Physics 305 *Computational Physics*

Spring 2020 Prof. Veronica Bindi

Course syllabus

Texts:

- *Computational Physics: Problem Solving with Computers by Rubin Landau, Manuel Paez, & Christian Boredeianu (2nd EDITION, not 1st)*
- *C++: A Beginner's Guide*, 2nd Edition by Herbert Schmidt
- T*he C Programming Language* by Brian Kernighan and Dennis Ritchie

Instructors:

Veronica Bindi and Matteo Palermo

Schedule:

Class meets Tuesday 12:30 -3:20 pm and Wednesday 1:30 - 3:20 pm in Watanabe 415A (NW corner of Watanabe 4th floor)

Office hours:

By appointment, send an email to bindi@hawaii.edu or mpalermo@hawaii.edu

Course Format:

This is a combination of a lecture and laboratory course. Lecture notes will usually be distributed to the students in electronic format with supporting detail. You will spend significant amounts of your time working on computers, including a lot of time beyond our normal class hours. Much of the course work will be based on web tutorials, so you will also be able to do

much of the work on other computers, including your home desktop or laptop. *Tutorials and direct support will be only for a linux environment. Therefore, if you are running Windows, you will need to install a linux-like environment on your computer. Please do that before the first day of class.*

To have linux in a virtual machine for windows/Mac go to:

https://www.virtualbox.org/

Grading:

There are no formal exams — that means, no midterms or final exam (per se) in the course.

Your grade is thus primarily determined by the quality and timely completion of the course assignments and final project. The course assignments involve 1-2 weeks mini-projects in which you will be presented with a computational problem, to be solved through a C/C++ program and analysis of its results, and summarized (both graphically and textually) in a short report, which will be graded. For each assignment, a substantial portion (half) of your grade depends on the written report that summarizes that assignment.
Assignment, reports [60-70%]

All assignments are due in 1st ten minutes of class on due date, unless you have a doctor's note or something comparable. Late assignments lose 25% of the credit per day late — that is, if you turn it in within 24 hrs after the due data and time, you get 3/4/ credit, two days late, 1/2/ credit etc.

Final project [40-30%] (A computational physics project of your own choosing).

Attendance is not directly graded, but unless you are an exceptional student, **your grade will suffer** from not coming to class. There are many things I will cover in class on the fly as questions come up, and you will miss out if you are not there.

Note that this is a 4-credit-hour course and your level of effort will be expected to match that

Writing Intensive aspects:

Like many UH courses, Physics 305 is “writing intensive (WI);” that is to say, it satisfies your WI requirements, fulfilling one of your 5 WI courses.

To satisfy the WI requirements, each lab assignment will require a brief report of typically 3-4pp including graphics/figures. The total lab assignment will be 8. To do well on these reports, you will have to strive to make them complete and coincise, describing clearly the problem you attempt to solve and the results of your efforts, whether or not the outcome met the expectations. We will learn to develop graphics and plots to support these reports. Before the first assignment, the instructor will show one or more examples of reports. Each one composed of abstract, introduction, data analysis, results, conclusions and bibliography. In addition, each assignment will be graded and given back to you with feedback and suggestions about how to improve. The final project is a written assignment of 6-8pp including graphics/figures on a physics problem of your own choice.

These reports will emphasize scientific writing and format, with content reflecting your computational physics research results.

Because this is a WI course, a “substantial part” of your grade must depend on your writing, that is the purpose of your reports. Therefore the combined writing in your lab reports and final report will comprise about 50% of your grade.

Programming:

Programming experience is not a pre-requisite. We will program (and learn to program) in the C/C++ language.

We will use computers (including your own if you so choose) which are running the **linux operating system.**

You may use your own laptop for much of the work in the course, but if it is not running linux you will need to figure out a way to run applications that approximate what we require. There are several ways to do this and we will help you figure out the best one for your case.

Learning Outcomes:

At the successful completion of the course you will able to:

Develop computational algorithms that adapt numerical methods to solving problems in theoretical, applied and experimental physics.

Create your own C/C++program to implement this algorithm, debug, compile, and run it, producing data which can then be used to assess the results of applying your algorithm.

Write a concise scientific report summarizing your computational physics results and graphics.