SYLLABUS
PHZ 5156, Computational Physics
Fall 2009
Prof. Patrick Schelling

Lecture: PL 101, Tues, Thurs 4:30-5:45pm
Office: PSB1 305 Phone: 407-882-1016
Email: pschell@mail.ucf.edu
Office hours: Mon, Tues, Wed 2:00-3:00pm
Midterm: Thursday October 22
Final: Thursday Dec. 10, 4:00-6:50pm

Required Book:

Suggested Books:


Numerical Recipes in Fortran 77 is available online at:
http://www.nrbook.com/a/bookfpdf.php

Grading:
Computer Projects + written homework: 50%
Midterm Exam: 25%
In Class presentation: 25%
I will use +/- grades. The following grading scale will be used:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>86-100</td>
</tr>
<tr>
<td>B+</td>
<td>81-85</td>
</tr>
<tr>
<td>B</td>
<td>76-80</td>
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<tr>
<td>B-</td>
<td>71-75</td>
</tr>
<tr>
<td>C+</td>
<td>66-70</td>
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<tr>
<td>C</td>
<td>61-65</td>
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<tr>
<td>C-</td>
<td>56-60</td>
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<tr>
<td>D</td>
<td>51-55</td>
</tr>
<tr>
<td>F</td>
<td>&lt; 51</td>
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This course is both an introduction to computational and numerical tools needed for physics, but also an opportunity to sharpen analytical skills. The class will be relatively evenly divided between numerical and analytical methods.

The numerical methods will be done using codes written in Fortran. In particular, we will develop the skills necessary to program in Fortran77. This is a somewhat outdated version of Fortran, yet it is a subset of more modern and widely used Fortran90. We will learn Fortran90 to some extent.

In addition to written homeworks, computer projects will form a major portion of the course. You can in some sense consider these to be research projects, where some portion of the work might involve looking up references and accessing journal articles from the web. The material that is handed in from a project will include a printout of the code, results, and a write-up.

Computer projects and written homework will be given at least every two weeks. All computer projects will be done as group exercises. Each student will present results of a longer group project as a short presentation towards the end of the semester. We will begin to work at larger projects after a few weeks into the course. There is a midterm, but the final exam will take the form of an oral presentation of results from a longer computational project. Homework and projects really comprise the bulk of the course, and attendance in class in absolutely essential. If you aren’t in class and your group hands in a project, you won’t receive credit. Also see the departmental policy on late work below.

The PL101 classroom is available after class for work on projects. If you need other time there, it can be arranged. However, we will try to use personal computers and laptops as often as possible. I will also create accounts on my group’s cluster for work. Please let me know if you need this assistance.

**Planned Topics:**
- Introduction to Fortran programming
- Modeling of data
- Ordinary Differential Equations
- Partial Differential Equations (PDE) in physics
- Matrix Algebra
- Fourier Transforms and Fast-Fourier Transforms
- Molecular Dynamics
Electronic Structure Methods
Monte Carlo Methods
Complex Variables

**Some possible planned projects include:**

- Tight-binding model of a simple crystal
- Phonon spectra of a lattice
- Thermodynamics of Ising model
- Quantum Monte Carlo estimate of ground state of helium atom
- Possibly some others...

**Missed Work, Makeup policy:**

*It is Physics Department policy that making up missed work will only be permitted for University-sanctioned activities and bona fide medical or family reasons. Authentic justifying documentation must be provided in every case (in advance for University-sanctioned activities). At the discretion of the instructor, the make-up may take any reasonable and appropriate form including, but not limited to the following: a replacement exam, replacing the missed work with the same score as a later exam, allowing a 'dropped' exam, replacing the missed work with the homework or quiz average.*

**UCF Golden Rule:**

Your work should be your own, although working with your classmates is encouraged. Compute projects are group projects, but you are expected and required to participate and understand the work of your group.

Academic cheating and dishonesty will not be tolerated. As graduate students in science, the highest standards of honesty are essential. If cheating or dishonesty occurs, it will be handled according to the UCF Golden Rule. Please familiarize yourself with these rules. Cheating may result in failure or even expulsion.

http://www.goldenrule.sdes.ucf.edu/
http://www.goldenrule.sdes.ucf.edu/2e_Rules.html