Physics 410: Computational Physics (Fall 2004)

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Course Home Page: http://laplace.physics.ubc.ca/410/
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Schedule

- **Tuesday/Thursday, 10:00-11:20 AM -- Hennings 304**

Course Links

- Syllabus
- News (last update **Sunday September 5, 1:00 PM**)
- Course Topics
- **COURSE NOTES**
- Online Course Resources
- Course Related Software
- Suggested Hardcopy References
- Homework Schedule and Problem Sets
- Suggested Term Projects
- Student Pages
- Computer Access Info: [P & A Computer Labs -- Schedule], [Linux Lab (PCs) Hennings 205]

COURSE OVERVIEW

This course will provide an *introduction* to techniques and applications in computational physics. Topics to be covered include: Unix fundamentals; symbolic & numeric computation and programming with Maple; scientific programming using Fortran 77; solution of linear systems; basic numerical analysis for continuum systems; solution of ordinary differential equations. There will be a significant programming component in virtually all stages of the course: tutorial sessions with the instructor can be arranged for those of you desiring additional help with programming. See below for a concise syllabus and the Course Topics page for a slightly more detailed description of course coverage.

Text: Due to the significant diversity in topics to be covered, there is no *required* text for the course. For testing purposes, you will be responsible only for material covered in lectures and homework assignments. I will distribute some class notes when appropriate, but you will also be responsible for taking notes in class. The optional text, *Numerical Recipes (2nd edition)*, by Press *et al* is particularly recommended for those of you who anticipate doing further numerical work. *Note, however, that the full text of the book is available on-line*. Also note that there are distinct Fortran 77 and C versions of the book: choose the one which you feel will suit you best. See the Suggested References page for texts and other references pertinent to the course, and the Course Resources web page for a collection of on-line reference/instructional material.

Grades: Tests, Homework and Term Projects

Your mark in this course will be determined on the basis of your performance on five homework assignments, a term project, and two tests---a mid-term and a final---with the following weighting:

- Midterm: 10%
- Final: 10%
- Homework Assignments: 55%
- Term Projects: 25%

Final marks *may* be subject to small adjustments based on overall class performance.

Tests

There will be two *one-hour* tests: one in-class and one in the final exam period:

- Midterm: **Thursday, November 2, 10:00 AM**
- Final: **TBA**

Note that the Midterm and Final count equally towards your final grade. In particular, although the Final exam will be scheduled in a regular examination slot, it will not take much longer than the mid-term to complete.

Except under extremely extenuating circumstances there will be NO makeup tests

Homework

See the syllabus below for scheduled homework due dates. *Homework will be assigned at least a week before it is due; late homework **may** be accepted at the instructor's discretion, and as per the **Late Homework Policy** described below.* As the course progresses, the Homework Schedule web page will contain information concerning current and past assignments.

Each homework will contribute roughly equal weight to your final mark but I will discount your worst mark.

Term Projects

Either individually or in consultation with the instructor, each student must choose a topic for a term project in some area of computational physics. A final list of suggested topics will be posted by Thursday, September 23 and *a one-page outline of your selected project is due Tuesday, October 19 at the latest*.

You are encouraged to develop your own project ideas, but *all project topics must be approved by the instructor.*

Please note that the one-page precis must be submitted in addition to the final paper, and that the outline will not graded nor otherwise evaluated in the normal case. It serves the purpose of ensuring that every student has selected an appropriate project and is fully cognizant of the major components of work that must be performed for the project to be successfully completed.

Even if the bulk of the project involves programming, a term paper describing the project must be prepared in the style of a technical paper or a scientific essay (ask *now* if you are unsure of what that means!), and *hardcopy of your paper MUST be submitted to the instructor, in class, in person, or via the instructor's mailbox in the Physics and Astronomy Main Office.* You are free to submit preliminary drafts of your paper to the instructor for critique; such pre-assessment will not affect your final grade on the paper. You are encouraged to use LaTeX (or TeX) mathematical typesetting software to prepare your papers. Suggested paper length is 15-20 pages double spaced, including figures, graphs and source code listings. Note that the project need not involve programming: for example, a critical essay on the impact of computation on a particular sub-field of physics is a viable option, provided that the student can convince the instructor that she/he has sufficient programming expertise and experience for the usual programming requirement to be waived.

*Term projects are due on December 2 (the last class day). Late projects will be accepted at the instructor's discretion. and as per the **Late Work Policy** described below*.

*Term project code (including graphical code) must run on the course Linux machines in Hennings 205, and, in particular, **cannot be MS-Windows specific***.

Late Work Policy (Strictly Enforced)

From time to time, work may be submitted late, subject to the following conditions:

1. If an extension is required, the extendee must submit a request for an extension, via e-mail, to the instructor.
2. Submitted homework which *absolutely must be submitted before the homework key is distributed* must similarly be accompanied by an e-mail indicating completion of the work.

Note that all messages are to be sent to the instructor, not the TA, and that if you finish the homework on time, *no additional action on your part is required*.

Computer Access

All students will be provided with an account for use in the Physics & Astronomy Computer Lab currently located in Hennings 205. You will also be given an account on the Linux Lab machines, which you will use for the majority of your homework assignments and, if you wish, your term projects. As the course progresses, and should your term project require it, you will also be given access to the Beowulf Pentium III/Linux cluster, **vn.physics.ubc.ca**.

Tutorials

As mentioned above, individual or small-group tutorial sessions may be arranged at mutually agreeable times for those of you who require additional help, particularly with the programming aspects of the course. Although I will try to detect when supplementary instruction is required, please contact me (e-mail preferred) if and when you think you could use a session or two.

Other Help

You should also feel free to contact me via e-mail (preferred) or phone if you have quick questions, or if you are having difficulty getting something to work. Perhaps most importantly, you should strive to develop the ability to make effective use of the available documentation for the software you are using (on-line help, man pages, Web resources, etc.). On-line help tends to be extensive these days and a little time invested in learning *how* to extract the information you are looking for usually pays off.

Syllabus

Tuesday	Thursday
September 7 Unix	*September 9* Unix
September 14 Unix	*September 16* Unix
September 21 Unix	*September 23* Maple **[H1 due]**
September 28 Maple	*September 30* Maple
October 5 Fortran	*October 7* Fortran
October 12 Fortran	*October 14* Fortran **[H2 due]**
October 19 Fortran **[Project outlines due]**	*October 21* Fortran
October 26 Linear Systems	*October 28* Linear Systems **[H3 due]**
November 2 **MIDTERM**	*November 4* Linear Systems
November 9 Solution of ODEs	*November 11* **REMEMBRANCE DAY [NO CLASS]**
November 16 Solution of ODEs	*November 18* Solution of ODEs
November 23 Solution of ODEs **[H4 due]**	*November 25* Nonlinear Equations
November 30 Nonlinear Equations	*December 2* Nonlinear Equations **[HW5 & Term Projects due]**

Syllabus Notes

- *Homework assignments are denoted* **H1** *through* **H5**.
- *See Course Topics page for a more detailed outline of course material.*
- *Term project outlines are due* **OCTOBER 19** *although earlier submissions are encouraged*
- *Term projects are due* **DECEMBER 2** *(last class day)*

Other Important Dates

- *Tuesday, September 21:* Last day for withdrawal from most Term 1 courses without withdrawal standing of "W" recorded on a student's academic record.
- *Monday, October 11:* Thanksgiving Day, University closed.
- *Friday, October 15:* Last date for withdrawal from most Winter Session Term 1 courses with withdrawal standing of "W" recorded on a student's academic record.
- *Thursday, November 11:* Remembrance Day. University closed. **NO CLASS.**
- *Friday, December 3:* Last day of classes.
- *Tuesday, December 7:* Examinations begin.
- *Tuesday, December 21:* Examinations end.

See the UBC 2004/2005 Calendar and Academic Year pages for more information

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