SYLLABUS

Physics 5071: Computational Physics

Fall 2016

Instructor: Prof. Charlotte Elster
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Class Info: M,W,F 8:35 - 9:30 am, Clippinger 133 and 257(W)
T 10:30-11:30 am, Clippinger 354

Office Hours: W 10:30-11:45 am, and by appointment

Course Web-Site: *www.phy.ohiou.edu/˜ elster/phys5071/*

Recommended Texts:
Computational Physics 1st ed by Rubin H. Landau, Manuel J. Paez,
e-book, library Ohio University
Computational Physics 2nd ed by Rubin H. Landau, Manuel J. Paez,
Cristian C. Bordeianu
Numerical Recipes 2nd Edition, W.H. Press, et al. in Fortran 77
additional texts and reference material on class web-site
www.phy.ohiou.edu/˜ elster/phys5071

Course Objective:
Computational physics is now widely accepted as a 'third' discipline in physics, equally valid and complementary to the traditional experimental and theoretical approaches to physics. The course intends to show how numerical methods are used to solve the problems physicists face.

The students are introduced to the process of approaching problems from a computational point of view:

- Understanding the physics and
- describing it in mathematical terms,
- manipulating the mathematics to the point where a numerical method can be applied,
- obtaining a numerical solution, and
- understanding the physical problem in term of the numerical solution that has been generated.
- Are able to clearly communicate employed techniques and interpretation of results.

During the course the students will be introduced to the different computational facilities available in the department and learn their elementary use.
During the first half of the course students will be introduced to a variety of computational

methods, like differentiation, integration, monte carlo methods, differential equations, linear algebra methods, and will be able to estimate computational errors. In the second half those methods will be applied to problems common to quantum mechanical situations. E.g. each student should be able to numerically solve the Schroedinger equation for a given potential and determine e.g. its bound state solutions.

Additional Expectations:

- Homework and help material are available on-line. It is expected that students will review the relevant sections in the textbook or the additional references.
- It is expected that students familiarize themselves with the additional material at the beginning of each week, since the class will refer to it, and not go through all details.
- Please arrange to obtain computer access either on helios, and the PC lab.
- It is expected that all codes turned in properly run on the *Sunstudio 12 Compiler* provided on the computers in the PC lab.
- Homework and help material are available on-line. It is expected that students will review the relevant sections in the textbook or the additional references.

Attendance: You are expected to attend every class, and are responsible for all material presented there. At the class sessions, you should be have prepared the assigned reading material. If you need to miss a class, please notify Prof. Elster in advance.

Collaboration: With the exception of exams, students are encouraged to collaborate with others for this course. However, verbatim copying of other's work without due understanding will be considered a form of academic dishonesty.

Workload: Due to its nature this is a demanding course. Students are expected to commit adequate time and effort in attending the class sessions and returning the assignments on time. In doing so, they may easily spend in excess of 10 hours/week on course-related work. Students expecting an A in this course hence must guarantee this level of commitment or may expect a lower grade in failing to do so.

Academic Honesty: You will be expected to exhibit professional integrity and ethical behavior in this course. Any exceptions to this could result in an "F" for the course and a referral to the OU judiciaries. Academic dishonesty includes, but is not limited to, the following examples: permitting another student to plagiarize or cheat from your work (Cheating implies dishonesty or deception in fulfilling academic requirements. Plagiarism involves the presentation of some others person's work as if it were the work of the presenter), submitting an academic exercise (written work or computer code) that has been prepared or created totally or in part by another (this also refers to material obtained from web-sources), acquiring improper knowledge of the contents of exams, using unauthorized material during an exam.

Assignments: Each week there will be a homework assignment due **electronically**, uploaded as tar-ball to your helios account by 8:15 am on Monday mornings. Since a

computer script will pick up your homework at 8:15 am, you need to make sure that your files are in your account by that time, and have in mind that file transfer depends on network speed, and you initiating your transfer at 8:15 will not guarantee that the file is at its destination at the same time.

Before you start, create a a directory *Homework* in your home directory on **helios** (*mkdir Homework*). You will copy all your homework during the course in the specified format to be picked up by me. I will run a shell-script on the specified due date for your homework at 8:15 am and pick up your file. If your homework file does not have the specified format, the script will not be able to pick it up, and your homework will not be delivered to me on time. **All** homework assignments **must** be called *assignX.tar*, where X is the number of the assignment. Please remember, my script is case sensitive. See the handout *guide1.pdf* for more details.
Each assignment is worth 10 points.

Exams: There will **two** exam projects, the first in the week of October 3, 2016, and one in finals week. Each exam project is worth 20 points.

Grading: Problem sets and small projects worth 10 points each, Midterm and Final project 20 points each. Passing the class requires more than 50% of the total points. Letter grades will be given according to the following general guide:
A $>$ 90%, B $>$ 75%, C $>$ 60%, D $>$ 50%

Contingency Plans: In the event of a major campus emergency, course requirements, deadlines, and grading percentages are subject to changes that may be necessitated by a revised calender or other circumstances beyond he instructor's control. I will make sure this information is communicated through e-mail.

Drop/Add: See the *Changing Class Schedule* policy in the OU Catalog. Makeup work may not be provided for past-due assignments when adding after the first day of classes.