# PHYS 4840: Mathematical & Computational Physics II

## General Information

Instructor: Daniel Dale
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E-mail: ddale@uwyo.edu
Website: physics.uwyo.edu/~ddale/teach/12_13/p4840
Lecture: TR 11:00-12:15 pm, CR 207
Text: Numerical Methods for Physics, 2nd edition, by A. L. Garcia

### Course Content

In this course we will learn how to write scientific programs to solve physical problems, and to comment upon the accuracy, stability, and precision of an algorithm. There will be frequent computing assignments. I have placed sample codes written by the textbook author in C++, FORTRAN, and MATLAB at the above course website.

### Class Meetings

Since ideas and definitions from the text will be used freely in class, it is necessary for you to read and study the assigned chapters before class. To promote interesting and relevant in-class discussions, we will experiment with a pedagogical technique called "Just-in-Time Teaching." Students will respond to a question posted before lecture, but far enough in advance such that depending on the responses, the classroom activities can be better tailored to meet student needs.

I have specifically avoided titling this section "Lecture." I prefer "Class Meetings" because research on science teaching has shown that the standard "sage-on-the-stage", one-way communication format is not the most effective learning environment. Thus, in addition to lecturing and developing the Just-in-Time Teaching technique, we will also try a mixture of seminar-type discussions, lab sessions, and conceptual questions. Please help me in determining an effective mix.

### Grading

Homework will be accepted up to 48 hours late, but with a 25% penalty. The tentative distribution is 65% for homework and 35% for (the two) exams. A "curve" will be used to assign letter grades. This does not necessarily mean that a full spectrum of grades will be given; if everyone does A work, then everyone will get an A.

### Homework

Assignments will be posted on the course website and will consist of several textbook problems due approximately every two weeks. Homework should be packaged as a 'tarball' or zip file and either emailed to me or placed in your home directory on our Linux network. Homework should include *electronic* copies of your code and output. The output might be text, numbers, or plots. Please do not send scripts that require me to run your code. Finally, for each homework set you should turn in a sheet of paper with your name on it for grading purposes.

### Just-in-Time Teaching

As alluded to above, we will experiment with a technique that fosters better lecture preparation for both teacher and student. Questions will be posed via email. It is your responsibility to respond by the advertised deadline.

**Academic Honesty**
Academic honesty develops trust and respect between faculty and students, ensures fair and effective grading, and creates an environment that fosters learning. Although you are encouraged to study together with other students, any assignments, exams, and lab submissions must be your own work unless you have been directed by your instructor to work together. Academic dishonesty is defined in University Regulation 802, Revision 2 as "*an act attempted or performed which misrepresents one's involvement in an academic task in any way, or permits another student to misrepresent the latter's involvement in an academic task by assisting the misrepresentation.*" There is a well-defined procedure to judge such cases, and serious penalties may be assessed.

## Special accommodations
If you have a disability that will require special accommodations, please let the instructor know as soon as possible. Procedures are in place to address such needs and you should register with Disability Support Services (766-6189; udss@uwyo.edu).

## Expectations
Consider reading "A&S Students and Teachers—Working Together" found at www.uwyo.edu/as/_files/current/Students%20and%20Teachers%20Working%20Together.pdf. This useful set of guidelines was written by a faculty and student committee. It is a concise attempt to inform students of instructor expectations as well as what students may expect of teachers and advisors.

***What I expect from you:***
- To attend and participate in each class meeting. Please read the assigned sections in the text *before* the class in which they will be covered. It is your responsibility to obtain and understand the material presented, even if you are not in attendance due to illness or a University-sponsored activity.
- To make a good effort and to be prompt in completing homework assignments.

### *What you should expect from me:*
- To cover the material outlined.
- To administer at least three feedback questionnaires, to better gauge your needs.
- To encourage group learning in lecture with frequent conceptual questions to be discussed in small groups.
- To expeditiously grade and return your work.

## *Tentative* Class Schedule

| Week | Topic (and readings) | Notes |
|---|---|---|
| Jan 14-Jan 18 | Preliminaries (§ 1.1-1.5) | *National Dress Up Your Pet Day Jan 14* |
| Jan 21-Jan 25 | (continued) | *MLK Day Jan 21* |
| Jan 28-Feb 01 | Ordinary Differential Equations I (§ 2.1-2.2) | *Rattle Snake Round-Up Day Jan 28* |
| Feb 04-Feb 08 | (continued) | *Create A Vacuum Day Feb 4* |
| Feb 11-Feb 15 | Ordinary Differential Equations II (§ 3.1-3.3) | *White Tee-Shirt Day Feb 11* |
| Feb 18-Feb 22 | (continued) | *National Battery Day Feb 18* |
| Feb 25-Mar 01 | Solving Systems of Equations (§ 4.1-4.2) | *International Polar Bear Day Feb 27* |
| Mar 04-Mar 08 | (continued) | Exam 1 Mar 7 |
| Mar 11-Mar 15 | Analysis of Data (§ 5.1-5.2) | *Worship of Tools Day Mar 11* |
| Mar 18-Mar 22 | | *Spring Break* |
| Mar 25-Mar 29 | (continued) | *Something On A Stick Day Mar 28*<br>*Easter Break Mar 29* |
| Apr 01-Apr 05 | Partial Differential Equations I (§ 6.1-6.2) | *National Peanut Butter and Jelly Day Apr 2* |
| Apr 08-Apr 12 | Partial Differential Equations II (§ 7.1) | *Name Yourself Day Apr 9* |
| Apr 15-Apr 19 | Quadrature (§ 10.2)<br>(*tentative*) | *Garlic Day Apr 19* |
| Apr 22-Apr 26 | Stochastic Methods (§ 11.1-11.3) | *National Pigs In A Blanket Day Apr 24* |
| Apr 29-May 03 | (continued) | *National Honesty Day Apr 30* |
| May 06-May 10 | | Finals Week<br>Exam 2 May 9, 10:15-12:15 |