

Computational Physics / PHYS-UA 210

This course teaches computational physics at a level appropriate for undergraduate physics majors. Classes meet Tuesday and Thursday 12:30am to 1:45pm, in 12 Waverly Place, L113. The textbook is *Computational Physics*, by Rubin Landau. I will also ask you sometimes to look online at the Python Data Science Handbook (PDSH) by Jake Van Der Plas.

Prof. Blanton's office is Room 941 of 726 Broadway, and his email is blanton@nyu.edu. Office hours are Wednesday 2:00pm to 3:15pm.

The teaching assistant is Shengqi Yang (sy1823@nyu.edu). Recitation is Wednesday 5:00pm to 6:15pm. This time will primarily consist in working on homework assignments.

The class will be participatory. Please read the assignments before attending class; you will be expected at certain points to follow along with calculations on your computer.

There will be no exams in this course, but there will be a pretty heavy load of assignments:

- You will complete weekly homeworks until the beginning of November, and a final one due the last week of classes. You may consult with each other about the homeworks, but you must write your own individual code and report. This report will be in the form of rendered Jupyter notebooks or Latex documents, submitted to Yang in a manner she prescribes.
- The second major assignment is a large-ish project performed in groups of two students each, culminating in a presentation in November or December. You will hand in a report written using Latex, a standard format for physics research that you might as well become familiar with (the homeworks will introduce this format). A draft report will be due by November 17.

Grades are based on problem sets (65%), a project with results presented to the class (25%), and class participation (10%).

The classes will proceed as follows (subject to revision!). The problem sets will be due on each Friday of the indicated weeks.

| <i>Date</i> | <i>Topic</i> | <i>Reading</i> | <i>Problem Sets</i> |
|----------------|----------------------------------|-----------------|---------------------|
| 2017-09-05 (T) | Numbers on computers | Ch. 1 & 2 | PS#1 |
| 2017-09-07 (R) | Arrays | PDSH, Ch. 1 & 2 | |
| 2017-09-12 (T) | Numerics | Ch. 3 | |
| 2017-09-14 (R) | Numerics | Ch. 3 | |
| 2017-09-19 (T) | Random Numbers | Ch. 4 | PS#2 |
| 2017-09-21 (R) | Random Numbers | Ch. 4 | |
| 2017-09-26 (T) | Differentiation | Ch. 5 | Teams declared |
| 2017-09-28 (R) | Integration | Ch. 5 | PS#3 |
| 2017-10-03 (T) | Integration | Ch. 5 | PS#4 |
| 2017-10-05 (R) | Integration | Ch. 6 | |
| 2017-10-10 (T) | Linear Algebra | Ch. 6 | PS#5 |
| 2017-10-12 (R) | Linear Algebra | Ch. 6 | |
| 2017-10-17 (T) | Eigensystems | — | PS#6 |
| 2017-10-19 (R) | Eigensystems | — | |
| 2017-10-24 (T) | Root-finding | Ch. 7 | PS#7 |
| 2017-10-26 (R) | Minimization | Ch. 7 | |
| 2017-10-31 (T) | Ordinary DEs | Ch. 8 | PS#8 |
| 2017-11-02 (R) | Ordinary DEs | Ch. 8 | |
| 2017-11-07 (T) | Fourier Analysis | Ch. 12 | — |
| 2017-11-09 (R) | Fourier Analysis | Ch. 12 | |
| 2017-11-14 (T) | Partial DEs | Ch. 19 | Presentations begin |
| 2017-11-16 (R) | Partial DEs | Ch. 19 | Draft report due |
| 2017-11-21 (T) | Optimization | Ch. 11 | PS#9 |
| 2017-11-23 (R) | Thanksgiving, no class | | |
| 2017-11-28 (T) | Diffusion | Ch. 20 | |
| 2017-11-30 (R) | Nonlinear dynamics | Ch. 15 | |
| 2017-12-05 (T) | Gravity | — | PS#9 |
| 2017-12-07 (R) | N -body gravity | — | |
| 2017-12-12 (T) | Legislative Day, no class | | |
| 2017-12-14 (R) | Parallel computing | — | |