

# PHY 2601: Computational Physics Lab I

Fall 2018

**Instructor:** Dr. Amber Stuver

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Office Hours:	MTWR 1:30-2:30 pm and other times by appointment

## Lab Meetings:

T from 10:00 – 11:50 am in G87 Mendel *and* R from 4:30 – 5:20 pm in 247 Mendel

You are required to bring your laptop with you to class. After the first 2 meetings, 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.

## Catalog Description:

Computational Physics Lab I

Computer applications, data analysis and presentation, algorithms and programming, numerical methods, and basic graphics for Physics and Astronomy majors.

*Prerequisite:* Any Intro Physics course (may be taken concurrently).

## 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. (There are MANY programming languages available to you; once you learn one, learning others will be much simpler.)

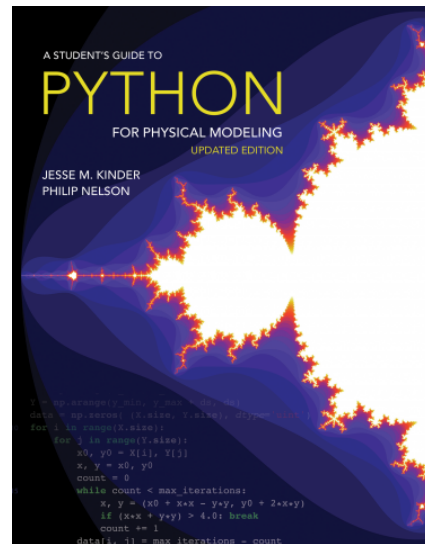
## Recommended Text:

- 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>

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:

- Learn the basic syntax of the Python programming language.
- Learn to use the Python libraries commonly used in computational physics.
- Learn to write high quality & commented code.
- Learn to debug code.
- Learn the basics of computer logic.
- Learn to iterate computations with different kinds of loops.
- Learn to import data, perform basic computations on it, and save the results in a usable format.
- Learn to display data in graphics suitable for publication.

## 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. Each homework is weighted equally and worth a total of 70% of your final grade. In general, no late homework will be accepted. Please see me before homework is late for extenuating circumstances.

### Final Project

By mid-October, you will be provided information on the final project in which will combine your knowledge of basic physics and knowledge of computational methods. This project will be due during finals week (exact due date to be announced) and worth 30% of your final grade.

### 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:	Weight:
Homework	70%
Final Project	30%
<b>Total</b>	<b>100%</b>

Percent:	Grade:
100.0 – 93.00	<b>A</b>
92.99 – 90.00	<b>A-</b>
89.99 – 87.00	<b>B+</b>
86.99 – 83.00	<b>B</b>
82.99 – 80.00	<b>B-</b>
79.99 – 77.00	<b>C+</b>
76.99 – 73.00	<b>C</b>
72.99 – 70.00	<b>C-</b>
69.99 – 67.00	<b>D+</b>
66.99 – 63.00	<b>D</b>
62.99 – 55.00	<b>D-</b>
< 55.00	<b>F</b>

### Tentative Course Schedule:

Week	Month	Day	Topic
1	August	28	<b>Syllabus &amp; Algorithms</b>
2	September	4	<b>Introduction to Python</b>
3	September	11	<b>Variables &amp; Visualization</b>
4	September	18	<b>Vectorization &amp; Slicing</b>
5	September	25	<b>Booleans, If Statements, &amp; For Loops</b>
6	October	2	<b>For Loops, While Loops, &amp; List Comprehensions</b>
7	October	9	<b>Euler Method</b>
<i>Fall Break</i>			
8	October	23	<b>Functions</b>
9	October	30	<b>String Formatting</b>
10	November	6	<b>File I/O (input/output)</b>
11	November	13	<b>Final Project</b>
<i>Thanksgiving</i>			
12	November	27	<b>Final Project</b>
13	December	4	<b>Final Project</b>
<i>Finals</i>			

## **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](mailto: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](mailto: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>

### *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.