

January 18, 2024

Computational Methods in Physics: APHY 577 / 477(Y)

LECTURE 01

*Let us do intros: Name?
* +year/status, why taking?*

Important Questions

- ⦿ Do you need the oral 'Y' requirement?
- ⦿ Who knows computer programming?
 - Which language(s)?
 - How much experience?
- ⦿ Who does *not* have access to a laptop?
 - Have it w/ you today? If not use a desktop machine
 - What operating system is on it?
 - Which plotting software do you use?
- ⦿ How many of you got my e-mail to all??
- ⦿ Next, let us all go over the syllabus...

3 Steps to HWs in This Course

- ⦿ Something you use to write your code
- ⦿ Something to *compile* your code into an *executable*
 - “Computer program” can refer to either your raw source code or the executable
- ⦿ In many cases, you want to make a graph of your results: something versus something or a histogram, et al.
 - Creating a simple plot of data
 - Occasionally a table or just one number

Help Getting Set Up (1 plus 2)

Informal “HW #0” (not graded): You MUST be set up by class on Thursday

Jan. 25th

- For users of Windows machines (PCs) but also anyone:
- Code Blocks (word processing AND compiling in one) <http://www.codeblocks.org/>
- Install --
https://www3.ntu.edu.sg/home/ehchua/programming/howto/CodeBlocks_HowTo.html
- another option: FREE (for students) the latest version of MS Visual Studio (TA will help you)
 - <https://code.visualstudio.com/download>

Alternatives: (1) Word Processors

- ◉ **Linux/Unix: emacs**, vi/vim, pico

- <http://www.gnu.org/software/emacs/tour/>
- <http://www.openvim.com>
- <https://www.cs.colostate.edu/helpdocs/pico.html>

- ◉ **Mac**: Xcode graphical user interface or same as above in Terminal (Unix)

- <https://developer.apple.com/xcode/> (free!!!)

- ◉ **Windows**: Microsoft Visual Studio OR install a Unix shell wrapper such as **Cygwin**, VirtualBox, or Gow and use Unix

- <https://cygwin.com/install.html> (free!!!)

if links don't work, type out by hand

(2) Compilers (Largest Hurdle?)

- **Linux/Unix**: can use gcc or g++ natively (*best* option but rare laptop OS)
- **Mac**: Xcode graphically or clang or gcc or g++ in Terminal (very close 2nd place)
 - <https://developer.apple.com/xcode/> (free)
- **Windows**: Microsoft Visual Studio OR install a Unix shell wrapper like Cygwin, VirtualBox, or Gow and use gcc or g++ (Windows is most work...)
 - <https://cygwin.com/install.html> (no charge)

(3) Plotters

- Excel of course (not the best) for PC, Mac
- gnuplot (free!!) for any operating system
 - <http://www.gnuplot.info>
 - Warning that command line based, not GUI!
- **KaleidaGraph** for PC/Mac (student license)
 - <https://www.synergy.com/free-trial/>
 - Excel on steroids (custom functions for example)
 - A free but 30-day student demo/trial available
- ROOT (for Windows, Cygwin is the easiest)
 - <https://root.cern.ch> (partially GUI) (uproot, pyroot)

My way: Unix, emacs. Commands

- ◉ Quick reference “Cheat sheets” for either Linux (Unix), Mac (Terminal), Win (Cygwin)
- ◉ Unix
<https://ubuntudanmark.dk/filer/fwunixref.pdf>
- ◉ emacs
<https://www.gnu.org/software/emacs/refcards/pdf/refcard.pdf>

Your Very First Program

- ⦿ Live demo on my machine, Apple laptop
 - 10.14.6 (Mojave, an early 2015 version of OSX)
 - I will use emacs, g++, and Excel (or KGraph)

[Time Permitting]

- ⦿ <http://plotdigitizer.sourceforge.net> (all systems)
 - Automated version

More Resources for Learning C, C++

- ◉ <http://www.angelfire.com/art2/ebooks/teachyourselfcplusplusin21days.pdf>

<http://101.lv/learn/C++/>

- ◉ <https://www.whbell.net/resources/HepCppIntro/HepCppIntroGuide-2009-06-03.pdf>

- See syllabus for your recommend textbook (also, I use C a lot, old school, precursor to C++, and mix)

- ◉ Just use Google for even more assistance!

- Including searching the *exact phrase* of any error messages you get as you are working

stack overflow is your best friend!

More Links of Use

● How to make a histogram

- <https://support.microsoft.com/en-us/kb/214269> (for multiple different versions of Excel)

- <https://www.synergy.com/documentation/>

(search the word *histogram*; you can also just take note of example in class)

- <http://gnuplot.sourceforge.net/demo/histograms.html>
- In ROOT
 - <https://root.cern.ch/root/html/doc/guides/users-guide/Histograms.html>



https://en.wikipedia.org/wiki/Random_number_generation

Getting Linux ~Directly onto Windows (Ubuntu flavor by default)

- <https://www.howtogeek.com/744328/how-to-install-the-windows-subsystem-for-linux-on-windows-11/>
- NOT the same as “dual booting.” A lot easier
- Specifically for Windows 11. For ≤ 10 , try my earlier suggestions like Cygwin and Code Blocks and Visual Studio (or VS Code)

If All Else Fails: god bolt

- ◎ <https://github.com/compiler-explorer/compiler-explorer>
- ◎ <http://godbolt.org/>
- ◎ <https://godbolt.org/z/dYajnsYEn>
- ◎ NOT a replacement for having your own local compiler though, realistically

How to Make Plots in ROOT

- ◎ <https://root-forum.cern.ch/t/reading-an-ascii-file-and-make-a-graph/15988>