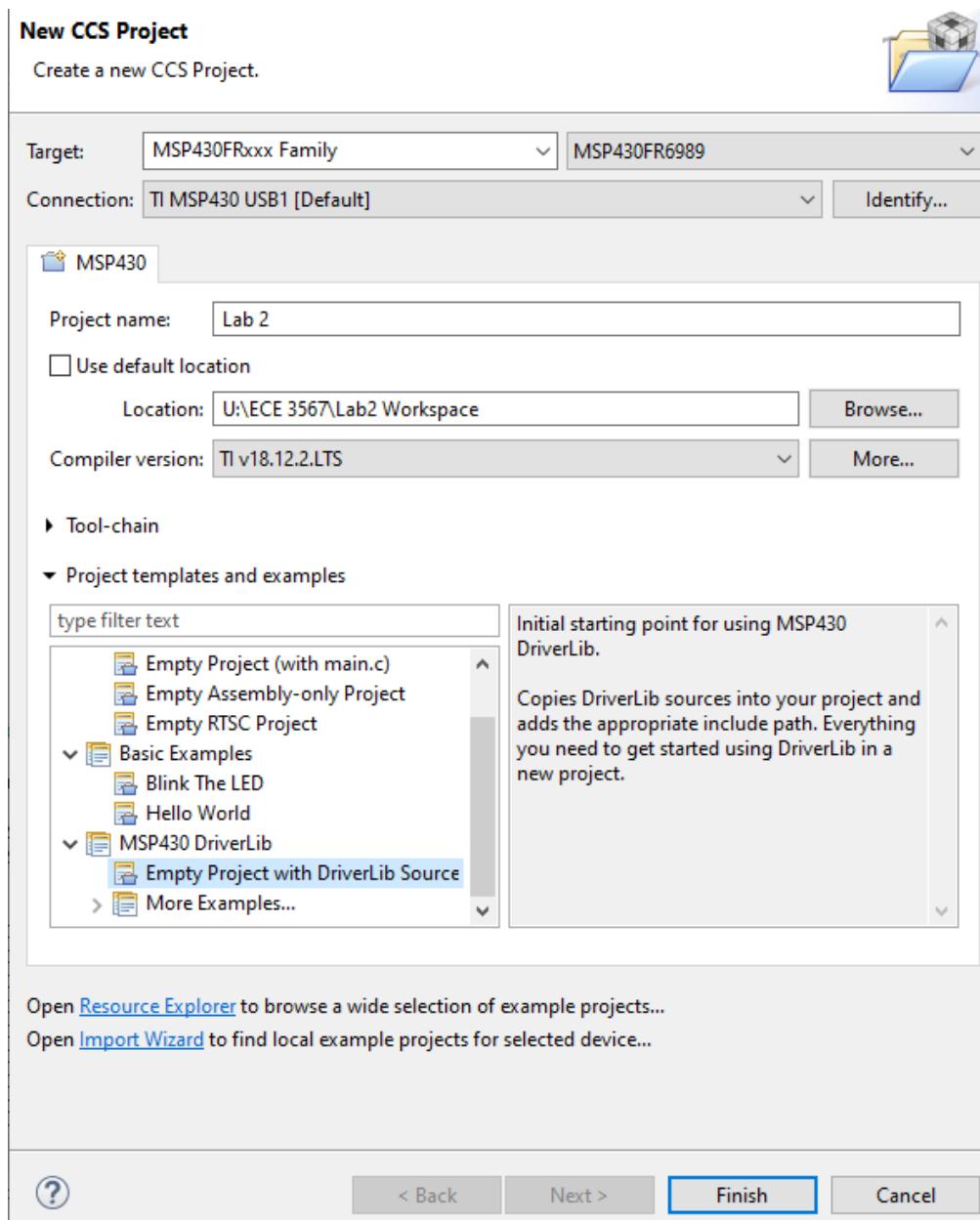
Project Set-up

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



If only Project Explorer is open, select **View → Getting Started**

Project Set-up

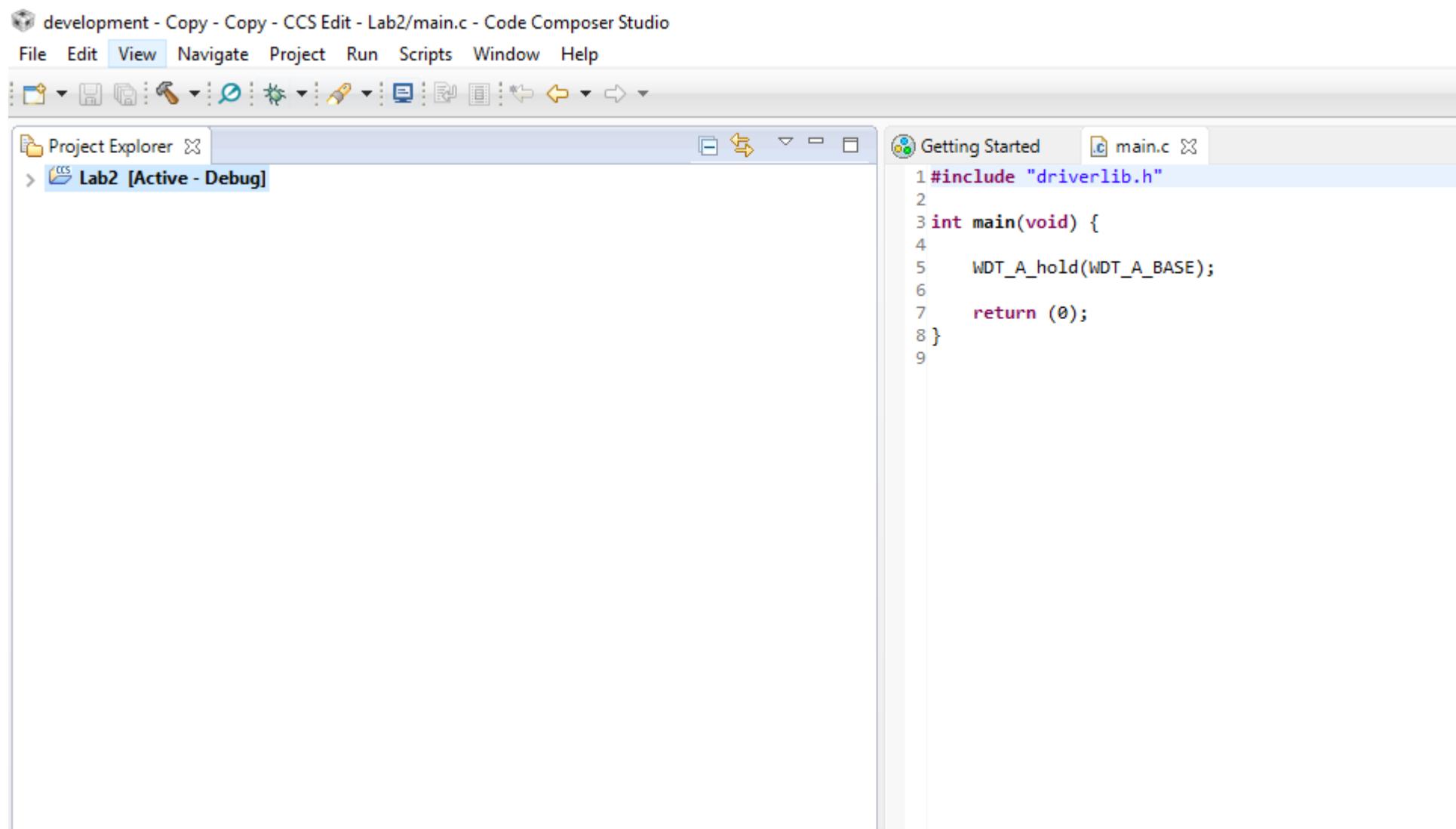


In the **CCS Project** window, configure the following fields:

1. Target: **MSP430FRxxx Family**
2. **MSP430FR6989**
3. Connection: Leave at Default
4. Project Name (*e.g. Lab 2*)
5. Uncheck use default location and browse to **YOUR WORKSPACE**
(*e.g. U:\ECE3567 OR U:\ECE3567\Lab2 Workspace*)
This depends on how you set it up. CCS will create a project folder with the Project Name under the WORKSPACE you define in LOCATION.
6. Leave Compiler at Default
7. In Project templates and examples, you must **SCROLL DOWN** to **MSP430 Driverlib**, select the down arrow **▼** and **SCROLL DOWN AGAIN.** Highlight:
Empty Project with DriverLib Source
8. Select Finish

Project Set-up

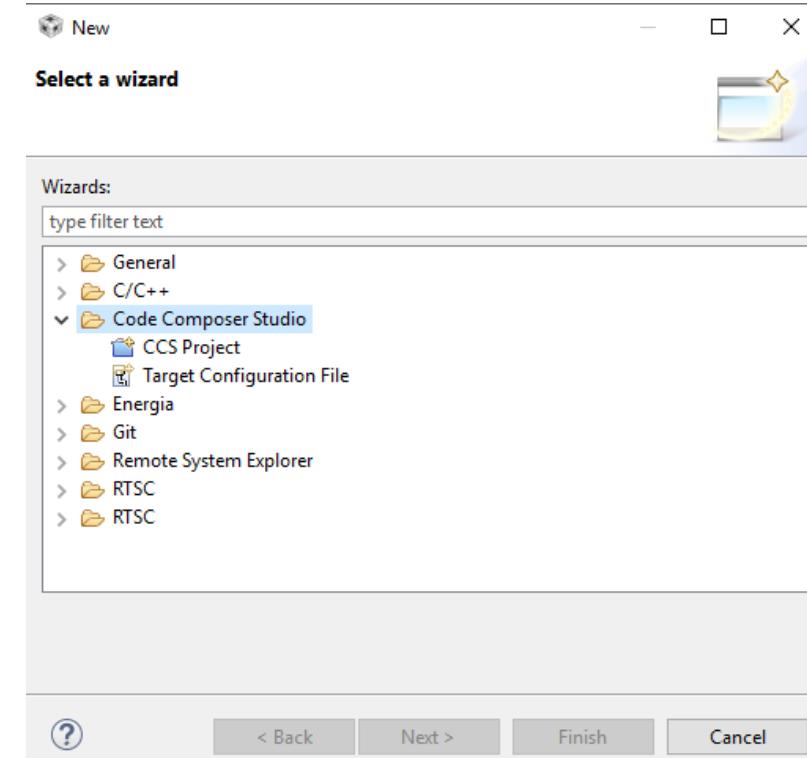
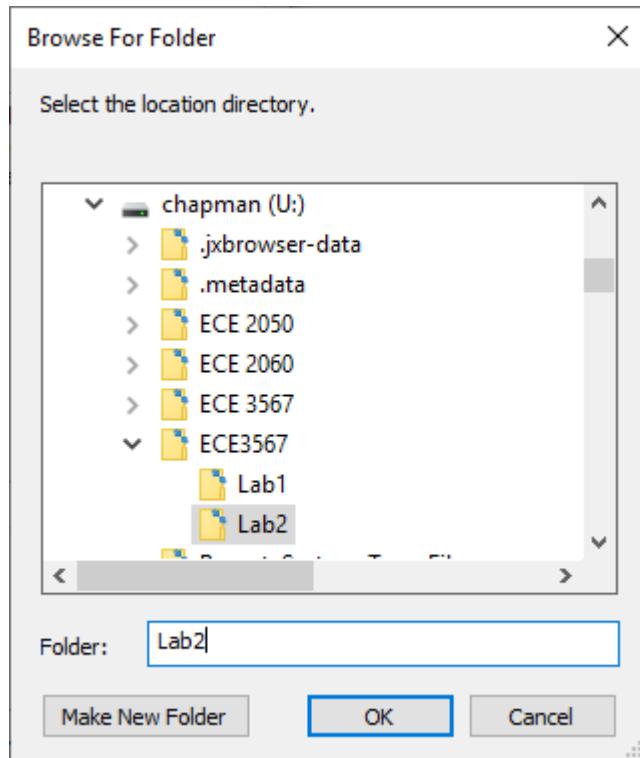
"Voilà"



Project Set-up

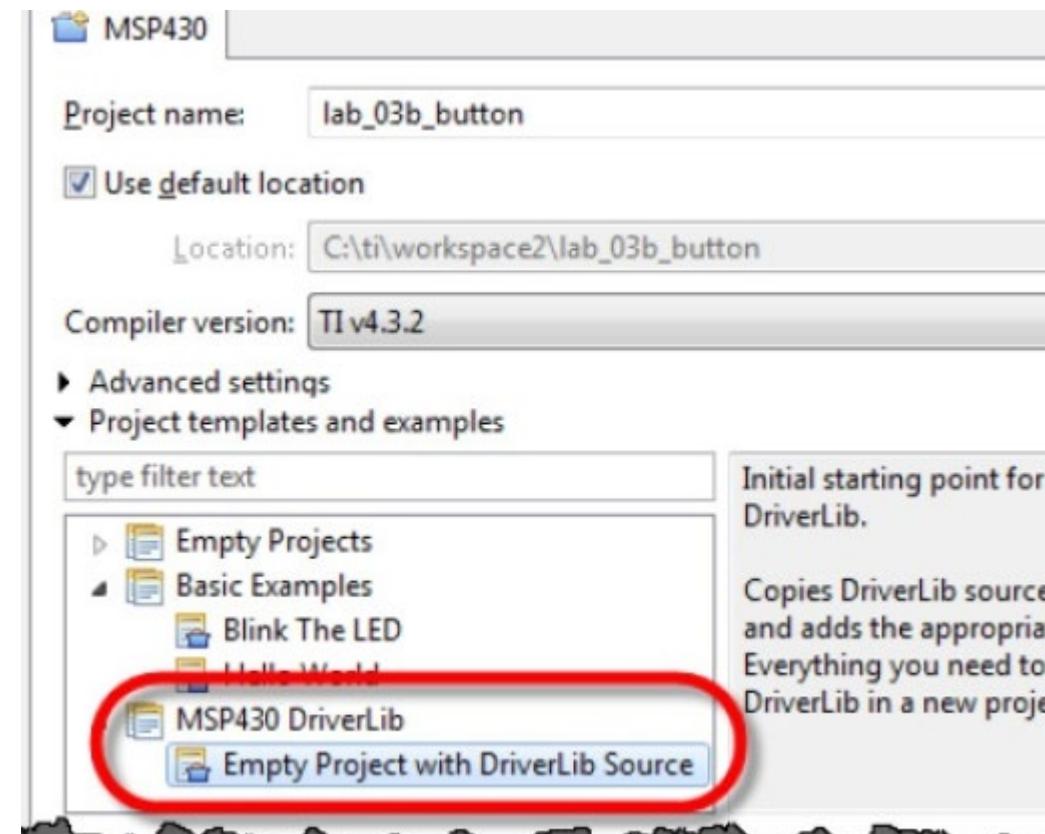
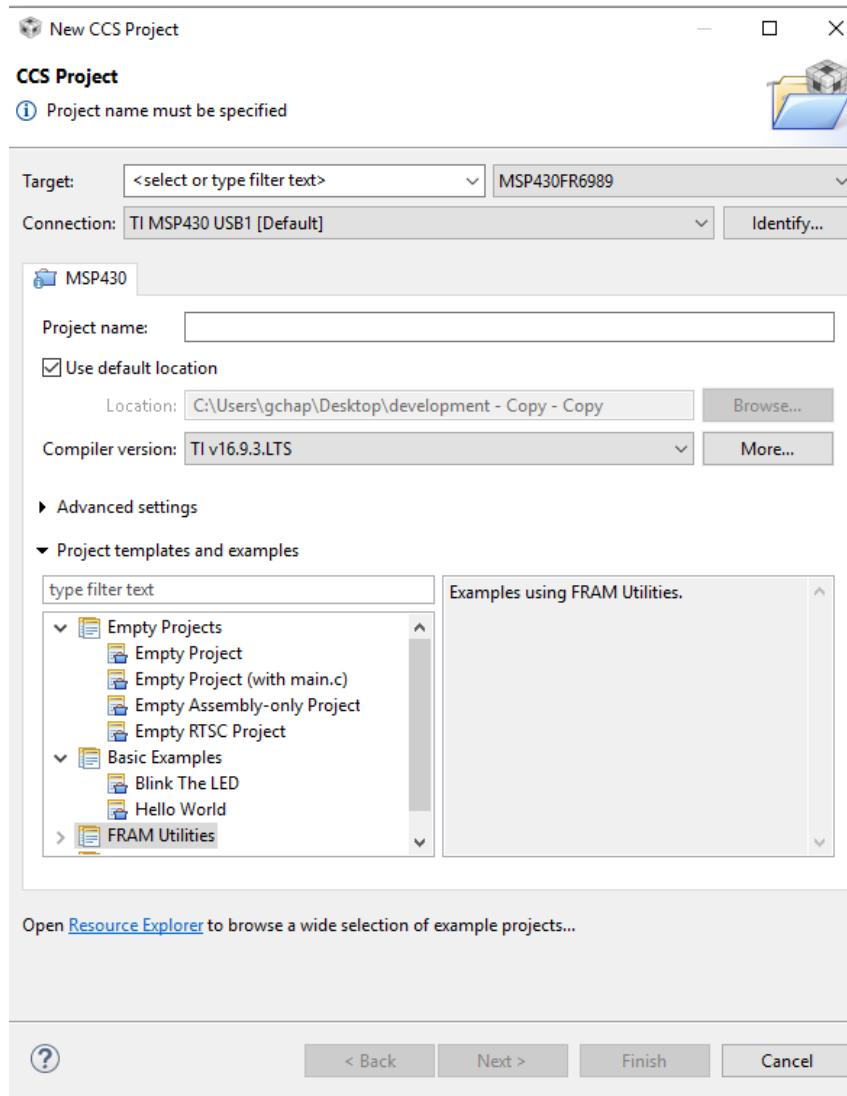
ALTERNATIVELY: If you are beginning with another project already open in Project Explorer:

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



Project Set-up

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

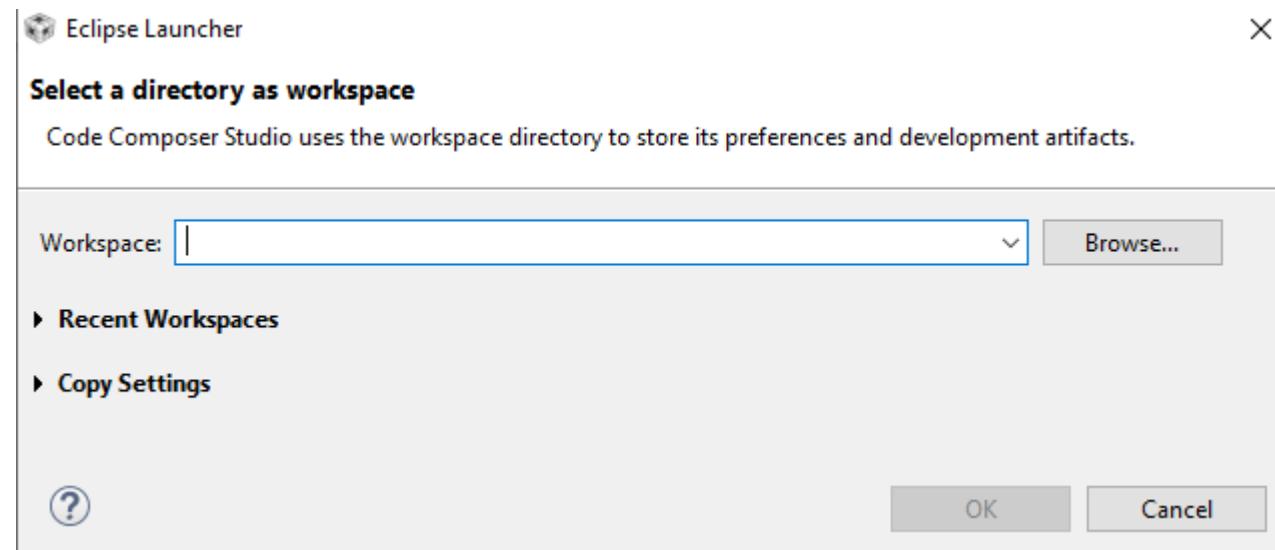


Don't Forget to select this template.

Project Set-up

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

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



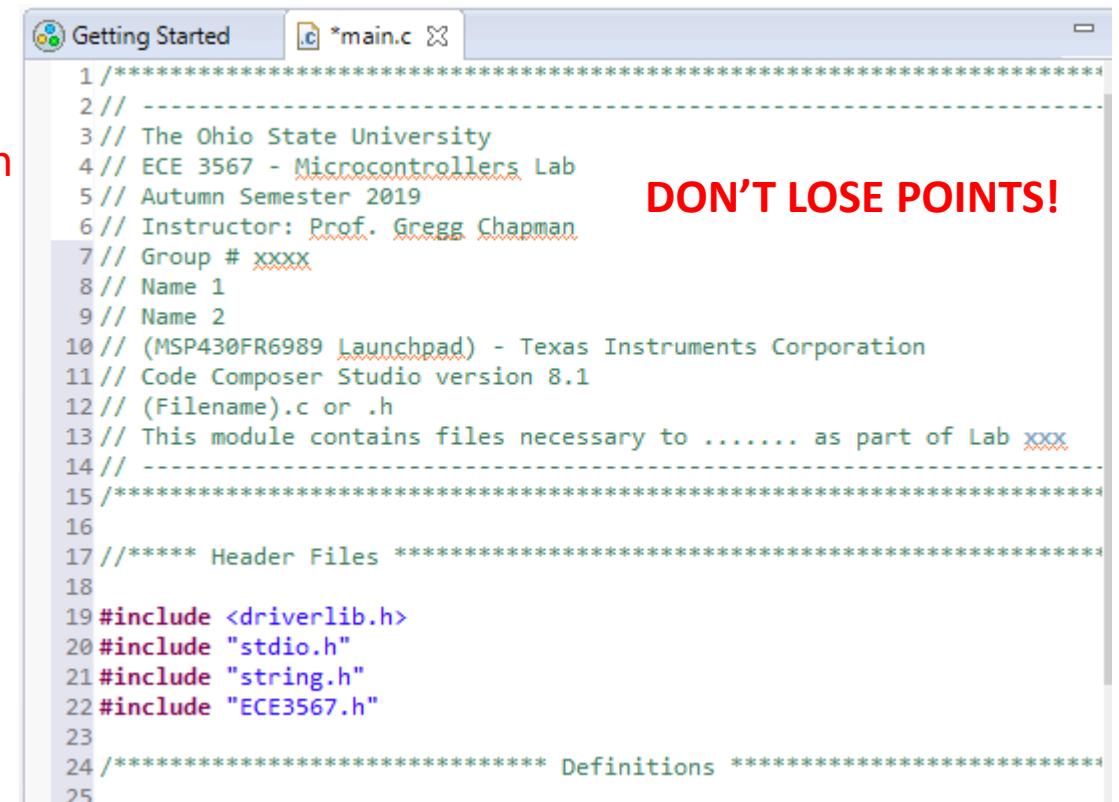
Code Composer Studio – Adding Code

1. Select File → New → Source File
2. Enter Code
3. Save the File
4. Select Project → 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 main.c
1 #include "driverlib.h"
2
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

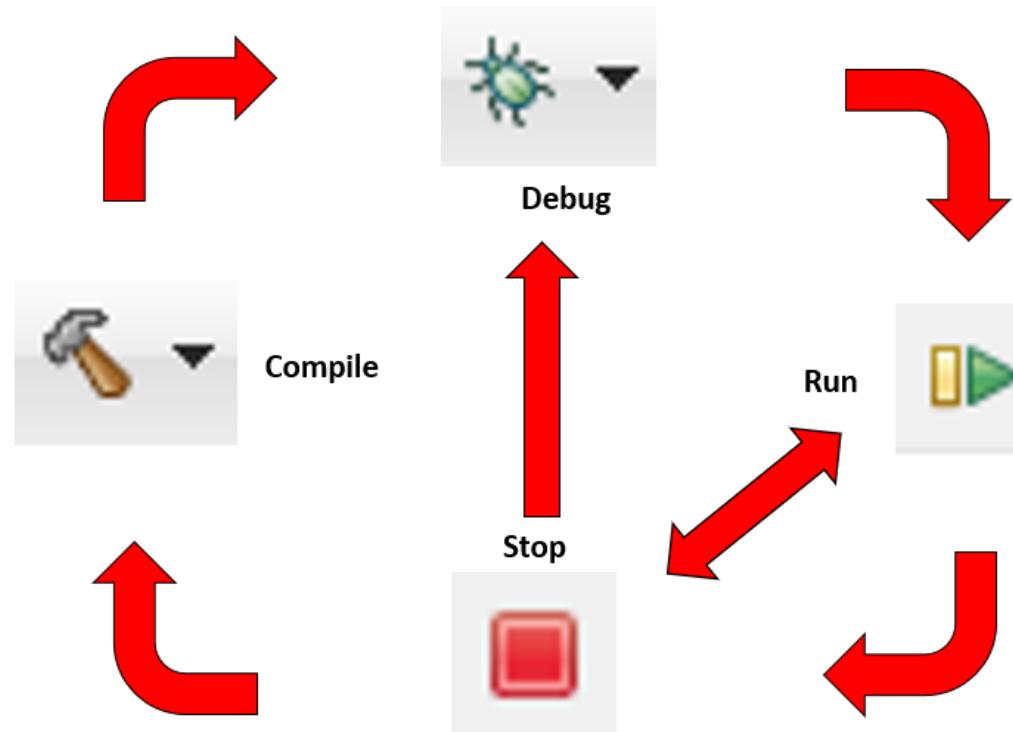


```
Getting Started *main.c
1 ****
2 /**
3 // The Ohio State University
4 // ECE 3567 - Microcontrollers Lab
5 // Autumn Semester 2019
6 // Instructor: Prof. Gregg Chapman
7 // Group # xxxx
8 // Name 1
9 // Name 2
10 // (MSP430FR6989 Launchpad) - Texas Instruments Corporation
11 // Code Composer Studio version 8.1
12 // (Filename).c or .h
13 // This module contains files necessary to ..... as part of Lab xxxx
14 //
15 ****
16
17 //***** Header Files *****
18
19 #include <driverlib.h>
20 #include "stdio.h"
21 #include "string.h"
22 #include "ECE3567.h"
23
24 //***** Definitions *****
25
```

DON'T LOSE POINTS!

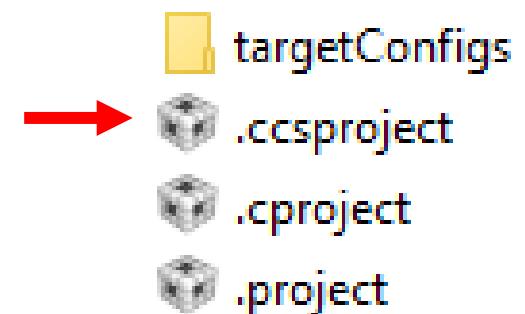
Code Composer Studio – Running the Project Code

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 
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)

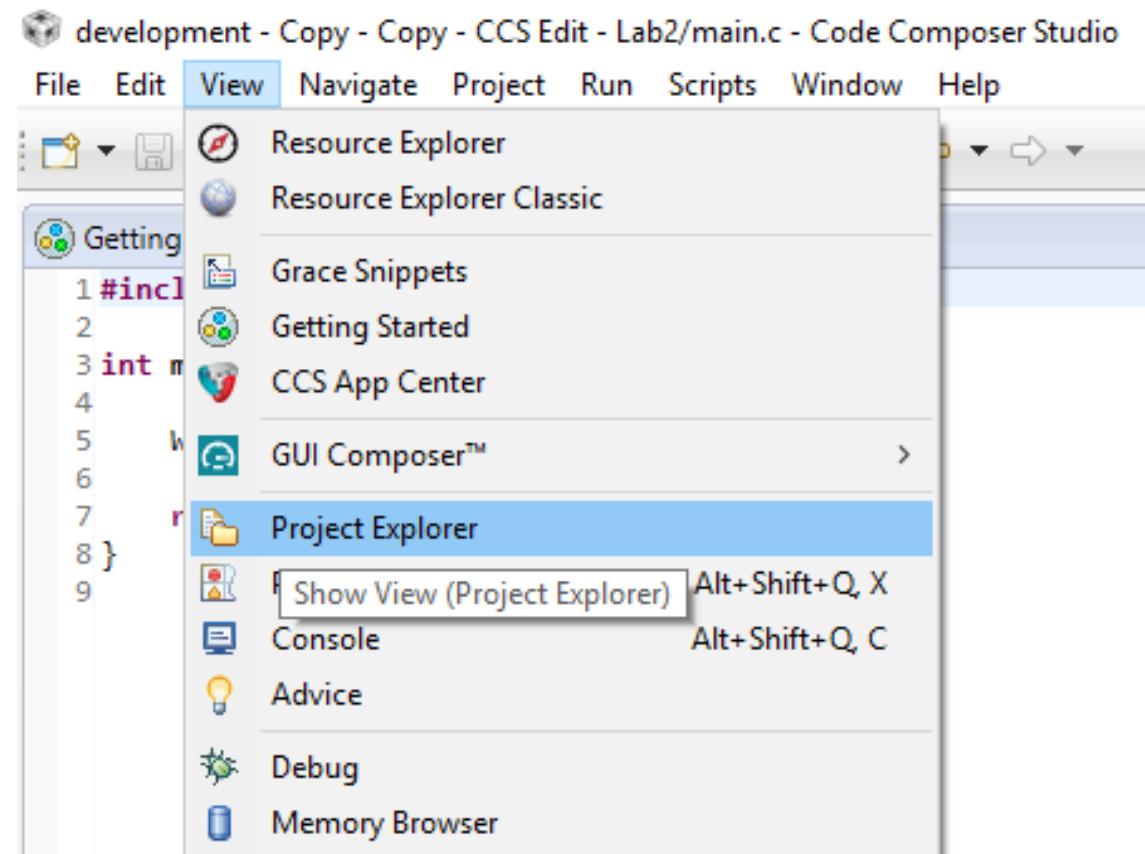
- This doesn't always work
- Make sure that the Workspace is set to your project location. To change it, select **File → Switch Workspace**, and navigate to the project location
- Double-click the **.ccsproject** ICON in the project folder
- If it doesn't work, try the Manual Method



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

If your project does not appear

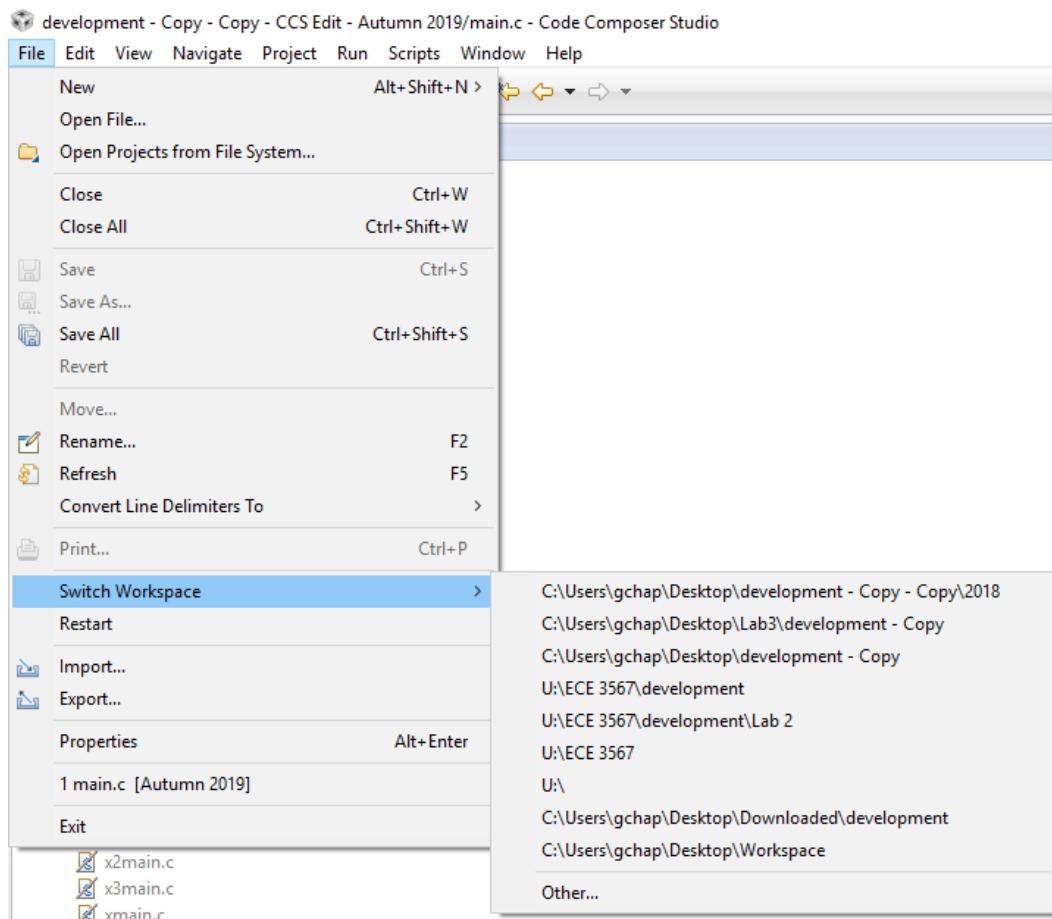
- Select **View → Project Explorer**



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

If you still don't see anything in Project Explorer

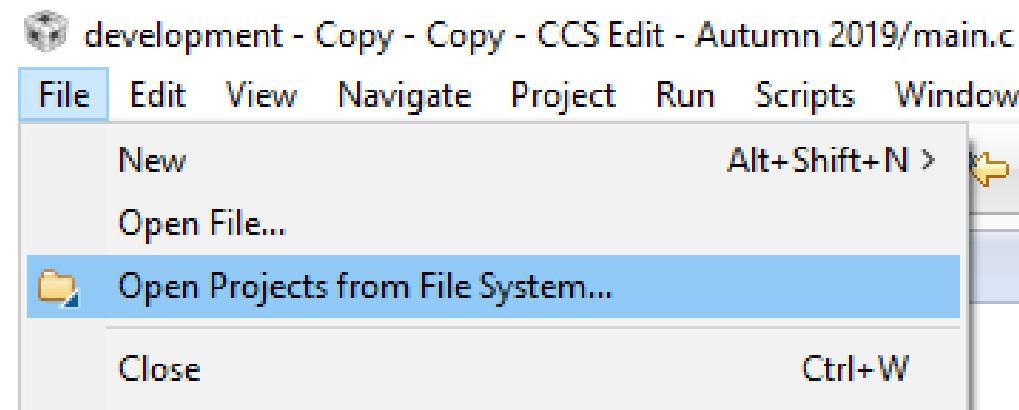
- Select **File → Switch Workspace**, and navigate to the project location



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 if they are not correct.

Change Workspace

1. Select **File → Switch Workspace → Other**
2. Enter the new workspace. **Always select the file ABOVE your Project file that CCS created. This is usually your current Workspace folder.**

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“

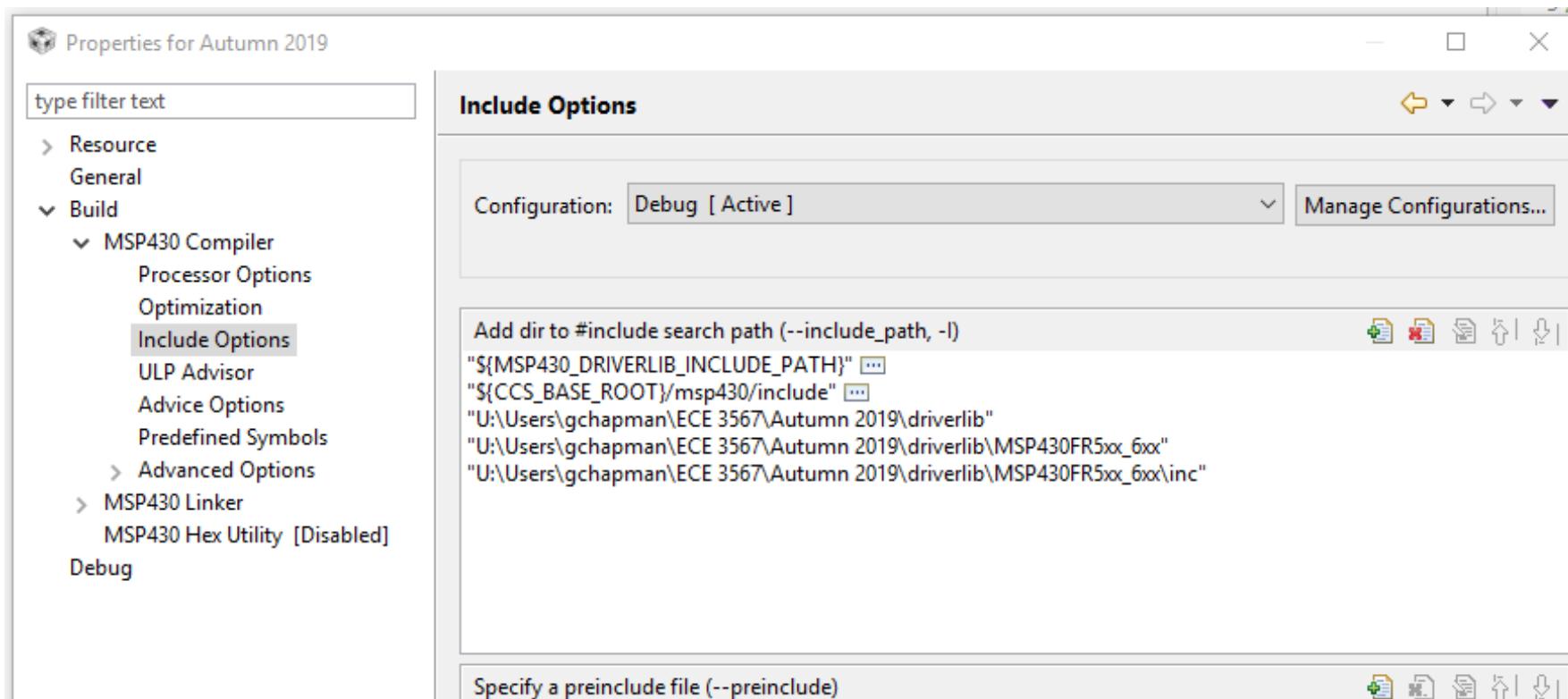
“U:\<your path>\<your project name.\driverlib\MSP430FR5xx_6xx\inc“

NOTE: DON'T copy my path format, this is on my computer at home.

4. Use the  ICON to add path

5. Delete old paths to same folders using  ICON

6. When finished, click OK



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.
REBUILD PROJECT.

ERROR: Cannot open source file “driverlib.h” (*You may not have selected ‘Empty Project with Driverlib Source’ when you set up the project!*)

Solution: MANUALLY 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 **ALL THREE** new paths:

.../ driverlib
.../ driverlib/MSP430FR5xx_6xx
.../ driverlib/MSP430FR5xx_6xx/inc

Code Composer Studio - Watch Window

Note that, unlike the TI C2000 series (ECE 2050). 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 if the Debugger is halted.

1. Select View → 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

Note: The debugger cannot always set a breakpoint on a selected line. If you get a compiler error, select another line of code.



```
101
102 //***** Enables all Configured Interrupts *****
103 _enable_interrupt();
104 //***** THE MAIN INFINITE LOOP *****
105 while(1)
106 {
107 //    ramp();
108 if(Command_Flag==1)          // A USCI_A1 ISR occurred and a Command was r
109 {
110     Command_Handler(length);
111     parse_Command();
112 }
113 if(ISR_Flag==1)  // Timer A0 has occurred. Used to set the Temperature u
114 {
115     ISR_Flag = 0;
116     _enable_interrupt();
117     if(RC_Control == TRUE)
118     {
119         RC_Voltage();
120     }
121     if((LED_Test == TRUE) && (LED_Control == TRUE))
122     {
123         update_RGB();
124     }
125 }
126 }
127 }
128 //***** END of main.c *****
```

Serial Communications via UARTs

Setting up the Terminal Window

(for Lab 5 – Serial Communications)

Code Composer Studio – The Terminal Window

1. View → Terminal

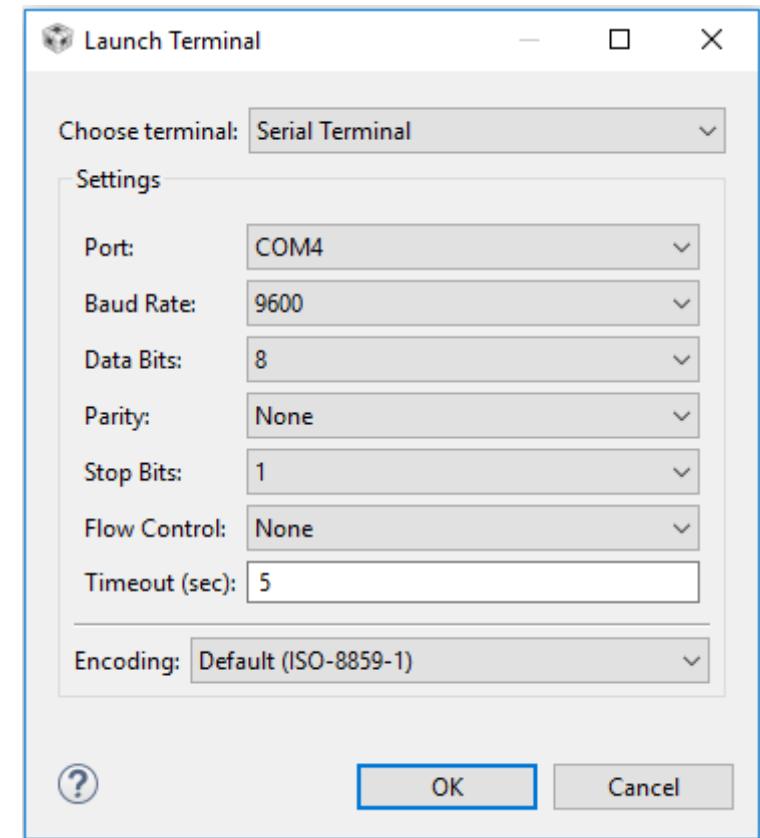


2. Click on the  ICON to launch the terminal. The Launch Terminal window should open:

Choose the Serial Terminal to switch to the proper settings

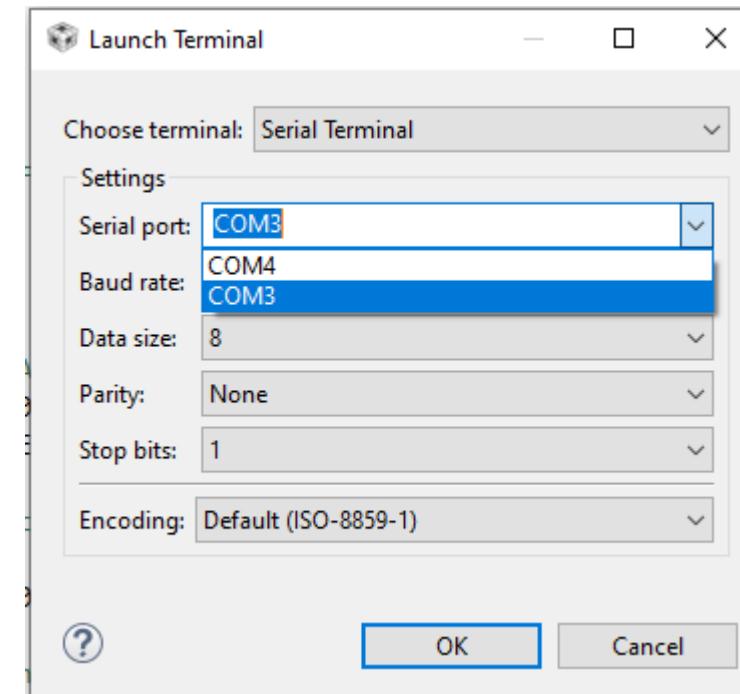
3. The pulldown menu for Port should list the available COM ports. If these end up not working, you will have to resort to the process on the following slide to discover the COM ports
5. If not already the default settings, select: Baud Rate – **9600**, Data Bits – **8**, Parity – **None**, Stop Bits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

6. Select OK



Finding an Available COM Port

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



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.

```
C:\Users\gchap>MODE

Status for device COM4:
-----
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
XON/XOFF:     OFF
CTS handshaking: OFF
DSR handshaking: OFF
DSR sensitivity: OFF
DTR circuit:  ON
RTS 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

- When you run the ECE 3567 Project program in Lab 5, 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 in Lab 5

Introduction to Lab 1

Lab 1 – Blinking LEDs

Goals:

- 1) Learn to set-up a new Project in Code Composer Studio
- 2) Learn 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 if you do not watch and understand the Lab 1 Video.

Lab 1 - Schematic

