Course Information

Physics 128AL Summer 2024

1 About Your Instructor

I grew up in West Lafayette, Indiana, home of Purdue University. I decided to become a physicist when I was fourteen years old, and in 1991 I graduated with a bachelor's degree in physics from the University of Chicago. By that point I was tired of the midwest, so I set out for the University of California, Berkeley, where I received my Ph.D., also in physics, in 1998. I did five years of postdoctoral research at the National Institutes of Health in Bethesda, Maryland and taught at George Washington University before joining the physics faculty here at UCSB in July 2003.

My research involves using very sensitive light detection to study the assembly and behavior of single biological molecules.

2 Contacting Your Instructor

The best ways to reach me this quarter are by email and at my office hours.

I will try to answer all email questions within no more than one day. The address you should use is `lipm1@elo.physics.ucsb.edu` . **Please use the following subject line:**

`Subject: 128AL - question`

This will help me to spot important messages from you as I delete hundreds of unimportant messages from elsewhere at UCSB.

My office hours will be Mondays from 2:30–3:45 P.M. in Broida 2409.

3 Graduate Student Instructor

The physics graduate students here at UCSB are some of the best in the world. Not only are your TAs brilliant, they are eager to help you learn.

TA contact information is available on the

4 Course Web Page

The course web page is located here:

`http://web.physics.ucsb.edu/~phys128/lipman/`

This is where all announcements, lecture videos, assignments, and other course information will be posted. **I will assume that everyone has read announcements on the web page two days after I post them, so please check frequently to keep yourself well-informed.**

5 Textbooks and Materials

You will need a specific type of lab notebook and a copy of the textbook, as described here:

http://web.physics.ucsb.edu/~phys128/lipman/materials.html

6 Course Components

- **Lab Notebooks — 40% of course grade.**
  What you should put in your lab notebooks, how you should write them, and how they will be graded are described in detail in the *Lab Notebook and Report Guidelines*, which you can find on the course web page.

- **Lab Reports — 50% of course grade.**
  What you should put in your lab reports, how you should write them, and how they will be graded are described in detail in the *Lab Notebook and Report Guidelines*, which you can find on the course web page.

- **Attendance — 10% of course grade.**
  Experience has shown that students who attend lecture are better informed and more engaged with the course. You are required to attend lab from 1:00–2:00 P.M. on scheduled lab days. Other times are at your discretion, but you must complete all lab assignments to pass the course.

7 Course Grade

Your course grade will be based on your percentage score, computed using the weights listed above. I will determine grade cutoffs based on my expectations for your mastery of the course material, historical performance of students in this class, and whether the grading was unusually lenient or harsh.

Often just after the end of a quarter, someone writes to me asking if there is any way they can do extra work to raise their grade. **Under no circumstances will there be any opportunity to raise your grade after the last assignment is turned in.** If you want to get a good grade, start working early and set aside the necessary time to complete the experiments and write high quality reports.

Continued on next page. . .

8 Course Content

Here is a summary, subject to change, of what I intend to cover this quarter. Taylor is *An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, third edition* by John R. Taylor.

Week	**Topics**	**Reading** (chapters)
1.	Department safety presentation; course web page; introduction to soldering; soldering safety. Solder flashlight kit, begin Geiger counter assembly.	*Lab Notebook and Report Guidelines*
2.	Radiation measurement and safety: types of nuclear radiation; radiation units; Geiger counter function; absorbed dose; geometry of radiation counting. Expectations for lab notebooks and reports; experiment selection. Complete Geiger counter, work on Counting Nuclear Radiation experiment.	Taylor: 1–3 *Counting Nuclear Radiation* handout
3.	Systematic and random errors; accuracy vs. precision; random measurement uncertainty; normal distribution; fundamentals of error propagation. Uncertainty in an average, general rules of error propagation, error bars, estimated error propagation. Work on counting experiment and Lab 1.	Taylor: 4, 5, 11
4.	Binomial processes and distribution; Poisson processes and distribution. Electrical wiring and safety. Optical imaging and laser safety. Work on Lab 1 and Lab 2	Taylor: 7, 8, 10
5.	Data analysis in practice and for complicated experiments. How to give presentations. Bending of beams. Work on Lab 2.	Taylor: 9, 12
6.	Makeup and review. Work on any incomplete labs.	None

9 Course Policy

- Requests to the instructor for due date extensions will be considered on an individual basis, and will only be granted in the case of serious illness, death in the family, or unavoidable circumstances of similar severity. TAs are not authorized to grant due date extensions.
- Academic dishonesty will be dealt with severely. Among the prohibited activities are:
  - Turning in notebooks or reports you did not write. Students who in the instructor's judgment have cheated will receive a grade of "0" for that entire assignment. **Turning work written by someone else or generated by AI is cheating.**
  - Attempting to misuse any course-related computer system.
  - Tampering with another student's coursework.
  - Making false claims of lost and/or ungraded coursework.

  NOTE: You are encouraged to discuss the coursework with other students in the class, but be sure to take your own data and write or create 100% of what you turn in!

10 DSP Accommodations

I am committed to providing every student the opportunity to fully participate in this class, and reasonable accommodations will be granted to students with disabilities. I am also committed to ensuring that all students are held to the same standards, and I will not grant requests for *unreasonable* accommodations or exceptions to course policy. If I feel that a particular accommodation is unreasonable or fundamentally alters what you are required to do for the course, I will contest it. All requests for accommodation must be submitted to the DSP office, according to their procedures, well in advance of when the accommodation is needed.

11 Why Bother?

In this course you will have a chance to see with your own eyes and carry out experiments that revolutionized our understanding of the physical world, in many cases winning Nobel prizes. By today's standards, the technology originally used in almost all of these experiments is crude and outdated, as our technology will no doubt seem to our descendants. Nevertheless, human ingenuity enabled physicists in the past to discover remarkable facts about the natural world that underpin all of modern science and technology.

Hands-on study of these remarkable accomplishments will give you an appreciation for the power of experimental physics, and, I hope, inspire you to seek your own discoveries.