Physics 305 *Computational Physics*

Spring 2017 Prof. Peter Gorham

Course syllabus [pdf version of this page]

Recommended 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

Also very useful for new programmers:

- *The C Programming Language* by Brian Kernighan and Dennis Ritchie

Instructor:

- Prof. Peter Gorham, office: 324 Watanabe, phone 956-9157, fax 956-2930

Schedule:

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

Office Hours:

- By appointment , send me email at gorham @ phys dot hawaii dot edu (without the spaces)

Course Format:

- This is a combination of a lecture and laboratory course; note **that this is a 4-credit-hour course** and your level of effort will be expected to match that. Lecture notes will usually be available as a web tutorial with supporting detail. You will spend significant amounts of your time working on the 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.
- *However, you may need to install a linux-like environment on your computer if you are running Windows.*

Grading:

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

there may be quizzes on occasion to help motivate good attendance (and thus quizzes are more likely when it is apparent that absences are excessive).

- 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 week mini-projects in which you will be presented with a physics 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. **A substantial portion (half) of your grade for each assignment depends on the written report that summarizes that assignment, as discussed in the next section.**
- Assignments, reports [60-70%], quizzes [0-10%].
- 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 date and time, you get 3/4 credit, two days late, 1/2 credit, etc. Quizzes will be typically later in the course periods for those who have time conflicts.
- Final Project [30%] (A computational physics project of your own choosing)
- Attendance is not directly graded (except for the effect of quizzes), 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.

Writing Intensive aspects:

- **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 requirement, each lab assignment will require a brief report of typically 3-4pp including graphics/figures. To do well on these reports, you will have to strive to make them complete and concise, describing clearly the problem you attempted to solve and the results of your efforts, whether or not the outcome met your expectations. We will learn to develop graphics and plots to support these reports.
- **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.**

- Your reports will be reviewed and returned to you with comments intended to improve the quality of your reports, with specific emphasis on helping you to sharpen your skills in scientific writing, which often differs from other genres. Comments will address these differences in a constructive manner, and if necessary I will meet with you to discuss these in greater detail.

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 be 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
- Create computer-generated graphics to help display and disseminate your results
- Write a concise scientific report summarizing your computational physics results and graphics.

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