Lab 1 Experiencing the Development Environment

In this lab, you are going to explore and get familiar with the program development environment.

Working Environment

In this course, you are going to study structured programming using C++. To facilitate your program writing and compilation, an Integrated Development Environment (IDE), called Visual Studio (VS) Code, will be used. An IDE is a type of computer software that assists programmers in writing and managing source codes and programs. VS Code allows programming in various popular languages, including C++, C#, Java and Python. It can be used in Windows, macOS and Linux, with a slightly different setup (Refer to Appendix A).

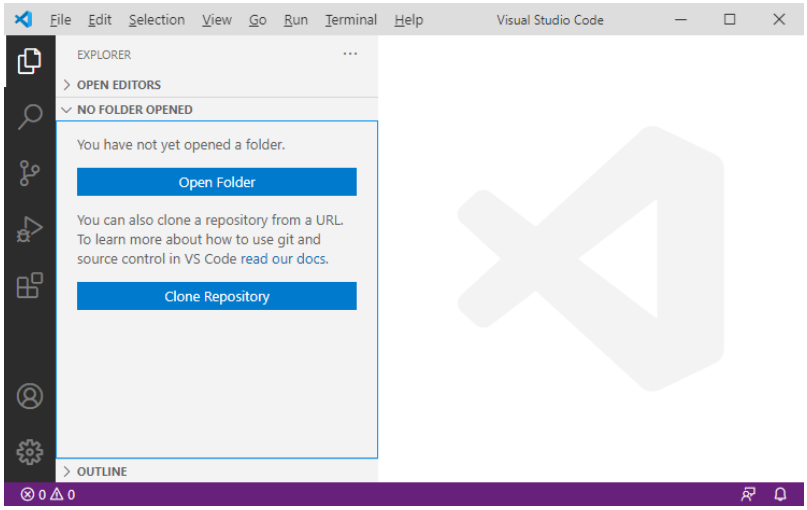
For all the instructions in the labs, we will assume a Windows environment.

Note: You may use other IDEs to write programs in this course. However, to ensure consistency in assessments, make sure all of your work can be compiled in VS Code with GCC C++ compiler (g++) and GDB debugger from mingw-w64 in Windows or Clang in Mac.

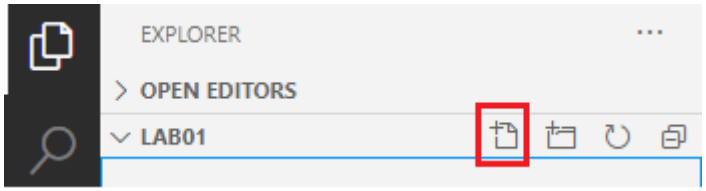
Task 1 Experiencing the Environment

It is better to create an empty folder in your local hard disk (e.g., D:\COMP1011) for storing your programs and data.

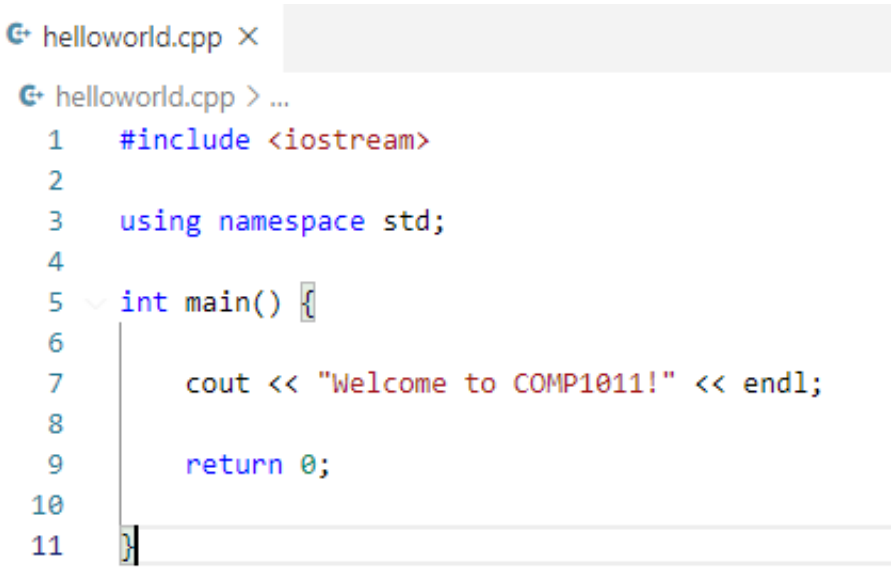
1. Create a folder named “Lab01” in “D:\COMP1011”.
2. Open Visual Studio Code.
3. In the “Explorer” Tab  , click “Open Folder” and choose “C:\COMP1011\Lab01”.



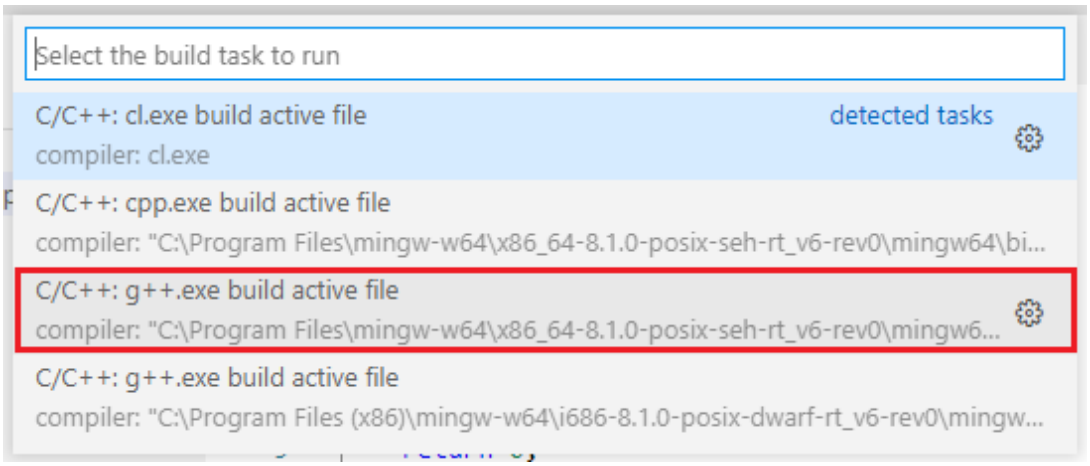
4. An entry "LAB01" is created. Create a New File.



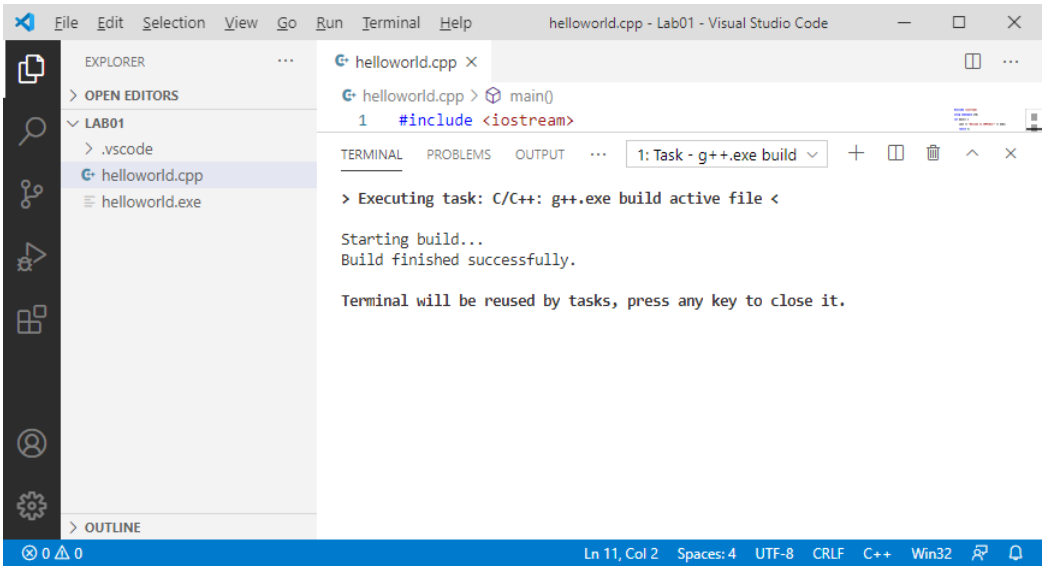
5. Type the file name as "helloworld.cpp".
6. On the right-hand side, you should see the code editing panel. Type the following:



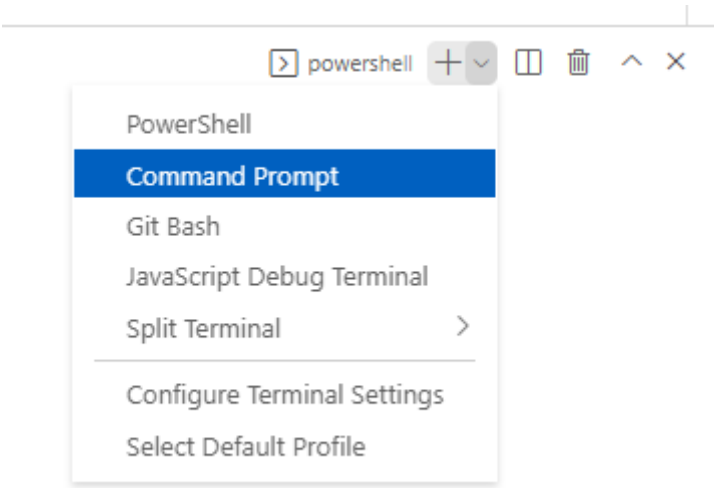
7. To compile the file and build the executable file, select "Terminal" → "Run Build Task command" from the main menu, or press the keyboard shortcut, Ctrl + Shift + B. This will display a drop-down list with various compiler task options. Choose "C/C++: g++.exe build active file".



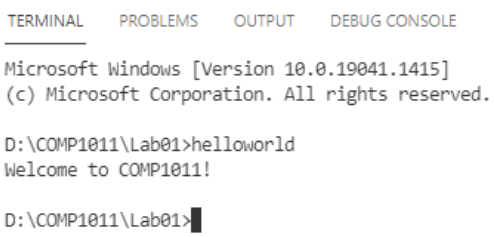
8. If there is no syntax error, you will see the following at the bottom panel. ("No news is good news" applies for compilation.)



9. In the Terminal panel, in the menu on the right-hand side, click "v" near the "+" button and select "Command Prompt". A new console will be shown.



10. Type "helloworld" to run the program.



11. You can also run the program by choosing "Run" → "Start without Debugging", or press the keyboard shortcut, Ctrl + F5. [Remarks: Choose "C++ (GDB/LLDB) for the first time" and then "g++.exe"]
12. You can also compile, build and run your program at the same time by pressing Ctrl + F5.

Task 2 A C++ Program

Modify the code in Task 1, change "`main()`" to "`test()`". Compile and run the program.

[Question: What can you see? Why?]

Task 3 Text Output

Write a program that prints *your name and email address* on the screen. A sample output is shown below:

```
D:\COMP1011\Lab01>Lab_01_T3
Dennis Liu
ywliu@polyu.edu.hk
```

Task 4 Syntax and Logical errors

The formulas below show how to calculate the volume of a sphere (1) and surface area of a sphere (2):

$$V = \frac{4}{3}\pi r^3 \quad (1)$$

$$SA = 4\pi r^2 \quad (2)$$

where *V* is the volume of a sphere, *r* is the radius and *SA* is the surface area of a sphere.

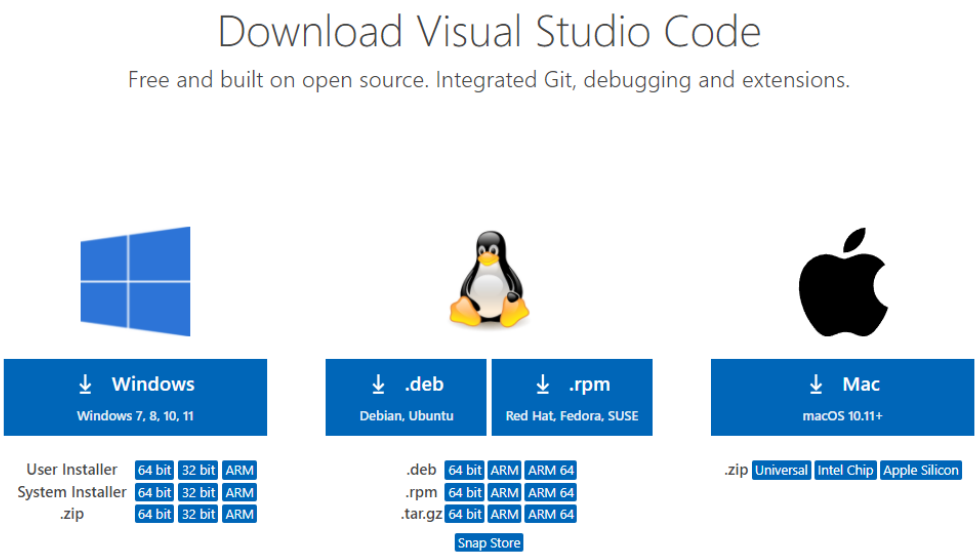
Compile the following program:

```
#include <iostream>

using namespace std;

int main() {
	double radius = 11;  /* centimeters
	double pi  = 3.14
	double sphere_volume = (4/3) * pi * (radius * radius ** radius);
	double surface_area = 5 * pi * radius;
	cout << "Volume = " < sphere_volume;
	cout << "Area = " << surface_area;
	return 0;
}
```

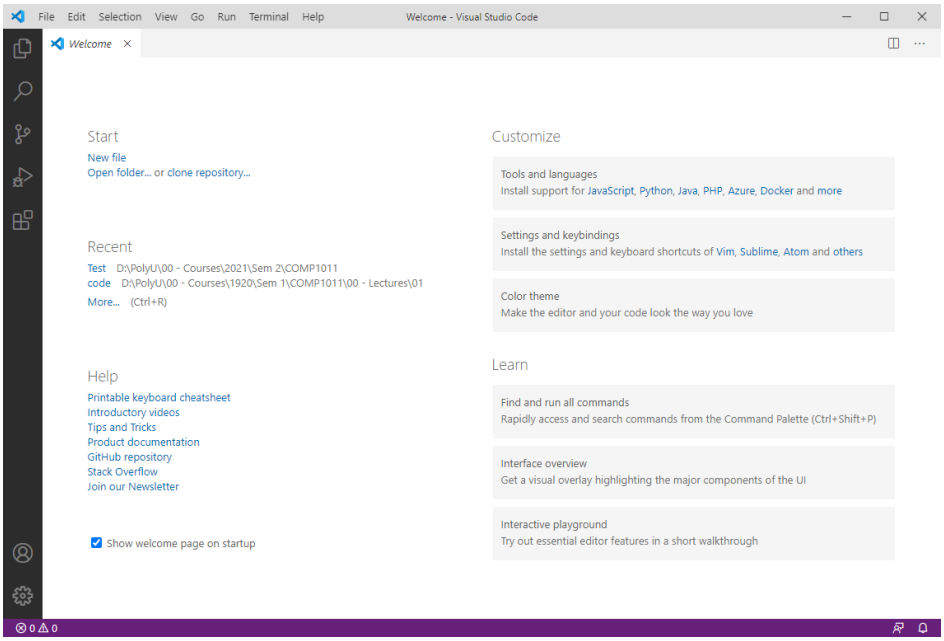
[Question: Can it be compiled? If not, what is the error message? Fix the errors. Does the program output the correct calculation results? If not, fix the errors. Are you able to distinguish between syntax errors and logical errors?]

Appendix A Installation of Visual Studio Code (For Windows User)

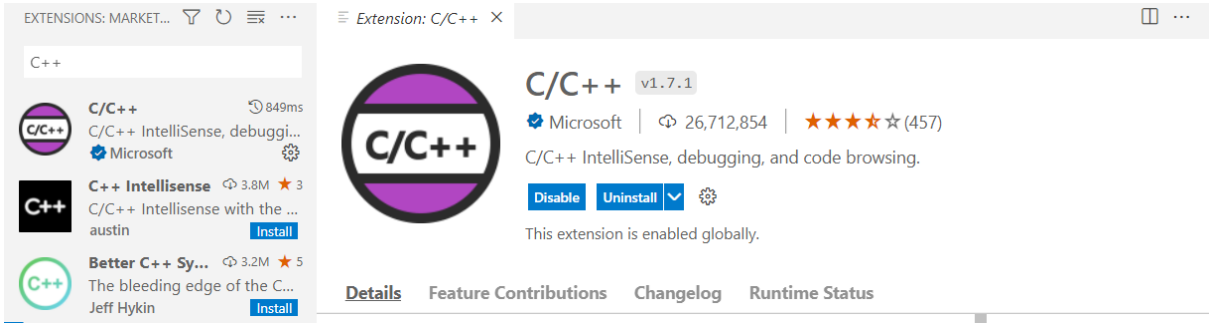
1. Visit [Download Visual Studio Code - Mac, Linux, Windows](#).
2. Click “64 bit” of “User Installer”. Download and run the installation program.



3. Install VS Code using default settings and launch it.

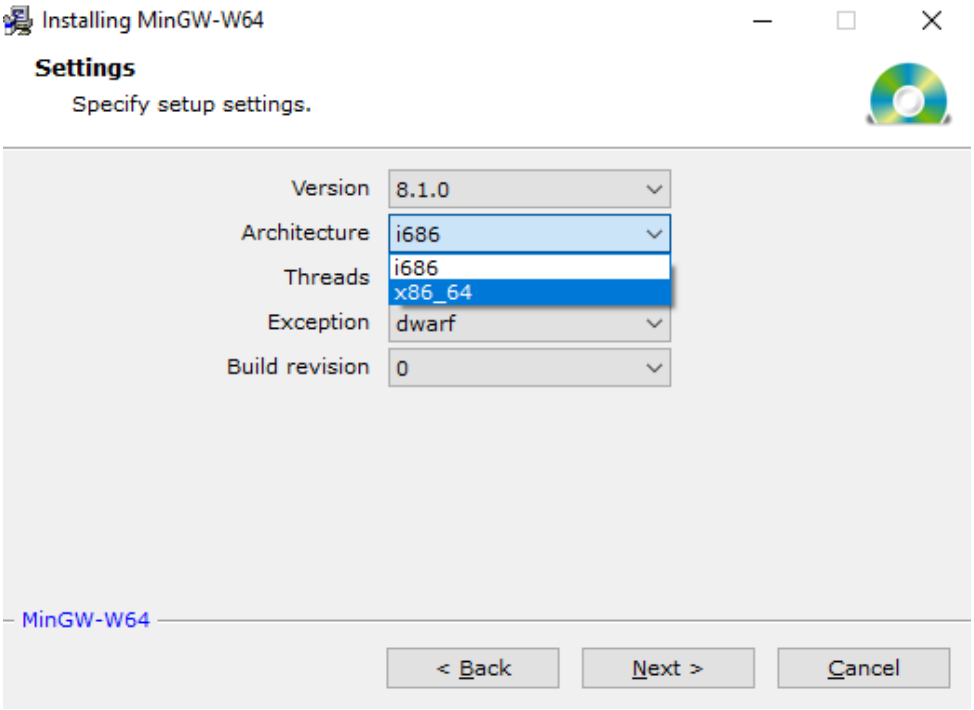


4. Select the Extensions view icon  on the Activity bar or use the keyboard shortcut, Ctrl + Shift + X).
5. Search for “C++”.
6. Select “Install”.



7. VS Code is essentially an editor, but does not include a C++ compiler or debugger. Go to Mingw-w64 to download and install the Windows Mingw-w64 installer.

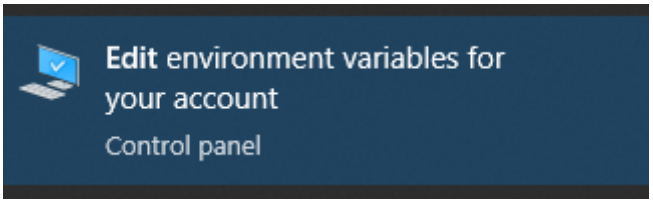
8. For *Architecture*, select *x86_64* and then select *Next*.



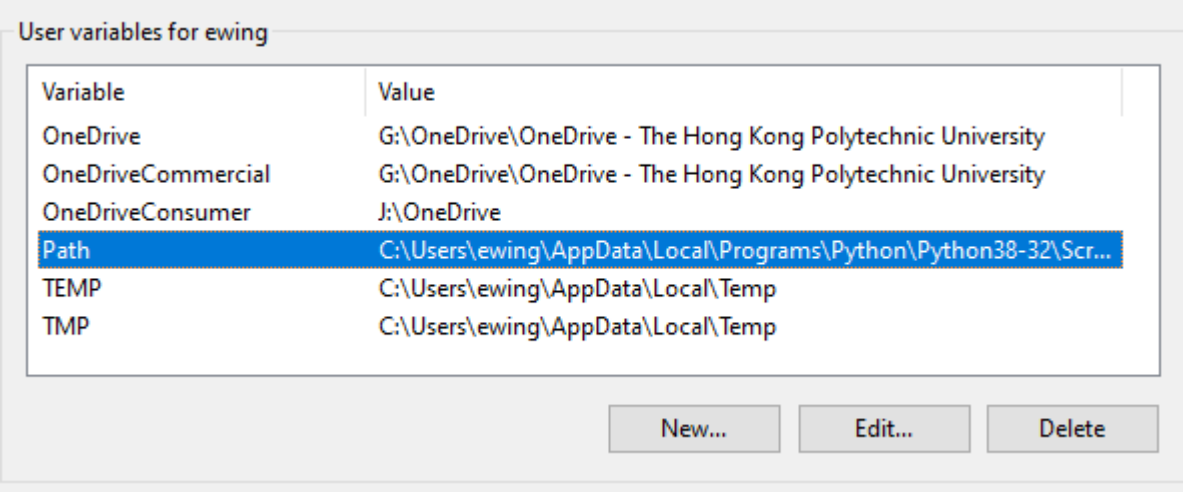
9. Complete the installation using default settings.

10. Add the path to your Mingw-w64 *bin* folder to the Windows *PATH* environment. In the Windows search bar, type “settings” to open your Windows Settings.

11. In Windows search, look for **Edit environment variables for your account**.



12. Choose the *Path* variable and then select *Edit*.



13. Select *New* and add the Mingw-w64 destination folder path. The exact path depends on which version of Mingw-w64 you have installed and where you installed it. If you used the settings above to install Mingw-w64, the path should be like: *C:\Program Files\mingw-w64\x86_64-8.1.0-posix-seh-rt_v6-rev0\mingw64\bin*.
14. Select *OK* to save the updated *PATH*. You will need to reopen any console windows for the new *PATH* location to be available.
15. To check that your Mingw-w64 tools are correctly installed and available, open a new Command Prompt and type **g++ --version**. You should see the following message.

```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows [Version 10.0.19041.746]
(c) 2020 Microsoft Corporation. All rights reserved.

C:\Users\ewing>g++ --version
g++ (x86_64-posix-seh-rev0, Built by MinGW-W64 project) 8.1.0
Copyright (C) 2018 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
```

For macOS users, download the macOS version of VS Code in Step 2 (64-bit deb) and install the IDE based on the default settings. For the installation and configuration of the compiler, follow the steps in [Configure VS Code for Clang/LLVM on macOS (visualstudio.com)]. (Up to the section "Debug helloworld.cpp")