

PHY407F: Fall 2015
Computational Physics Lab

Lecturer: Paul Kushner, MP716, 416-946-3683, paul.kushner@utoronto.ca

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Lectures: M12-1, MP134

Labs: M9-12, MP257 (and MP238). Tutorial starts W9 in MP257

Office Hours: Prof. Kushner – R2-3. O. Watt-Meyer – TBA.

Topics:

This is an introduction to scientific computing in physics. Students will be introduced to computational techniques used in a range of physics research areas. By considering select physics topics, students will learn computational methods for function analysis, ODEs, PDEs, eigenvalue problems, non-linear equations and Monte Carlo techniques. "Survival skills" in scientific computing, such as command line programming, debugging, solution visualization, computational efficiency and accuracy will be developed. The course is based on python and will involve working on a set of computational labs throughout the semester as well as a final project.

This course was revamped in 2013 to reflect U of T Physics' commitment to spreading computational physics, focused on python, through its undergraduate curriculum. Prof. Sabina Stanley was responsible for the development of the current course and Prof. Kushner is for 2015 following the previous years' curriculum fairly closely.

In 2015 we have a new computer lab room, MP257 to use. We have also booked MP238 for overflow during the lab period since we have a large enrolment in 2015.

The course website is on Blackboard. Materials including organizational info, lecture notes, pre-labs, labs, announcements and **(new for 2015)** discussions on forums will be posted. Please check it frequently, it is a valuable aid for this course.

Grading Scheme:

Pre-labs:	10%
Labs:	65%
Final Project:	25%

Prerequisites: PHY224H/254H, and preparation of other physics courses is strongly recommended. CSC courses are helpful but not required.

Make sure you are familiar with content of the tutorials on the compwiki webpage to get started:

<http://compwiki.physics.utoronto.ca/>

Course Text: Computational Physics by Mark Newman. Available at U of T bookstore or Amazon.

The first few chapters are available free online at the following location so if you aren't sure that you are going to take the course, you can hold off a couple of weeks before buying the text. There are also excellent resources on this webpage such as python programs you will use:

<http://www-personal.umich.edu/~mejn/cp/>

Lecture Notes: I will also provide my lecture notes on the course webpage before the lectures. You are responsible for the material covered in the lectures, even if it's not in the text or the posted lecture notes.

Pre-labs: These involve readings from the text and a short online assignment that must be completed before the lecture.

Labs: These are more involved computational exercises that you can work on during the lab time, as well as on your own before or after the lab. They will involve a variety of physics concepts and introduce you to the major scientific computing tools.

Computer Software: The programming language for this course is python. The department has a wiki page to learn python and a free download version for various systems. If it's been a while since you've worked with python, I highly recommend carefully going through chapters 2 & 3 of the text (available free online) and/or going through the tutorials at:

<http://compwiki.physics.utoronto.ca/>

A reasonably recent version of Python (Python 2.7 or Python 3.0) is required to do the exercises in the course. We use numpy, scipy, matplotlib, and to a limited extent vpython (visual) for the work in the course. Other packages might also be mentioned.

Accessibility Services: Please see the Accessibility Services website:

<http://www.accessibility.utoronto.ca/index.htm>

for information on services available to students with disabilities. If you require special accommodations please register with Accessibility Services and ask your Accessibilities Advisor to send me confirmation of the accommodations I can provide for you.