Computational Physics

PHYS-GA-2000, Fall 2019
Tuesdays and Thursdays, 12:30-1:45
Recitation Wednesdays, 12:30-145
Room 1045, 726 Broadway

Professor Jeremy Tinker
Office: 905, 726 Broadway
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No teaching assistant this semester-- will be TA'd by the professor

Text Books:

Required: "Computational Physics" by Mark Newman, (2013) ISBN 978-148014551-1. The first first five chapters are online at: http://www-personal.umich.edu/~mejn/cp/

Optiional (but strongly suggested): Numerical Recipes: The Art of Scientific Computing" By Press et al (Cambridge University Press). This classic text is very useful as a reference manual for your graduate career (and beyond).

Topics, with tentative schedule.

Week 1: Introduction and basics of computing.
Week 2-3: Numerical derivatives and integrals
Week 3-4: Non-linear equations
Week 5-6: Fourier transforms and spectral methods
Week 7-8: Ordinary Differential Equations
Week 8-10: Partial Differential Equations
Week 11-12: Monte Carlo methods and random processes
Week 13-14: Parallel computing
Week 14-15: Advanced topics

Grading: The course grade will be entirely of the homeworks, which will be assigned every 2-3 weeks.

Software requirements:

- Coding: You are not required to use any specific language. I encourage C or python, but anything is acceptable. I am able to help with C, FORTRAN, IDL, but have limited python experience.

- 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/.