Intro to Experimental Physics

Phys 1110

Instructor Info

Natasha Holmes

Office Hrs: Wed 12-1pm;
Mon 1:30-2:30pm (Zoom);
Thurs 5-6pm (Zoom)

PSB 406

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Lab Manager: Mark Lory-Moran

Rockefeller B27

Course Info

Labs: Monday-Thursday
(see enrollment info)

Lectures: Friday

Lec 001: 8:00 - 8:50am
Lec 002: 2:40 - 3:30pm

Schwartz Auditorium

TA Info

Emily Stump ems489

Gavin Niendorf gsn27

Joseph Grassi jdg282

Lena Franklin laf233

Meagan Sundstrom mas899

Nora Fayyazuddin nef33

Sean Deyo sjd257

Billy Liu zl642

Course Syllabus as of September 27, 2022

Overview

An introduction to experimental physics aims to introduce you to the role of experimental physics in generating knowledge about the universe. The objectives for this course fall under five big themes:

By the end of this course, you should be able to

1. Collect data and revise an experimental procedure iteratively and reflectively,
2. Evaluate the process and outcomes of an experiment quantitatively and qualitatively,
3. Extend the scope of an investigation whether or not results come out as expected,
4. Communicate the process and outcomes of an experiment, and
5. Conduct an experiment collaboratively and ethically.

The full list of specific learning goals is available on Canvas under Learning Goals. The course is broken down into six experiment units and 14 lectures, each with a specific subset of learning goals. Each experiment unit focuses on developing and applying tools of experimental physics to extend our understanding of physical behavior and how we model it. Experiments will often critically assess the conceptual and experimental basis for physical models and their applicability or limitations in specific situations.

Why I love this course

As a professor, I study teaching and learning in college physics classes, particularly labs. I am driven to understand what students should learn from lab and how we can best support them in doing so. The research on labs is helping us understand how a fundamental understanding of experimental physics can help students regardless of their majors and future career paths.

The purpose of this lab program is NOT to demonstrate or reinforce concepts typically found in a textbook. Although lab activities may draw upon concepts and principles from other parts of the introductory physics course sequence, you should NOT expect a close connection to that material. Rather, the purpose of the lab program is to teach skills and tools used in experimental physics to assess how well the physical world may be modeled by those or other concepts.

The goal is to understand *how we know*, not what we know.

Grading Scheme

20%	Homework exercises (drop lowest 2)
30%	Lab notes (drop lowest 2)
33%	Quizzes
5%	Final presentation
5%	Lecture participation (drop lowest 3)
4%	Lab participation (drop lowest 2)
1%	Other participation*
2%	Surveys

The available drops are intended to cover all reasonable absences including illness, travel, and sports. There is no need to contact us regarding missed lectures or homework assignments. Accommodations will be made for extenuating or special circumstances – please come by my office hours or schedule a meeting to discuss such situations.

*Other participation points

With a large class, I am structuring ways to stay in contact with you all. Other participation points, therefore, can be made by 1) visiting our office hours, 2) posting questions on Ed Discussion, and 3) responding to others' questions on Ed Discussion (bonus!).

FAQs

What if I can't make it to lab?

You are expected to attend your registered lab section each week as per the course schedule. Missed labs will receive a score of zero, but the lowest TWO lab grades will be dropped to accommodate any missed labs. Exceptions will only be considered under exceptional circumstances.

What if I can't make it to lecture?

You are expected to attend your registered lecture section each week as per the course schedule. Missed lectures will receive a score of zero, but the lowest THREE lecture grades will be dropped to accommodate any missed lectures. Exceptions will only be considered under exceptional circumstances.

What if I can't make it to a quiz?

Because the quizzes are scheduled during class time, there will be no make-up quiz scheduled. If you are unable to attend the quiz, please contact me as soon as you are aware of the conflict. Exceptions will only be considered under exceptional circumstances.

Help! I don't know how to code!

You are not expected to know any programming in this course. We will teach you what you need to know! That being said, the Python homeworks are prone to silly errors. We will have a separate set of FAQs for the Python homeworks posted on Canvas. You can also post questions on Ed Discussion and stop by our office hours for help.

What materials do I need for lab?

None! Instructions will be on Canvas and Gradescope and lab notes will be submitted through Gradescope. The labs have desktop computers so you don't need to bring in your own laptop. Lab rooms have all the equipment you'll need, though you are also welcome to bring in extra stuff.

In lecture, we will use Poll Everywhere to actively engage you in discussions and ideas. You will need a web-enabled device to access Poll Everywhere. We can discuss alternatives (e.g., submitting responses on paper) if this poses a problem for you.

Getting help or contacting the teaching team

For almost any course question, please use the Ed Discussions platform rather than email. That way, anyone on the teaching team or students in the class can help you out, giving you a response much more quickly than through email. You can also attend office hours for questions that are best handled through discussion. Email should be reserved for more serious, personal matters.

Statement on inclusiveness

I will be working hard to create an inclusive, accessible, and engaging classroom environment. Please join me in that effort. I am committed to ensuring all members of the class are treated fairly and with dignity and respect.

Students with special circumstances

I look forward to discussing academic accommodations that may be required for students with any special circumstances, be it temporary and permanent disabilities, mental health concerns, other personal situations, or other kinds of learning needs. Please register with Student Disability Services for any relevant accommodations and check in with me as things come up throughout the semester.

Academic integrity

I strongly encourage you to work with other students throughout the course and have explicitly organized the course to encourage collaboration. Each student in this course is still expected to abide by the Cornell Code of Academic Integrity: "Any work submitted by a student in this course for academic credit will be the student's own work."

Copying text from other sources is a form of plagiarism. In labs, group work should reflect the contributions of all group members and only the group members. Homework should be your own work, though you should discuss the homework with peers. Individual quizzes should be only your own work. Lecture activities should be your own work – submitting classroom responses for peers is a violation of academic integrity.

I am happy to clarify the boundaries between collaboration and copying. Please chat with me or other members of the teaching team if you have any questions. For further details see: http://cuinfo.cornell.edu/aic.cfm.

Class Schedule

Section 1: Model Testing

Week	Day	Lab/Lecture #	Lecture Topic	Homework
	M	–	–	–
	T	–	–	–
8/22/2022	W	–	–	–
	R	–	–	–
	F	Lecture 1	Measurement and experiment	0. Intro to Python + Pre-test Survey
	M	Lab 1.1	–	–
	T	Lab 1.1	–	1. Uncertainty
8/29/2022	W	Lab 1.1	–	–
	R	Lab 1.1	–	–
	F	Lecture 2	Uncertainty and comparison	–
	M	LABOR DAY	–	–
	T	Lab 1.2	–	2. Distinguishability + Group-forming survey
9/5/2022	W	Lab 1.2	–	–
	R	Lab 1.2	–	–
	F	Lecture 3	Uncertainty and ethics	–
	M	Lab 1.2	–	–
	T	Lab 2.1	–	3. Ethics
9/12/2022	W	Lab 2.1	–	–
	R	Lab 2.1	–	–
	F	Lecture 4	Uncertainty and fitting	Group contracts
	M	Lab 2.1	–	–
	T	Lab 3.1	–	4. Fitting I
9/19/2022	W	Lab 3.1	–	–
	R	Lab 3.1	–	–
	F	Lecture 5	Fitting and model testing	–
	M	Lab 3.1	–	–
	T	Lab 3.2	–	5. Fitting II
9/26/2022	W	Lab 3.2	–	–
	R	Lab 3.2	–	–
	F	Lecture QUIZ	Quiz 1	–

Section 2: Model Building

Week	Day	Lab/Lecture #	Lecture Topic	Homework
	M	Lab 3.2	–	–
	T	Lab 4.1	–	–
10/3/2022	W	Lab 4.1	–	–
	R	Lab 4.1	–	–
	F	Lecture 6	Quiz review and model building	–
	M	FALL BREAK	–	–
	T	FALL BREAK	–	–
10/10/2022	W	–	–	–
	R	–	–	–
	F	Lecture 7	Collaboration and experimental physics	–

Week	Day	Lab/Lecture #	Lecture Topic	Homework
	M	Lab 4.1	–	–
	T	Lab 4.2	–	6. Uncertainty propagation
10/17/2022	W	Lab 4.2	–	–
	R	Lab 4.2	–	–
	F	Lecture 8	Linearization and data collection	–
	M	Lab 4.2	–	–
	T	Lab 5.1	–	7. Linearization
10/24/2022	W	Lab 5.1	–	–
	R	Lab 5.1	–	–
	F	Lecture 9	What makes a good research question?	–
	M	Lab 5.1	–	–
	T	Lab 5.2	–	8. Research questions
10/31/2022	W	Lab 5.2	–	–
	R	Lab 5.2	–	–
	F	Lecture QUIZ	Quiz 2	–

Section 3: Project Lab

Week	Day	Lab/Lecture #	Lecture Topic	Homework
	M	Lab 5.2	–	–
	T	Lab 6.1	–	
11/7/2022	W	Lab 6.1	–	–
	R	Lab 6.1	–	–
	F	Lecture 10	Quiz review and figures	–
	M	Lab 6.1	–	–
	T	Lab 6.2	–	9. Figures
11/14/2022	W	Lab 6.2	–	–
	R	Lab 6.2	–	–
	F	Lecture 11	Presentations	–
	M	Lab 6.2	–	–
	T	–	–	–
11/21/2022	W	–	–	–
	R	THANKSGIVING	–	–
	F	BREAK	–	–
	M	Lab 6.3	–	–
	T	Lab 6.3	–	
11/28/2022	W	Lab 6.3	–	–
	R	Lab 6.3	–	–
	F	Lecture 12	TBD	–
12/5/2022	M	–	–	Post-test Survey & Group work reflection
	T - R	STUDY PERIOD		
12/12/2022	M - F	FINAL QUIZ: TBD		