Physics 410: Computational Physics (Fall 2001)

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

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

Course Links

- Syllabus
- News (last update **Friday August 3, 10 AM**)
- 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], [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: Homework and Term Projects

Your mark in this course will be determined on the basis of your performance on six 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, October 25, 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.* 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 20 and *a one-page outline of your selected project is due Tuesday, October 16 at the latest. All topics must be approved by the instructor.* 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. 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. *Term projects are due on November 29 (the last class day). Late projects will be accepted at the instructor's discretion.*

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, 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 4 Unix	*September 6* Unix
September 11 Unix	*September 13* Maple
September 18 Maple **[H1 due]**	*September 20* Maple
September 25 Fortran	*September 27* Fortran **[H2 due]**
October 2 Fortran	*October 4* Fortran
October 9 Linear Systems	*October 11* Linear Systems **[H3 due]**
October 16 Solution of ODEs **[Term Project outlines due]**	*October 18* Solutions of ODEs
October 23 Solution of ODEs	*October 25* **MIDTERM** / Solution of ODEs **[H4 due]**
October 30 Solution of ODEs / Nonlinear Equations	*November 1* Nonlinear Equations
November 6 Nonlinear Equations	*November 8* Finite Difference Methods **[H5 due]**
November 13 Finite Difference Methods	*November 15* Finite Difference Methods
November 20 Finite Difference Methods	*November 22* Finite Difference Methods **[H6 due]**
November 27 Finite Difference Methods	*November 29* Finite Difference Methods **[Term Projects due]**

Syllabus Notes

- *Homework assignments are denoted* **H1** *through* **H6**.
- *See Course Topics page for a more detailed outline of course material.*
- *Term project outlines are due* **OCTOBER 16** *although earlier submissions are encouraged*
- *Term projects are due* **NOVEMBER 29** *(last class day)*

Other Important Dates

- *Tuesday, September 18:* Last day for withdrawal from most Term 1 courses without withdrawal standing of "W" recorded on a student's academic record.
- *Monday, October 8:* Thansgiving Day, University closed.
- *Friday, October 12:* Last date for withdrawal from most Winter Session Term 1 courses with withdrawal standing of "W" recorded on a student's academic record.
- *Monday, November 12:* Holiday in lieu of Remembrance Day. University closed.
- *Friday, November 30:* Last day of classes.
- *Tuesday, December 4:* Examinations begin.
- *Thursday, December 20:* Examinations end.

See the UBC 2001/2002 Calendar and Academic Year pages for more information