Physics 320 – Computational Physics

Wittenberg University
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http://userpages.wittenberg.edu/jwilliams/courses/Ph320/index.html

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Class Schedule:

Class Meetings: MWF 9:10 – 10:10 AM  Sci 315
Final: Tuesday, May 6, 2008  12:00 – 3:00 PM

Primary Text:

• At least three quadrille-ruled, bound lab notebooks.

Course Description

Wittenberg Catalog Course Description: Introduction to numerical methods in physics.

Prerequisites: Physics 220, Mathematics 202, and Computer Science 150.

This course is intended to provide you with an introduction to some of the computational techniques that are used in various fields of physics and not as an introduction to computer programming. Thus, it is assumed that you have some familiarity with programming and a basic level of competence in at least one programming language. You are welcome to use any programming language (i.e. C++, C, Fortran, Pascal, Python, etc.) or higher level program (Mathematica, MatLab, Octave, etc.) of your choosing. My programming history is somewhat limited, which will impact the level of support that I can provide. I have experience in C++, G (the language of LabVIEW), Mathematica and an assortment of scripting languages. I have minimal experience in FORTRAN and have recently begun playing with MatLAB, Octave and Python.

This can be a very challenging topic, but the techniques that we will discuss are a very powerful tool that allows one to gain insight into a wide range of problems across many areas of physics. As such, we will be covering a substantial amount of material in the coming weeks. What this means for you is that the pace of this course will be rapid and that it is imperative for you to keep up to date with the material. It also means that YOU must let me know if the pace is too fast (or slow).

The schedule will be determined and adapted to best fit your needs and interests.
Course Policies:

Attendance: Class participation and attendance are not mandatory and do not directly contribute to your course grade. However, much of what we discuss in class will be directly related to the work that you will be doing outside of class. Therefore, it is in your best interest to attend and be actively engaged in class. If you miss a class, it is your responsibility to get the assignments and to submit them on time.

Grade Determination: All assignments will be graded on an absolute scale. At the end of the semester, the absolute grades for the entire class may be normalized to determine each individual's final grade. The course grade will be determined using the following scheme:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>60%</td>
</tr>
<tr>
<td>Project</td>
<td>30%</td>
</tr>
<tr>
<td>Presentation</td>
<td>10%</td>
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Homework: Homework will be assigned throughout the semester and your solutions will due at the start of class on the due date. Your solutions will be returned to you later in the day and you will have a chance to revise your solutions. These revisions will be due at the start of the next class meeting. Each problem is worth 10 points, up to 5 points can be earned on your initial submission and the remaining 5 points can be earned in the revised submission. If your initial solution is complete, no revision will be needed and you will receive all 10 of the available points. Solutions will be posted after the final version has been submitted. Late solutions will not be accepted.

Since your solutions will involve code, plots of simulation results, as well as a discussion of the results and the relevant physics, you will be keeping your solutions in a lab notebook. We will discuss what this entails in class, but your notebooks need to be neat, organized and legible (typed or written in pen) with key results clearly labeled (boxed, highlighted, bold, etc.). You are expected to justify your answer by showing your work and by stating, in words, what you are doing. Full credit will not be given without some words describing the physics being used.

In addition to the homework solutions that you submit, it is expected that you will keep up with the course reading and are prepared for each class meeting.

Project: This is an opportunity for you to explore, in greater detail, a topic that is of interest to you. This can involve reproducing the results from a published paper or another topic that you are interested in. You need to identify a topic by the end of the second week and your results will be due at the end of the semester.

Accommodations: Any student with a documented disability who needs to arrange reasonable accommodations must contact each instructor at the beginning of the semester. Please contact Lisa Rhine, Assistant Provost for Academic Services at 937-327-7924 in room 208 Recitation Hall to coordinate accommodations and receive self-identification letters for each instructor.

Course Schedule:

There will not be a detailed course schedule for this course. In my experience, it is very difficult to stick to a course schedule in an upper-level course and these courses are much more enjoyable when there is greater flexibility in the choice of topics and the pace of coverage. As a result, the pace and content of the course will be determined as the course progresses. This means that you will have to be engaged with the course, providing feedback on what your interest are and if the pace of coverage is too fast (or slow).
Regarding Academic Honesty:

The important guiding principle of academic honesty is that you must never represent the work of others as your own. While it is expected that you will abide by the Wittenberg Honor Statement, the following guidelines should help govern your behavior in the course; please request clarification if you find yourself in any doubtful situations.

You are encouraged to seek assistance from the instructor, from your fellow students or from anyone you think would be useful with the homework and with preparing for class discussions. You are also encouraged to work with other members of your class on these assignments, as it is often very beneficial in the learning process. However, whatever you turn in MUST be your own work. Simply copying someone else's work is clearly a representation of work as your own and is a case of academic dishonesty. Exams must be entirely your own work. Detailed instructions will be given on the exams themselves and discussed in advance. No collaboration of any sort is allowed once an exam begins.

Useful Advice:

You will get more out of this course if you are actively engaged. To that end, below are a few pieces of advice.

1. If you are having trouble, ask for help. There are a number of resources available to you, including the office hours that are provided by the instructor, other faculty in the department and your peers.

2. Prepare for class by reviewing your class notes between lectures and reading the relevant portions of your text before coming to class, so that you can come to class prepared to ask questions.

3. The only way to learn physics is by doing it. This means that you should read with pen in hand to work out things described only briefly in the text or lecture and work extra problems if you need feel you need additional practice. I am happy to provide additional problems, if you let me know.

4. Don't spend more than a few hours on a single homework problem. If you are stumped, show clearly where you're stumped and then ask for help.

5. Peruse the posted solution to problems and exams.

6. Don’t get (too) frustrated if you are having trouble. Physics is hard. But, with practice and perseverance, it is all worth it.

As always, this syllabus is subject to change.