Intro to Experimental Physics

Phys 1110

Lead Instructor

Natasha Holmes

Office Hrs: Tues 2-3pm;
Wed 3:30-4:30pm

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Support Instructors -

Cristina Schlesier

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Lab Manager: Mark Lory-Moran

Course Info

Labs: Monday-Thursday
(see enrollment info)

Lectures: Fridays

Lec 001: 1:25 - 2:15pm
Lec 002: 2:40 - 3:30pm

Schwartz Auditorium

TA Info

Sagnik Banerjee sb2678

Nate McFadden njm222

Rachel Merrill rm854

Pranjal Praneel pp475

Zihao Qi zq73

Zihan Zhang zz872

Course Syllabus as of August 23, 2024

Overview

An introduction to experimental physics aims to introduce you to how scientists learn about the universe, accounting for all the messiness and subjectivity inherent in experimentation. 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 11 lectures. 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.

What this course is not

The purpose of this lab course 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.

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 3)
15%	In-Class quizzes (drop lowest 2)
12%	Final presentation and report
10%	Lecture participation (drop lowest 5)
10%	Lab participation (drop lowest 2)
3%	Surveys

How do I hand in work in this course?

Each week, your group will work through lab instructions that are embedded in a Google Colab document (a web-based Jupyter Notebook platform). You will add to the Colab document with answers to provided questions and with your lab notes and analysis. Lab notes will include descriptions and justifications of your experimental designs, interpretations of data, iterations and improvements, data analysis, and tentative conclusions. You will submit a single PDF of your Google Colab file for your whole group each week on Gradescope. These assignments will also be linked through Canvas.

You will also have brief homework assignments (should take about 15 minutes each week) each week to reflect on your lab activities and practice your data analysis and interpretation skills. These will typically be written or Colab through Gradescope, but may use other platforms as well. Either way, the assignments will be linked through Canvas.

Lastly, we will have activities and (brief) quizzes in lecture that use iClickers.

All assignments and grades will ultimately be visible through Canvas.

FAQs

What if I can't make it to lab?

You are expected to attend your registered lecture section each week as per the course schedule. But do not worry! We will drop your lowest 2 labs. No need to email us!

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. But do not worry! We will drop up to 5 missed lectures. No need to email us!

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

Quizzes will take place via iClicker during scheduled lectures and there will be no make-up quiz scheduled. But do not worry! We will drop your lowest 3 quizzes. No need to email us!

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, coding is prone to silly errors. We will have a running set of FAQs on the Canvas Discussions page related to Google Colab. You can also post your own questions on the Canvas Discussion, stop by our office hours for help, and check in with your peers.

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, though you are welcome to. Lab rooms will also have all the experiment equipment you'll need, though you are also welcome to bring in extra stuff.

What materials do I need for lecture?

We will use iClicker to actively engage you in discussions and ideas. You will not be permitted to use the iClicker app. We can discuss alternatives (e.g., submitting responses on paper) if this poses a problem for you. There is no textbook for this course.

What if I need to miss a lab or lecture?

If you are sick or have an emergency that precludes you from attending lab or lecture or submitting a homework assignment, do not worry. The available drops are intended to cover all reasonable absences including illness, travel, and sports. There is no need to contact us regarding missed labs, lectures, or homework assignments. Accommodations will be made for extenuating or special circumstances – please come by our office hours or schedule a meeting to discuss such situations.

We will also have dedicated makeup lab sections during weeks partially containing university breaks; these lab sessions are not used for making up a single absence, but rather for students who have needed to be absent for multiple weeks due, for example, to health issues. These sessions are by invitation only.

Getting help or contacting the teaching team

For almost any course question, please use the Discussions platform on Canvas 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 conversation. Email should be reserved for more serious, personal matters.

Lab notes and homework grading schemes

Lab notes and homework will be graded on a coarse scale: 0, 1, 2, 3, or 4. Why?

Each assignment will look different. You may take a slightly different approach than someone else and that's ok. It can be very difficult to assign a detailed point system for documents with varied approaches and we want you to focus on learning and doing.

Here's the system:

- 4 is meant to be an A level submission. It does not have any significant flaws and has all the pieces we asked for.
- 3 is meant to be a B level submission. It is good, but has one or more significant flaws and room for improvement (e.g., in data collection, evaluation, interpretation, and/or communication).
- 2 suggests some major flaws (e.g., data is presented in a clearly incorrect way, figures are missing or unreadable, one or more major sections of the assignment do not appear).
- 1 suggests multiple flaws of the kind in category 2.
- 0: You didn't do the assignment.

Your assignments may not be graded by your lab instructor. That's ok! If we assign you anything other than a 3 or 4, it will be reviewed by two instructors. If you are assigned a 1, it will be reviewed by Prof. Holmes or Prof. Schlesier personally.

It is possible to earn a 5. A "5" reflects an assignment that really goes above and beyond–particularly in the areas of data analysis, interpretation, or figure presentation without making the report longer. This will be rare (<5% of all reports) and will also be reviewed by two instructors. This is the route to an A+!

Class Schedule

Section 1: Model Testing

Week	HWK due	Mon	Tues	Wed	Thurs	Fri
8/26/2024	Pre-Survey	Lab 0	Lab 0	Lab 0	Lab 0	L1: Introduction and Measurement
9/2/2024	Hwk 1	Labor Day	Lab 1.1	Lab 1.1	Lab 1.1	L2: Uncertainty
9/9/2024	Hwk 2	Lab 1.1	Lab 1.2	Lab 1.2	Lab 1.2	L3: Distinguishability and Quiz 1
9/16/2024	Hwk 3	Lab 1.2	Lab 2	Lab 2	Lab 2	L4: Experiment and Fitting
9/23/2024	Hwk 4	Lab 2	Lab 3.1	Lab 3.1	Lab 3.1	L5: Fitting and Quiz 2
9/30/2024	Hwk 5	Lab 3.1	Lab 3.2	Lab 3.2	Lab 3.2	L6: More Uncertainty

Section 2: Model Building

Week	HWK due	Mon	Tues	Wed	Thurs	Fri
10/7/2024	Hwk 6	Lab 3.2	Lab 4.1	Lab 4.1	Lab 4.1	–
10/14/2024	Fall Break			–	–	L7: Collaboration and Ethics and Quiz 3
10/21/2024	Hwk 7	Lab 4.1	Lab 4.2	Lab 4.2	Lab 4.2	L8: Frontiers of experimental physics
10/28/2024	Hwk 8	Lab 4.2	Lab 5.1	Lab 5.1	Lab 5.1	L9: Linearization and data collection
11/4/2024	Hwk 9	Lab 5.1	Lab 5.2	Lab 5.2	Lab 5.2	L10: Asking good questions and Quiz 4

Section 3: Project Lab

Week	HWK due	Mon	Tues	Wed	Thurs	Fri
11/11/2024	Hwk 10	Lab 5.2	Lab 6.1	Lab 6.1	Lab 6.1	L11: Presentations
11/18/2024	Hwk 11	Lab 6.1	Lab 6.2	Lab 6.2	Lab 6.2	L12: TBD
11/25/2024	–	Lab 6.2	–	Thanksgiving Break		
12/2/2024	Hwk 12	Lab 6.3	Lab 6.3	Lab 6.3	Lab 6.3	L13: Wrap up and Quiz 5
12/9/2024	Final Report and Post-survey					

Statement on inclusiveness

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

Students with special circumstances

We 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 us as things come up throughout the semester.

Academic integrity

We 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.

We are happy to clarify the boundaries between collaboration and copying. Please chat with any member of the teaching team if you have any questions. For further details see: http://cuinfo.cornell.edu/aic.cfm.