COURSE TITLE:

Introduction to Computational Physics

CALENDAR ENTRY:

Physics 210. (3) *Introduction to Computational Physics* — Introduction to UNIX/Linux; software tools for processing, fitting and displaying data; numerical methods and applications in the physical sciences. *Prerequisites*: one of PHYS 102 or PHYS 108 or SCIE 001. *Corequisites*: one of MATH 221 or MATH 223. [2–3–0; 0–0–0]

TIME AND PLACE: Lecture: Henn 201 - Tue & Thu 12:30-13:30;
Laboratory A: Henn 205 - Tue & Thu 13:30-15:30.
Laboratory B: Henn 205 - Tue & Thu 15:30-17:30.

WEB SITE: http://musr.physics.ubc.ca/p210/

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OFFICE HOURS: Between Lecture and Lab, or by appointment.

MARKING:

ITEM	MARKS
Assignments	30
Participation	15
Proposal	5
Project	40
Presentation	10
TOTAL	100

TEXTBOOK: Various on-line documentation, tutorials, blogs, wikis and help files.
You need not spend any money on dead trees for this course.

REFERENCES: The diversity of topics will require numerous sources. A list of Web links to useful references will be maintained on the course's Website.

— *continued on reverse* —

PHYS 210 is designed to provide an introduction to computational methods in physics and to meet the specialized computational needs of Physics and Astronomy students. The first step will be to familiarize everyone with the UNIX/Linux operating systems we will use. Then an eclectic variety of software will be introduced and available for student use, from simple `bash` shell scripts to computational exercises in MatLab (or Octave) and Maple (or Maxima) to elementary programming in Python, FORTRAN and/or C. Students will learn to use simple UNIX commands and plain text editors, to manage their own files and directories, to configure their email, to maintain their own Web pages, to prepare computer presentations, to typeset manuscripts in LaTeX and to manipulate, plot and fit data. MatLab syntax and formalism will be employed to demonstrate the principles of numerical analysis. A tentative *outline & schedule* of the course is available on the course Website; it is certain to evolve.

CAVEAT: This was a new course in 2006, and is still evolving. Partly for this reason, the targeted "body of knowledge" to be covered is not yet rigourously defined; and partly because your instructor is an ornery, stubborn, subversive libertarian, the details described above (and on the reverse) are just a guess as to what we are really going to do and how we are going to do it. In the first week or two, you will have a change to discuss what *you* really want out of this course (and what I feel obliged to include); we can then redesign it to match. It is my hope that out of the resultant chaos will emerge something of lasting value — and a lot of fun.

EXAMS: There aren't any, unless you feel a midterm would be helpful in calibrating your progress through this maze of loosely related tasks. (Some people have actually asked for this; we can discuss it in the first week of classes.)

ASSIGNMENTS will be set on Tuesday each week and due by the *beginning* of the class 1 week later unless otherwise specified; solutions will be provided at that time if appropriate. *The deadline will be strictly enforced and late assignments may not be marked.* There will be approximately 12 assignments. The assignment mark will be based on the average of the *best 8* assignment marks for each student.

PARTICIPATION: It is difficult to define exactly what I mean by this, but in a course of this type it is very important. One of the foremost hazards of "computing" is its tendency to encourage isolation. While it is essential to have some undisturbed and uninterrupted time to work on a problem, it is also important to share ideas with others. Synthesis and "cross-fertilization" can make a group effort much more powerful than the sum of its parts. In some cases several people may work together on a more ambitious term project. You are encouraged to seek help from each other in doing the homework; discussing the problems in a study group is a great way to learn, but I do expect each student to write up (and understand!) his/her own solutions handed in for grading. This is taken very seriously — students have been thrown out of school for copying! (I apologize if I am insulting your intelligence by stating the obvious, but this probably won't be the last time. `;-)`

PROJECTS: The term project is the largest single component of your course mark. You must submit a *written report* in the format preferred by the most appropriate scientific journal (*e.g.* REVTeX for Physical Review) explaining what you did, why, and how it turned out. (Success is nice, but sometimes one learns the most important lessons from failure. It's better to be a little too ambitious than to aim low, as long as you reflect profitably on the lessons learned, and share your advice with others.) I anticipate an enormous variety of project ideas, and don't want to bias your thinking by offering a list of suggestions that might be misinterpreted as a menu. Come talk to me, in class or out.

PROJECT PROPOSALS: At mid-term, each student will present a *proposal* for her/his term project to the entire class in a short (5 min) *talk* (barring disabilities) employing computer presentation tools such as *PowerPoint* or *OpenOffice*. The goal of these presentations is to elicit feedback from fellow students and instructors regarding the proposed topic. Is it too ambitious? Too ill-defined? Too broad? Or just the reverse? You are not expected to know exactly what you want to do at this point, much less to have done it. The purpose of the exercise is to get other people's help in planning your term project, and to give *them* the benefit of *your* judgement. The latter contribution will account for a substantial fraction of your "participation" mark.

PROJECT PRESENTATIONS: In the last week of classes, each student will present to the entire class a seminar-style presentation on his/her term project. The available time (roughly 5-6 hours) will be divided equally among presentations. This time there are no restrictions on media (within reason), but if appropriate you can use the `.odp`, `.ppt` or `.key` file from your proposal as a starting point for your presentation. All students will be expected to attend every presentation and participate in its evaluation, as part of their "participation" mark.

FEEDBACK: You have to do all the work of learning, but there may be things I can do to make it more fun, more efficient, more rewarding or more useful. Let me know if you have any suggestions! There are several tools on our Web site to facilitate such *feedback*.