COMPUTATIONAL PHYSICS
PHYS-GA-2000, Fall, 2018
Tues & Thurs 12:30-1:45
Room 1045, 726 Broadway

Professor:

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Teaching Assistant:

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Recitation is required:

Wednesdays 11:00-12:15 in room 1045, 726 Broadway

Class assignments will be submitted through github:

https://github.com/nyu-compphys-2018

Text Books:

Multiple texts and the class notes form the reading material for this class.

Required:

"Computational Physics" by Mark Newman (2013) ISBN 978-148014551-1

Introduces Python for basic topics in computational physics. First 5 chapters are online at:

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

Recommended:

"Numerical Recipes: The Art of Scientific Computing" by W. Press et al (Cambridge University Press)

Classic text with explanation and coded examples of useful algorithms.

"Computational Physics" by J. M. Thijssen (Cambridge University Press)

Covers condensed matter topics including lattice computations and Monte Carlo methods.

"Computational Gas Dynamics" by Culbert B. Laney (Cambridge University Press)

Excellent text on computational hydrodynamics, useful for class project.

Topics (subject to change):

Week 1: Introduction to computational physics, getting setup with Python, some basics

Week 2: Numerical Integrals and Derivatives

Week 3-4: Solving Linear and Non-linear Equations

Week 5-6 Fourier Transforms and Spectral Methods

Week 6-7 Ordinary Differential Equations

Week 7-10 Partial Differential Equations

Week 10-11 Monte Carlo Methods

Week 12-13 Advanced topics & work on class projects

Week 14-15 Class presentations

Grading:

Will be based on correct solution of the class assignments (60%) and on the final course project write-up and presentation (40%).

Software tools:

- Python: Almost all of the coding in the class will be in Python. It is a very forgiving language, quick to learn, and ubiquitous in science and industry. There are many great learning python resources online, this is particularly good: http://learnpythonthehardway.org/book/. It also has sections on learning to use the shell/command line, which we'll be doing a lot of!

- git: 'git' is version control software, a tool that saves different versions of a project, allowing you to easily back up your work, merge different branches of development, and distribute your work. All homework will be submitted using git, so you'll get used to it fast! https://github.com/ has a tutorial, links to the software itself, and will be hosting your "repos" during the semester.

 - LaTeX: LaTeX is, of course, the typesetting program used to make scientific papers in physics, math, and many other disciplines. Your homework write-ups and final project will be in LaTeX. If you don't already have it, the package and some introductory materials are here: https://www.latex-project.org/.