

Computational Physics I (PHY 4610 or 4611) Fall 2009

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Course: PHY 4610-001
Time: M-W 9:00am-11:00 am
Room: NC 3604
Textbook: *Numerical Methods for Physics*, by A. Garcia
Optional texts: *Numerical Recipes*, by W. Press et al.
A MatLab Reference book **OR**
A FORTRAN reference book **OR**
The language of your choice reference book

Description:

This course is a senior level, one-semester treatment of the topic of Computational Physics. Its prerequisites are Waves and Vibrations (PHY 2711), Modern Physics I (PHY 2811), and Differential Equations (MATH 3420). A strong background in computer programming is also very useful even though a programming course is not a formal prerequisite. This course is fundamentally a mathematical physics course concentrating on problems that can not be solved (easily or at all) by analytic techniques. It is not a programming course; we will be concentrating on mathematical techniques for solving complex physical problems, not programming languages, syntax, data structures or programming best-practices. You are free to use any language, meta-language or analysis package you like. Some computational resources are provided in the laboratory (mainly MATLAB) but you can use anything you are familiar with or perhaps would like to learn better. You will also be making plots of your code's output so familiarity with a graphing program or package would also be useful, as there will be no formal instruction on using these programs.

Grades:

Your grade will consist of your performance on 6 computational physics projects, You will be allowed to make up one of your projects during the last week of the semester in case you missed one or to improve the grade you received. Projects are due at the end of the day (defined as 5pm) on the day listed in the class schedule. You will be docked 10% for each day the project is late for up to 4 days (Friday of that week) after which you will receive no credit for the project.

Although you can discuss the projects with your fellow students, the work you turn in must be solely your own. Anyone caught plagiarizing any aspect of the projects will fail the course and a formal report of the incident will be sent to the Judicial Affairs office of your school. Plagiarism in senior level courses, carries very stiff penalties including expulsion. It is simply not worth risking this as a college senior.

The course grade is not “curved” in the traditional sense as the performance of your peers will have no bearing on your grade. Final course grade is will be as follows:

100% - 90%: A

89% - 75%: B

74% - 60%: C

59% - 45%: D

If your accumulative score is less that 45% you will fail the course. If you have any questions about the grading policy make sure you get them answered in the first couple weeks of class.

Additional Information:

Although Computational Physics I is only a two unit class that meets once a week, it can be very time consuming based on your levels of mathematical proficiency and programming experience. This course can be reasonably compared to Junior Lab (PHYS 4711) and Senior Lab (PHYS 4721) in that a great deal of time is spent getting things to work outside of the lecture portion of the class. As mentioned above, this course is a senior level physics course, with computation at the post MATH 3420 level, used as the tool for solving otherwise unsolvable physics problems. It is not uncommon for student to spend up to 10 hours a week outside of class to do these projects. This is a considerable commitment so make sure you can allocate at least the minimum time required. Some students require considerably more time to digest and comprehend the material and do the required programming. Only you can gauge how much more time your may require to succeed in this course. It is of the utmost importance to keep up with the lectures and assignments throughout the semester. Many of the projects build on previous projects so completion of a project is extremely important, even though you may have to turn it in late. Questions on any aspect of the material covered are welcome in class and in office hours but are most effective if the reading has been done beforehand.

General Guidelines Department of Physics

Described below are some general school and departmental policies of which you should be aware. This is not necessarily a comprehensive list. You should read your Student Handbook and Course Catalog for further information on these or other issues. Questions may be addressed to a faculty member or the *department chair*.

Students with Disabilities (both MSCD and UCD students)

Students with disabilities who may need academic accommodations should discuss options with their professors during the **first two weeks of class**.

Incomplete Grades (both MSCD and UCD students)

At the discretion of the instructor, an incomplete (I) may be assigned when a student is unable to take the final examination and/or cannot complete all of his/her out-of-class assignments due to unusual circumstances such as hospitalization. At the discretion of the instructor, incomplete work is made up during the time specified by the instructor. If the work is not made up within the time specified (not more than one year) the grade is converted to a failure (F). The (I) notation may not be awarded in self-paced classes. In any circumstance where an incomplete (I) is desired, a contract between the student and instructor outlining the work and timetable is required.

Withdrawal / Drop Policy (MSCD and UCD students)

Students wishing to drop courses must see the Student Handbook and Course Schedule for appropriate timelines and deadlines, as well as for descriptions of requirements for re-taking courses. See below for discussion of cases when signatures are required. Note that time frames appropriate to the full semester courses are applied to modular courses, weekend courses, workshops, and summer terms.

Signatures (both MSCD and UCD students)

In some instances (e.g. withdrawal from a course after a specified date, etc.) the signature of your professor may be required. You are responsible for understanding when a signature is required, as outlined in your Student Handbook and/or Course Catalog. If a signature is required, you are advised to obtain the signature during office hours or by appointment **well before the necessary deadline**.

Conflicts

If there exist conflicts (i.e. with exams, field trips, or other activities) due to religious or other unusual circumstances, you must inform the professor during the first two weeks of class to discuss if any accommodations will be made.

Tentative course schedule (subject to revision)

Week	Date	Chap.	Topics	Due
1	17-Aug	----	Introduction to Comp. Phys	
2	24-Aug		PROJECT #1: Monte Carlo Integration	
3	31-Aug		follow up lab session	
4	7-Sep		LABOR DAY	
5	14-Sep		PROJECT #2: ODEs	PROJ 1
6	21-Sep		follow up lab session	
7	28-Sep		PROJECT #3: ODEs II	PROJ 2
8	5-Oct		follow up lab session	
9	12-Oct		PROJECT #4: PDEs	PROJ 3
10	19-Oct		follow up lab session	
11	26-Oct		PROJECT #5: PDEs II	PROJ 4
12	2-Nov		follow up lab session	
13	9-Nov		PROJECT #6: PDEs III	PROJ 5
14	16-Nov		follow up lab session	
15	23-Nov		FALL BREAK	
16	30-Nov		Make Ups	PROJ 6
17	(TBA)		Make Ups	
Finals				MKUPs