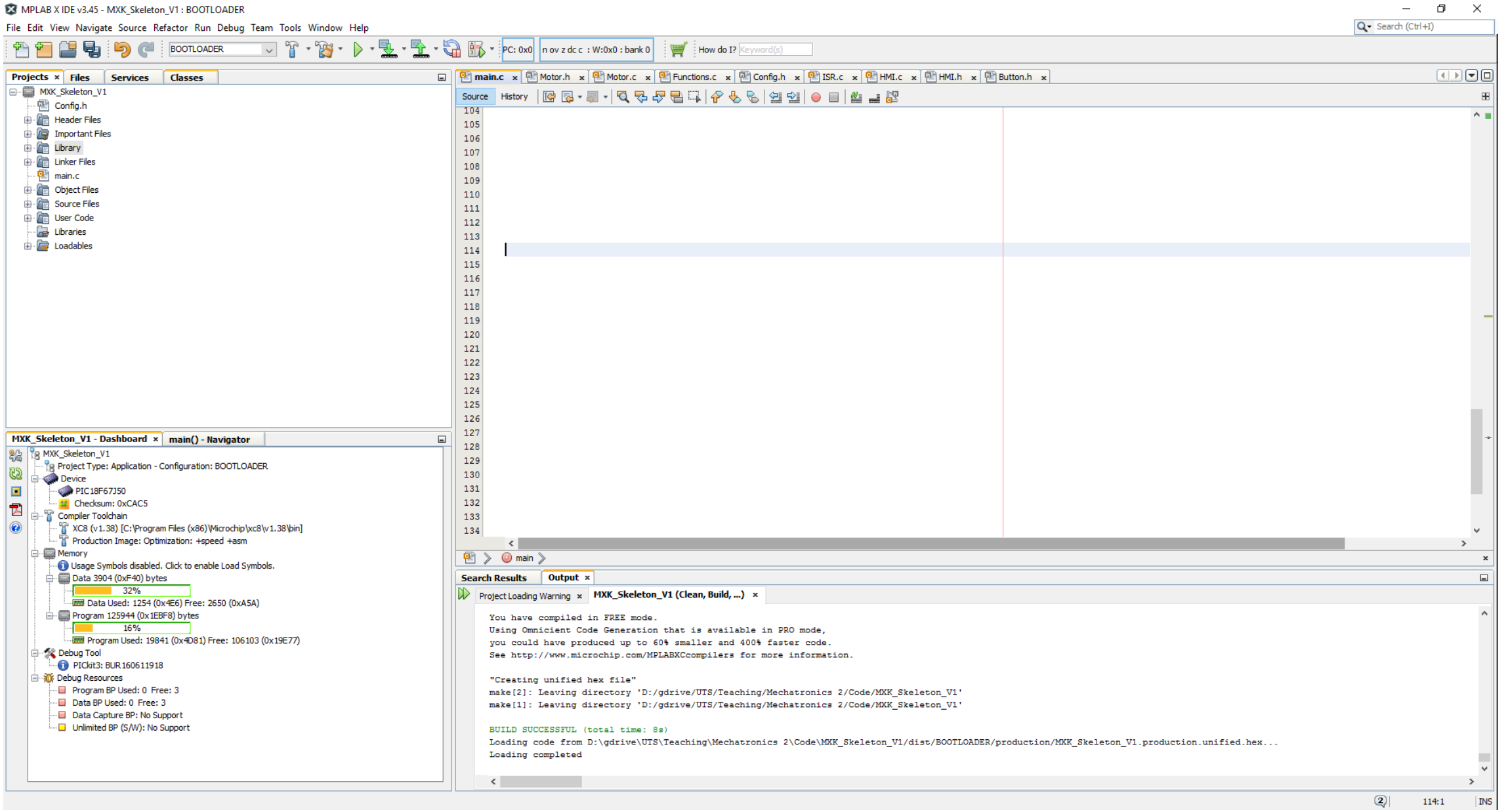
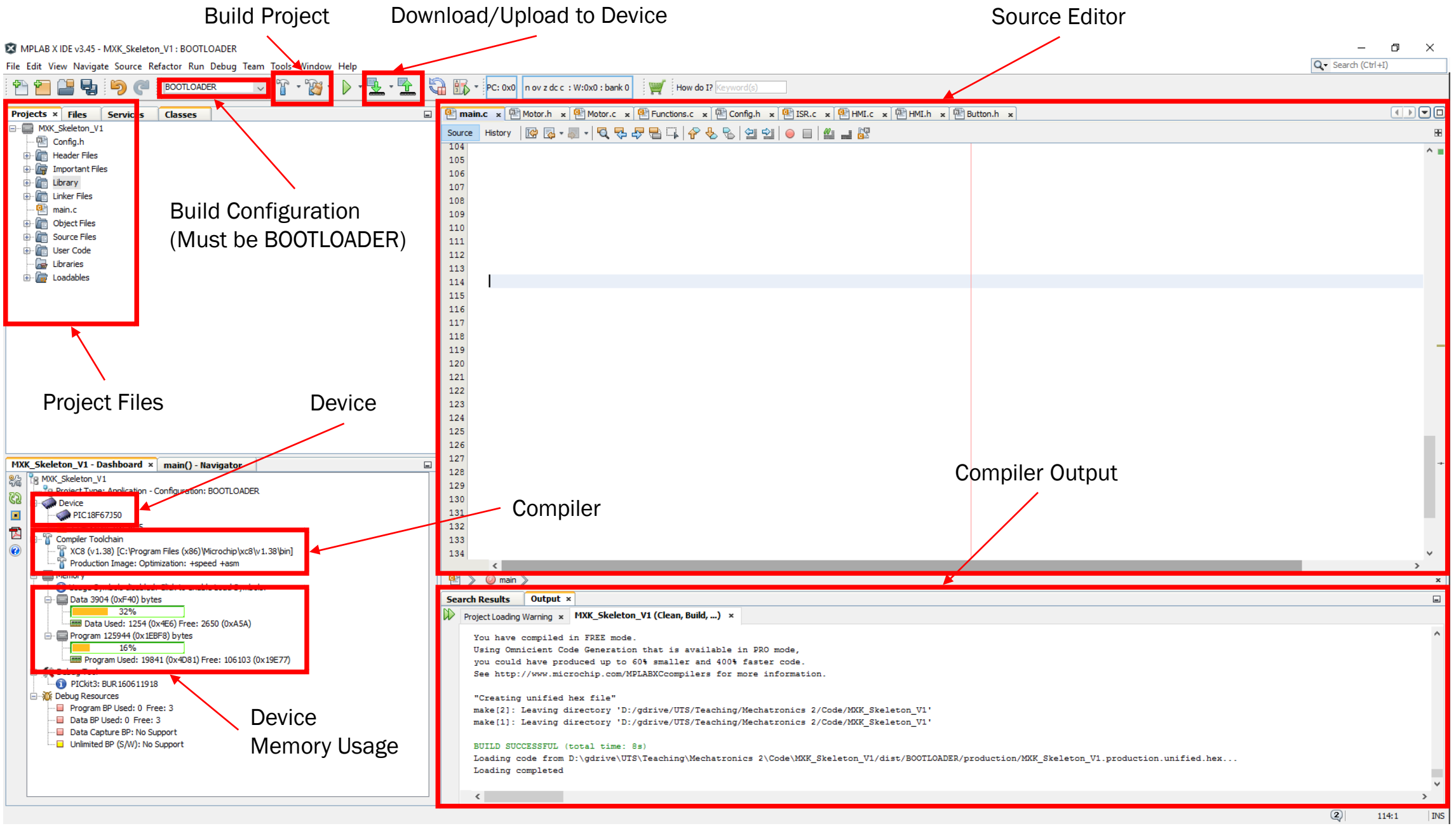
EMBEDDED C

Mechatronics 2

MPLAB X

- Integrated development environment for embedded devices i.e. an all in one toolset for programming PIC microcontrollers
- Can be used with different compilers and languages (such as MPASM assembly or XC8)
- Can compile and write HEX files directly to embedded devices and even perform debugging with the correct hardware (such as a PICKit3)
- Available for free from: http://www.microchip.com/mplab/mplab-x-ide


MPLAB X IDE v3.45 - MXK_Skeleton_V1 : BOOTLOADER
File Edit View Navigate Source Refactor Run Debug Team Tools Window Help
BOOTLOADER
Projects
Files
Services
Classes
MXK_Skeleton_V1
Config.h
Header Files
Important Files
Library
Linker Files
main.c
Object Files
Source Files
User Code
Libraries
Loadables
MXK_Skeleton_V1 - Dashboard
main() - Navigator
Project Type: Application - Configuration: BOOTLOADER
Device
PIC18F67J50
Checksum: 0xCAC5
Compiler Toolchain
XC8 (v1.38) [C:\Program Files (x86)\Microchip\xc8\v1.38\bin]
Production Image: Optimization: +speed +asm
Memory
Usage Symbols disabled. Click to enable Load Symbols.
Data 3904 (0xF40) bytes
32%
Data Used: 1254 (0x4E6) Free: 2650 (0xA5A)
Program 125944 (0x1EBF8) bytes
16%
Program Used: 19841 (0x4D81) Free: 106103 (0x19E77)
Debug Tool
PICkit3: BUR160611918
Debug Resources
Program BP Used: 0 Free: 3
Data BP Used: 0 Free: 3
Data Capture BP: No Support
Unlimited BP (S/W): No Support
main.c
Motor.h
Motor.c
Functions.c
Config.h
ISR.c
HMI.c
HMI.h
Button.h
Source
History
Search Results
Output
Project Loading Warning
MXK_Skeleton_V1 (Clean, Build, ...)
You have compiled in FREE mode.
Using Omnicient Code Generation that is available in PRO mode,
you could have produced up to 60% smaller and 400% faster code.
See http://www.microchip.com/MPLABXCcompilers for more information.
"Creating unified hex file"
make[2]: Leaving directory 'D:/gdrive/UTS/Teaching/Mechatronics 2/Code/MXK_Skeleton_V1'
make[1]: Leaving directory 'D:/gdrive/UTS/Teaching/Mechatronics 2/Code/MXK_Skeleton_V1'
BUILD SUCCESSFUL (total time: 8s)
Loading code from D:\gdrive\UTS\Teaching\Mechatronics 2\Code\MXK_Skeleton_V1/dist/BOOTLOADER/production/MXK_Skeleton_V1.production.unified.hex...
Loading completed
114:1
INS


Build Project
Download/Upload to Device
Source Editor
MPLAB X IDE v3.45 - MXK_Skeleton_V1 : BOOTLOADER
File Edit View Navigate Source Refactor Run Debug Team Tools Window Help
BOOTLOADER
Projects
Files
Classes
MXK_Skeleton_V1
Config.h
Header Files
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Linker Files
main.c
Object Files
Source Files
User Code
Libraries
Loadables
Build Configuration
(Must be BOOTLOADER)
Project Files
Device
MXK_Skeleton_V1 - Dashboard
main() - Navigator
Device
PIC18F67J50
Compiler Toolchain
XC8 (v1.38) [C:\Program Files (x86)\Microchip\xc8\v1.38\bin]
Production Image: Optimization: +speed +asm
Compiler
Compiler Output
Data 3904 (0xF40) bytes
32%
Data Used: 1254 (0x4E6) Free: 2650 (0xA5A)
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Program Used: 19841 (0x4D81) Free: 106103 (0x19E77)
PICkit3: BUR160611918
Debug Resources
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Data Capture BP: No Support
Unlimited BP (S/W): No Support
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Memory Usage
main.c
Motor.h
Motor.c
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ISR.c
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Loading code from D:\gdrive\UTS\Teaching\Mechatronics 2\Code\MXK_Skeleton_V1/dist/BOOTLOADER/production/MXK_Skeleton_V1.production.unified.hex...
Loading completed
114:1
INS

Task Preparation

- Download task skeleton file from:
  UTSOnline > Subject Documents > Week 3 > **MX2_W3_Skeleton.zip**
- Download the HMI User Guide from:
  UTSOnline > Subject Documents > Week 3 > **HMI_User_Guide.pdf**
- Unzip folder and open project in MPLAB X
- Open **main.c** and read through the commented code
- Go to page **11** of the **HMI User Guide** and read through each of the function descriptions

Programming

- Click **Clean & Build Project** from the top menu in MPLAB X
- Open the **HIDBootloader.exe** program (available from MXK Online) and load the file: [*YourProject*].X\dist\BOOTLOADER\production**[*YourProject*].X.production.hex**
- Hold down the **TST1** button on the microcontroller module then press the **RST1** to place the board into bootloader mode
- Click “Erase/Program/Verify”
- Click “Reset Device” to exit bootloader mode and start your program
- Note: Do **NOT** use [*YourProject*].X.production.**UNIFIED**.hex

Task 1

- (Simple): Write your name to the LCD screen
- (Advanced): Write your name to the LCD screen with each letter a different colour

- Note:
  - *Choose the functions you think you will need to use from the user guide*
  - *Make sure your input parameters are the correct data type for each function*
  - *Break the problem down into smaller problems and test your code frequently*

Task 2

- (Simple): Print your birth year to the seven segment display
- (Advanced): Display a counter that counts up by 1 every second on the seven segment display

- Note
  - *The seven segment display must be ‘rendered’ every loop iteration*

Task 3

- (Simple): Display the current button states on the LCD screen
- (Advanced): Change the colour of the LCD screen depending which button is pressed
- (Boss): Left and Right buttons change background colour while Up and Down buttons change text colour

Week 4 Preparation

- Ensure you have the following equipment for class:
  - *Stepper Motor*
  - *Stepper Motor Module*
  - *9V battery + clip-on battery leads OR alternative 9-12V DC source to power stepper motor*
- Ensure you are comfortable with all of the tasks covered this week
- Read through the week 4 content when it is released

See you next week!

Image References

- https://digitalsynopsis.com/wp-content/uploads/2015/03/web-designer-developer-jokes-humour-funny-41.jpg