PHY 2603: Computational Physics Lab II

Spring 2019

Instructor: Dr. Amber Stuver

Office:	262A Mendel Hall
Phone:	(610) 519-6534
Email:	amber.stuver@villanova.edu (This the is best way to contact me!)
Office Hours:	M: 3:00-4:30 pm T: 2:00-3:00 pm W: 1:00-2:00 pm and other times by appointment

Lab Meetings:

T from 10:00 – 11:50 am in 362 Mendel *and*
Th for *an hour of your choice* between 3:00 – 5:00 pm in 259 Mendel.

You are required to bring your laptop with you to class. As in PHY 2601, you will be expected to have the Spyder IDE (Integrated Development Environment) installed on the computer you bring with you to class (this is freely available as part of the Anaconda distribution: https://www.spyder-ide.org/). If you choose to use another Python coding environment, instructional support for your usage is not guaranteed. Installing Spyder will be reviewed in class, i.e. you are not expected to do this on your own. We will be programming in Python 3.6.

We will also be using other software that builds on Python including Jupyter notebooks. You will be instructed in class on how to install these if they are not already (Juypter should already be available as part of the Anaconda installation we performed last semester).

Catalog Description:

Computational Physics Lab II (1 credit): Continuation of Computational Physics I.

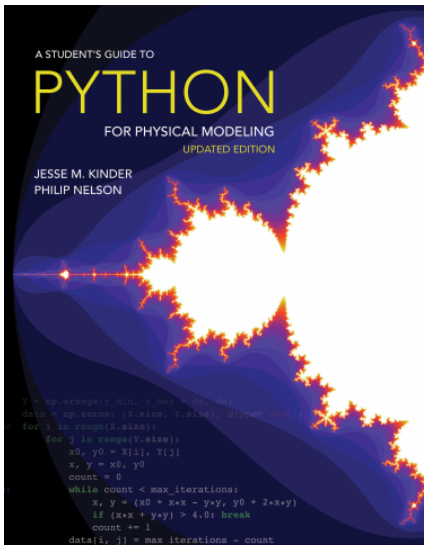
Prerequisite: PHY 2601

Overview/Course Description:

Physicists no longer work simply with paper and pencil. Instead, data is recorded electronically and processed with computers. In order to do frontier science, we must look to ourselves to develop the computational methods and software to do our research; we cannot rely on Apple, Microsoft, etc. to write the programs we need.

This class will introduce you to the basics of computational physics using the programming language Python. This will not only expand on your basic Python skills, but give you experience with others you will find useful when doing research.

Recommended Text:



- Kinder & Nelson, *A Student's Guide to Python for Physical Modeling (Updated Edition)*, (Princeton Univ. Press, 2018) ISBN: 9781400889426.

Code samples and data sets from this text can be found here:

http://press.princeton.edu/titles/10644.html

Additional Resource Text:

You may also find this free book helpful, although I do not plan on using this for class readings (I do reserve the right to change my mind and use this book formally but you will be notified of the need to download this book in class if I do).

- Downey, *Think Python: How to Think Like a Computer Scientist*:
  http://greenteapress.com/wp/think-python-2e/
  You can also purchase a print copy of this book from O'Reilly (ISBN: 1491939362).

Course Objectives:

- Expand on the basics of Python that we learned in PHY 2601.
- Develop a basis for numerical analysis including finite differencing and numerical integration.
- Learn how to use new tools built on the Python programming language.
- Practice basic computational physics skills.
- Learn to display data in graphics suitable for publication, including various kinds of plots such as logarithm scale plots and histograms.

Assignments:

Exams
There will be **no examinations in this class**. However, the final project will be due during finals week (exact due date to be announced).

Homework
Homework will be assigned approximately weekly and will be worth 100 points each and account for 70% of your course grade. In general, no late homework will be accepted. Please see me before homework is late for extenuating circumstances.

Final Project
By midterm, you will be given information on a final project in which you will utilize your knowledge of basic physics and knowledge of computational methods. This project will be due during finals week (exact due date to be announced). The final project is worth 30% of your course grade.

On Internet Research and Collaboration…
You will also find that you will spend a good bit of time searching the internet for help. This is perfectly acceptable as long as you turn in your own work. Copying multiple lines of code without citing the source (in a comment associated with the lines of code in question) will be considered academic dishonesty. Working together is also acceptable, but you must turn in your own work. Your work must be unique from the other students. Plagiarism of other students' work will be considered academic dishonesty.

Grades:

Your final grade is determined using the weighted combined average of your homework (70%) and your final project (30%). See the table at right for the translation of this average into letter grades.

Graded Item:	Percent:
Homework	70%
Final Project	30%
Total	**100%**

Percent	Grade
100 – 93.00	**A**
92.99 – 90.00	**A-**
89.99 – 87.00	**B+**
86.99 – 83.00	**B**
82.99 – 80.00	**B-**
79.99 – 77.00	**C+**
76.99 – 73.00	**C**
72.99 – 70.00	**C-**
69.99 – 67.00	**D+**
66.99 – 63.00	**D**
62.99 – 55.00	**D-**
< 55.00	**F**

Tentative Course Schedule:

Week	Month	Day	Topic
	January	15	**CANCELLED**
1	January	22	**Syllabus & Review**
2	January	29	**Subplots, Error Bars, and More Commands**
3	February	5	**Semi-Log, Log-Log, & Histograms Plots**
4	February	12	**2D Plotting: Contour, Streamline, & Quiver**
5	February	19	**Finite Differences: Forward & Centered**
6	February	26	**Numerical Integration: Trapezoidal & Simpson's Rule**
			Spring Break
7	March	12	**LaTeX & Jupyter Notebooks**
8	March	19	**Random Numbers & Monte Carlo Simulation**
9	March	26	**Experimental Design, Error, & Confidence**
10	April	2	✧ Possible new topic: TBA
11	April	9	**Final Project**
12	April	16	**Final Project**
13	April	23	**Final Project**

Office of Disabilities and Learning Support Services:

It is the policy of Villanova to make reasonable academic accommodations for qualified individuals with disabilities. You must present verification and register with the Learning Support Office by contacting 610-519-5176 or at learning.support.services@villanova.edu or for physical access or temporary disabling conditions, please contact the Office of Disability Services at 610-519-4095 or email stephen.mcwilliams@villanova.edu. Registration is needed in order to receive accommodations.

Academic Integrity

All students are expected to uphold Villanova's Academic Integrity Policy and Code. Any incident of academic dishonesty will be reported to the Dean of the College of Liberal Arts and Sciences for disciplinary action. For the College's statement on Academic Integrity, you should consult the Enchiridion. You may view the university's Academic Integrity Policy and Code, as well as other useful information related to writing papers, at the Academic Integrity Gateway web site: http://library.villanova.edu/Help/AcademicIntegrity