Intro to Physics Computation
Fall Quarter 2023
Physics 40

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Physics 511

Lectures: M,W 3:10-4:00 PM in Wellman Hall 226

Lab: Section 1: T,R 2:10-4:00 PM (Physics 185)
Lab: Section 2: T,R 4:10-6:00 PM (Physics 185)
Lab: Section 3: T,R 6:10-8:00 PM (Physics 185)

Text:
Online lecture notes at `https://www.scipy-lectures.org`
Lab Manual available on course website
Gezerlis "Numerical Methods in Physics with Python" is available online at the UC Davis library.

Lab Instructor: Ronaldo Ortez supron00@gmail.com

Lab Instructor: Thomas Steele twsteele@ucdavis.edu

Office Hours:
- Valenti – Friday 11am on Zoom https://ucdavis.zoom.us/j/6018765982
- Ronaldo Ortez – TBD
- Thomas Steele – TBD

Course Description: Introduction to programming with examples from numerical analysis and computational physics. Introduction to modern tools used for scientific analysis and computer algebra.

Lectures: The primary emphasis of this course will be on learning by doing. The purpose of the lecture is enrichment to better prepare you for the lab activities. The lectures will be a mix of traditional board lecture and projected live computing.

Labs: The computing labs are the essential activity for this course. Attendance will be taken during the first lab of each week. **If you miss attendance to more than 2 labs, you will get an incomplete at the end of the course.** The lab activities may be finished outside of lab, but must be posted to the course website by Friday evening in order

to be graded. If you do not complete an assignment, submit what you were able to finish before the deadline.

Quizzes: Starting in Week 2, there will be a short low-stakes quiz at the start of each lecture or at least once a week.

Late and Missing Evaluations:
You should always submit whatever you have completed from the week's lab assignments before the Friday deadline. Each student may submit or update one week's worth of lab assignments by the following Monday night (Tuesday if Monday is a holiday) after the deadline, twice during the quarter, with no penalty. At the end of the quarter, before the final exam, there will be a *make up* lab where students may update one week's worth of lab assignments which will replace their original grade. If you have missed one lab, you can only replace the missing lab (or a make up lab provided by the instructor). The lowest quiz grade will be dropped, but not if more than one quiz was excused for another reason. One lab absence will be excused when computing the attendance grade.

Final Grades: The final grades will be based on a weighted average of the lab exercises, exams, quizzes, and lab attendance.

Jupyter Notebooks:
The lab manual describes numerical problems which you should complete with Scientific Python in Jupyter Notebooks. Even though you may work together, each student must maintain their own notebook for each lab. Details on preparing and submitting your notebooks to the course site are provided in lab manual.

Pencil and Paper:
Occassionally, the lab manual will assign pencil and paper computations. When requested, take a picture of your pencil and paper computations, or scan them to PDF, and submit it to the course website along with your Jupyter Notebook.

Reinventing the Wheel:
There are many exercises in this course which involve implementing software that is likely already available elsewhere. This approach is usually a bad idea. It is a programming *anti-pattern* called "Reinventing the Wheel". Generally one should use library functions instead of homemade solutions whenever possible, as the library versions are thoroughly debugged. In this case, however, we are doing this deliberately as an exercise. Even when you are quite experienced at programming, you will sometimes opt to re-implement something as a learning experience, just as we are doing here. The anti-pattern would be to continue using the homebrew solution after the learning experience, instead of using a superior existing solution.

You may use the internet to search for solutions to specific technical challenges, but you *may not* search for top-level solutions to the assignments. So "how to use a while loop in Python" is perfectly fine but "how to sum fractions in Python" is not. The quizes are designed to check that you understand the completed exercises at a level that would be difficult to reach

with cut-and-paste.

Campus Ready:
Please review the information for students provided at:

`https://campusready.ucdavis.edu/students-and-families`.

Missed Exams:
There is no option to take exams remotely. Students that miss an exam (or exams) for a documented absence, who are otherwise passing the course, may elect to receive an incomplete (I) for the course. A single comprehensive make-up exam will be offered at a later date, and the final grade will use the score from the make-up exam to replace the missed exam (or exams).

Course Schedule:
Note that the dates refer to lectures. The lab date is the next day. The topics and schedule may be adjusted while the course is in progress.

Week	**Lab Date**	**Lab**
1	28 Sep	Installation
	29 Sep	lab 1 submission
2	3 Oct	Binary Numbers
	5 Oct	(catch-up)
	6 Oct	lab 2 submission
3	10 Oct	Sequences and Series
	12 Oct	(catch-up)
	13 Oct	lab 3 submission
4	17 Oct	Quadratic Equation and Prime Numbers
	19 Oct	(catch-up)
	20 Oct	lab 4 submission
5	24 Oct	array and plotting
	26 Oct	(catch-up)
	27 Oct	lab 5 submission
6	31 Oct	Differentiation and Projectile Motion
	2 Nov	(catch-up)
	3 Nov	lab 6 submission
7	7 Nov	Pendulum Motion
	9 Nov	(catch-up)
	10 Nov	Holiday
	13 Nov	lab 7 submission (Monday of week 8)
8	14 Nov	Roots and Integrals
	16 Nov	(catch-up)
	17 Nov	lab 8 submission
9	21 Nov	Monte Carlo Simulation
	23 Nov	Holiday
	27 Nov	lab 9 submission (Monday of week 10)
10	28 Nov	Ideal Gas
	30 Nov	(catch-up)
	1 Dec	lab 10 submission
11	5 Dec	(catch-up)
	7 Dec	(catch-up)
	8 Dec	make-up submission