Lectures
Tuesdays & Thursdays 12:30 – 1:45 PM; Online-only through NYU Zoom

Recitations
Thursdays 5:00 – 6:15 PM; Online-only through NYU Zoom

Instructor
Prof. Anthony R. Pullen
Contact: anthony.pullen@nyu.edu, 212-998-7634
Office: 726 Broadway, Room 938
Office Hours (on Zoom): Wednesdays 1:30 – 2:30 PM and by appointment
Zoom Personal Meeting ID: 379 410 1967

TA
Jackie Sustiel
Contact: zds241@nyu.edu
Office: 726 Broadway, Room 864E
Office Hours (on Zoom): Tuesdays 2:30 – 3:30 PM
Zoom Personal Meeting ID: 793 195 9912

Course Website
Located on NYU Classes

Course Description
This course will introduce the concepts of computational physics, the application of computers to solve physics problems. We will learn and use the Python programming language in this course. Computation is an indispensable tool in physics; very little in modern theoretical and experimental physics research is done without the aid of computational methods. Upon completion of this course, the student will have the basic computational tools needed to solve physics-related problems, both in industry as well as graduate-level research.

We will cover the following topics:
- Python Programming
- Numerics
- Differentiation/Integration
- Linear Algebra
- Root-finding/Optimization
- Fourier Analysis
- Differential Equations
- Random Processes/Monte Carlo methods
Information on Remote Learning
All courses, recitations, and office hours will take place online using the Zoom platform. To connect, please log into nyu.zoom.us prior to the session. Please use the zoom personal meeting ID associated with Prof. Pullen to log into the lectures and his office hours. Use Jackie’s personal ID to log on to the recitations and to Jackie’s office hours.

Programming Language
We will use Python in this course. It is free, modular, and has broad adoption in both industrial and academic research settings. The concepts introduced in this course will have equivalent applications in most computational languages including C, Fortran, Java, IDL, and Julia.

Graduate Prerequisites
There are no prerequisites to this course.

Required Textbook

Other References
- J. Van Der Plas, *Python Data Science Handbook* – available for free online (google book title)

Classes/Recitations
The class will consist of a combination of slide presentations and demonstrations using Jupyter notebooks. Make sure to read the relevant chapters before attending class. Slides from the lecture will be available just before each class period.

Recitations will take place Thursday evenings and will include a brief review of the material, opportunities to ask questions, and help with homework assignments.

Problem Sets
Eight problem sets will be assigned up until the beginning of November. The problem sets will be posted on the course website on Tuesday of the week that the relevant material is presented and are due at 11:59 PM of the following Monday. The solution will consist of a report written in LaTex and a Jupyter notebook containing the code and results. The solutions must be submitted to the GitHub classroom repository for this course. I will explain this more on the first day of class. DO NOT submit a printed solution set to the TA or me; they will not be accepted. Solution sets will be posted on the course website on the Wednesday after its due. Grades will be returned within a week after the homework due date.

Students can discuss the assignment with the instructor, other students, or anyone else. However, students are always required to turn in their own independent code and reports.
Late Homework Policy
Late homeworks will be accepted for reduced credit – 75% credit for up to 2 days late, 50% credit for longer.

Final Project
A major part of your grade will be a large project performed individually, culminating in a presentation between mid-November and December. Project topics will be provided. You will also hand in a report written in LaTeX. The draft report is due November 16, after which presentations will commence. The final report is due December 11.

Exams
There are no exams in this course.

Grading
- Problem Sets – 75%
- Final Project – 25%

Joint Undergraduate/Graduate Course
This course will take place as a joint undergraduate/graduate course. The lectures, recitations, and office hours will be the same for both cohorts. Although undergraduates and graduate students in this course will be exposed to the same material, the depth of the material will vary considerably over the semester such that I expect both cohorts will benefit from this course. There will, however, be two versions of the homework, with the graduate homework more challenging than the undergraduate homework. Also, for the final project undergraduates will be allowed to complete them in pairs while graduate students must complete them individually.

Tentative Schedule
The schedule on the next page is tentative and subject to change. In the “Newman Chapters” column, the cells with “(Landau)” denote chapters from Landau, Páez, and Bordeianu, while the cell with “(NumRec)” denotes Numerical Recipes.
<table>
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