

Scientific Computing for Physical Systems

Physics 2300, Weber State University, fall semester 2023

Instructor: Dr. Daniel Schroeder

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Course web site: <http://physics.weber.edu/schroeder/scicomp/>

Lab manual: *Physics Simulations in Python* (distributed on first day)

Please see the Preface of your lab manual for information about course topics, goals, prerequisites, and required materials.

Project due dates

We will spend approximately one week on Project 1, two weeks each on Projects 2 through 6, and four weeks on the Final Project. Due dates (always at the beginning of class) for the first six projects are as follows:

1. Making Shapes: Wednesday, September 6
2. Projectile Motion: Monday, September 18
3. Pendulum: Monday, October 2
4. Orbits: Monday, October 16
5. Molecular Dynamics: Wednesday, November 1
6. Random Processes: Wednesday, November 15

For most projects I will also announce earlier due dates for turning in a portion of the work. Late work will be marked down one point (out of 100 total in the course) for each day or portion thereof.

Your final project presentations will take place during our scheduled final exam time on Wednesday, Dec. 13, from 2:30 until 4:20 pm. All turned-in project materials (papers, presentation slides, and code) will be due at the beginning of the session (2:30), and you'll be expected to attend the entire session.

There will be no major tests or exams in this course, although there will be some short quizzes (see below).

Meeting time and location

MWF 2:30–3:20 pm, in TY 127. We also have a scheduled “lab” session on Friday from 3:30–4:20 pm. Because this is a face-to-face class, I'll expect you to attend at all of these scheduled times. If you cannot attend due to illness or other emergency, please contact me and your lab partner immediately to make appropriate arrangements. (Also see below for COVID protocols.)

The classroom is ours during the 3:30 to 4:20 time slot on Monday and Wednesday as well, so I will hold “office” hours in the room at that time and I encourage you

to stay and continue working whenever you can. I will also hold office hours in my actual office (TY 322) during the 1:30 hour, before our class begins. Feel free to make an appointment if you would like to meet with me at some other time.

We will not meet on official school holidays: Monday, September 4 (Labor Day); Friday, October 20 (Fall break); and Friday, November 24 (Thanksgiving break).

Room policies

You may use your own laptop computer or help yourself to one of the laptops stored in the cart. These laptops may not be taken from the room. When you're finished with one of these laptops, please return it to the cart and plug in its power cord. You may also use the computers that live under each table in the room (connected to the big screens). Don't rely on saving documents on any WSU-owned computers; use cloud storage or a USB stick for backup. Don't use any of these computers for non-academic purposes.

The printer in TY 127 is for printing graphics to include in your lab reports for this class. Don't use it for any other purpose without permission. Please avoid printing images with dark backgrounds that would waste toner.

To keep the electronic equipment clean, please don't eat any messy snacks or drink anything other than water while in the room. You're welcome to step out of the room for an occasional snack or for other reasons.

Keeping in touch

Please check your WSU email account regularly for announcements related to this course. In case of a snow day or other campus emergency or closure, check your email as soon as you can for possible changes to due dates or quiz dates.

Lab partners

I will assign you to work with a lab partner on all projects except the final project. In some cases you will still write your own individual code, comparing notes with your lab partner from time to time, with each helping the other as needed (but not sharing actual code or exercise answers). In other cases I will ask you to work together on the same computer and turn in a single program (or a single set of programs) that represents your joint effort. Even then, though, you will each turn in separate lab reports.

If you have any concerns about working with a particular individual as a lab partner, please contact me privately.

Further collaboration and outside help

Please also try to interact with the rest of your classmates. Give each other hints. Check results with each other. Help each other find bugs. Just don't turn in anyone else's work as if it were your own. With a computer program, this means that all of your code must be typed by your own fingers (or your lab partner's if you're

jointly working on the same code). It also means that you may not look at anyone else's code while writing your own (with the exception of the code fragments in your project instructions and in general-purpose reference materials). Do not tempt your classmates by putting your finished code where they can see it. Searching online sources for ready-made solutions to the exercises in this course, or asking outside experts (or AI chatbots) for that kind of help, is also prohibited unless you get special permission from your instructor.

Although it is common for professional programmers to share code with each other when they are each working on unique tasks in a real-world environment, this otherwise admirable practice is not appropriate in a classroom setting where you are still working to acquire basic scientific programming skills.

The penalty for inappropriate copying or collaboration, or for seeking inappropriate help, or for other violations of the WSU Student Code, will range from failure on the assignment to failure in the course. Severe cases may also be referred to a higher-level hearing committee or the WSU Dean of Students for further sanctions.

Project grading standards

In grading your projects I will consider the following:

- Completeness and correctness of your programs (approximately 40%)
- Clarity and organization of your code (approximately 10%)
- Written exercise responses (approximately 40%)
- Effectively working with your lab partner (approximately 10%)

Note that the percentages are approximate, and will vary somewhat from one project to another due to differences in the projects. I also reserve the right to modify these percentages significantly to handle unusual situations. I may also grant some extra credit, if you go beyond the required work for a project.

Quizzes

No, these aren't tests in disguise. But we'll have a brief closed-book quiz at the beginning of class about once each week for the first ten weeks or so. Quiz dates and subject matter will be announced in advance. (Most quizzes will be given on Mondays, but the first quiz will be on Wednesday, September 6.) The purpose of the quizzes is to make sure you have memorized and understood the basics of the VPython programming environment and the simpler numerical algorithms of this course, so you won't have to look things up so often that it slows you down.

Final projects

In addition to the six "canned" projects listed above, each of you will get to carry out a final project consisting of an independent computational science project of your

own choosing. You'll do the independent project by yourself—not with a lab partner. Guidelines for choosing an independent project topic are given at the end of your lab manual. You will have about four weeks at the end of the semester to work exclusively on your independent project. I'll be asking you to turn in a brief project proposal in early November, but please consult with me sooner as you think about ideas for your project, and don't start on a project before I've approved it.

Final grades

Grades will be computed according to the following weights:

Project 1	6%
Projects 2–6 @12%	60%
Final project	20%
Quizzes and attendance	14%

If you're accustomed to being graded mainly on what you know (as measured by exams), then this course may take a little getting used to. Notice that your grade will be based almost entirely on what you produce: finished computer programs and lab reports. In many ways this is more like a “real job”, where you're rewarded for your accomplishments, not your knowledge. What's the secret to succeeding in such an environment? In a nutshell: *Take pride in your work!*

COVID procedures

Please take reasonable precautions to avoid spreading COVID (or any other contagious disease) to the rest of us and our families. Should you become sick or need to isolate due to likely exposure, contact me and your lab partner(s) immediately so we can make a plan for you to continue your work remotely.

Give some thought in advance to how you could work from home in case you need to isolate due to COVID symptoms or exposure. If you do not have a home computer and internet connection that would be adequate for this use, please let me know during the first week of the semester.

Miscellaneous policies

The WSU Student Code contains several provisions that essentially require you to treat your fellow students with respect, both in and out of the classroom. Inappropriate behavior toward other students will not be tolerated and will be reported to appropriate authorities for possible sanctions.

Any student requiring accommodations or services due to a disability must contact Services for Students with Disabilities (SSD) in room 181 of the Student Service Center. SSD can also arrange to provide course materials (including this document) in alternative formats if necessary.