Exploring Experimental Physics

Phys 2210

Instructor Info

Natasha Holmes

Office Hrs: TBD

PSB 406

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Lab Manager: Mark Lory-Moran

Rockefeller B27

Course Info

Pre Reqs: Phys 1110

Lab 401: W 8:00 - 9:55am
Lab 402: R 12:20 - 2:15pm
Lab 403: M 2:40 - 4:35pm

Rockefellar Hall B03

TA Info

Rebeckah Fussell

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Course Syllabus as of October 26, 2022- subject to change

Overview

Exploring experimental physics aims to push your understanding of experimental physics through a semester-long group project. 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 consists of 12 lab sessions, 12 homework assignments, and 3 at-home online quizzes.

In this laboratory course, students will build on the knowledge and skills developed in Physics 1110 (Introduction to Experimental Physics) to conduct semester-long experimental physics projects. Students will work in lab project teams to iteratively develop a research question, write a proposal that is reviewed by their peers and experts, engage for multiple weeks with their project, and present their findings in a public poster session at the end of the semester. Students will learn additional skills in experimental design and data analysis, with broader focuses on how to generate interesting, testable, and feasible research questions, how to provide critical and constructive feedback to others, and how to present research to a broad audience. The course provides an early opportunity for students to get a glimpse of experimental physics research, employ creativity to generate an answer to a novel research question and/or design a unique experimental approach.

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.

In this course, you get to explore the full range of experiences associated with experimental physics from coming up with a research question, writing a proposal, going through a peer review process, dealing with the inevitable bumps and twists and turns, and presenting their work to an audience of peers and experts. This is not about reproducing facts we already know – this is an opportunity for you to try on the hat of an experimental physicist and generate knowledge and discover something we did not know beforehand.

What materials do I need for lab?

None! Instructions will posted on and all assignments will be submitted through Canvas and Gradescope. Lab rooms have all the equipment you'll need, though you are also welcome to bring in extra stuff. We have some desktop computers available, but it will beneficial if some members of your group can bring in a laptop.

Mask policy

We are strongly encouraging all students to wear masks when in the lab room. We are happy to discuss this recommendation with students and will also reevaluate as needed throughout the semester.

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.

Help! I don't know how to code!

Not a problem! We are all here to learn. The first homework will be a refresher of the material from Phys 1110 that will clarify the kind of coding analysis we will expect you to be able to execute in Jupyter Notebook. We will also have a separate set of FAQs for the Jupyter Notebook analysis posted on Canvas, you can post questions on Ed Discussion, stop by our office hours for help, and check in with your peers.

What's this about quizzes?

The quizzes will be take home through Canvas and will ask you about material associated with the course learning goals. We will also ask some questions about your particular investigation for you to reflect upon. We will clarify the details as they approach.

What if ...?

So many questions, I know! We'll sort it out week 1!

Grading Scheme

20%	Homework exercises (drop lowest 2)
30%	Lab notes (drop lowest 2)
33%	Quizzes
10%	Final presentation
3%	Lab participation (drop lowest 2)
1%	Other participation*
3%	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 homework exercises. Accommodations will be made for extenuating or special circumstances – please come by my office hours or schedule a meeting to discuss such situations.

Quizzes will be take-home through Canvas with no extensions or associated drops. Contact me as soon as you foresee any possible conflicts.

*Other participation points are included as a way for me to stay in contact with you all. Other participation points, therefore, can be made by 1) visiting my office hours within the first two weeks of class and 2) either attending office hours or posting a question or answer on Ed Discussion during at least six of the last 12 weeks of the semester.

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.

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

Project lab plan

Week	Day	Lab #	In-lab assignment	Homework
	M	Lab I	Research question ideas	–
	T	–	–	–
8/22/2022	W	Lab I	Research question ideas	–
	R	Lab I	Research question ideas	Group forming survey + Pre-test Survey
	F	–	–	–
	M	Lab II	Draft proposal	–
	T	–	–	
8/29/2022	W	Lab II	Draft proposal	–
	R	Lab II	Draft proposal	–
	F	–	–	1. Analysis review
	M	LABOR DAY	–	–
	T	–	–	–
9/5/2022	W	–	–	–
	R	–	–	–
	F	–	–	2. Peer review proposals
	M	Lab III	Final proposal	–
	T	–	–	3. Group contracts
9/12/2022	W	Lab III	Final proposal	–
	R	Lab III	Final proposal	–
	F	–	–	–
	M	Lab IV	Final plan with preliminary data	–
	T	–	–	4. Making good figures
9/19/2022	W	Lab IV	Final plan with preliminary data	–
	R	Lab IV	Final plan with preliminary data	–
	F	–	–	–
	M	Lab V	Lab notes	–
	T	–	–	QUIZ 1
9/26/2022	W	Lab V	Lab notes	–
	R	Lab V	Lab notes	–
	F	–	–	–
	M	Lab VI	Lab notes and list of planned figures	–
	T	–	–	5. Group member feedback
10/3/2022	W	Lab VI	Lab notes and list of planned figures	–
	R	Lab VI	Lab notes and list of planned figures	–
	F	–	–	–
	M	FALL BREAK	–	–
	T	FALL BREAK	–	–
10/10/2022	W	–	–	–
	R	–	–	–
	F	–	–	6. Draft figure

Week	Day	Lab #	In-lab assignment	Homework
	M	Lab VII	Lab notes and draft figure	–
	T	–	–	7. Effective poster presentations
10/17/2022	W	Lab VII	Lab notes and draft figure	–
	R	Lab VII	Lab notes and draft figure	–
	F	–	–	–
	M	Lab VIII	Lab notes	–
	T	–	–	8. Peer review figures
10/24/2022	W	Lab VIII	Lab notes	–
	R	Lab VIII	Lab notes	–
	F	–	–	–
	M	Lab IX	Lab notes	–
	T	–	–	QUIZ 2
10/31/2022	W	Lab IX	Lab notes	–
	R	Lab IX	Lab notes	–
	F	–	–	–
	M	Lab X	Lab notes	–
	T	–	–	9. Presentation outline
11/7/2022	W	Lab X	Lab notes	–
	R	Lab X	Lab notes	–
	F	–	–	–
	M	Lab XI	Lab notes and draft presentation	–
	T	–	–	10. Final report outline
11/14/2022	W	Lab XI	Lab notes and draft presentation	–
	R	Lab XI	Lab notes and draft presentation	–
	F	–	–	–
	M	–	–	–
	T	–	–	
11/21/2022	W	–	–	–
	R	THANKSGIVING	–	–
	F	BREAK	–	–
	M	Lab XII	Lab notes and presentation	–
	T	–	–	11. Peer review presentations
11/28/2022	W	Lab XII	Lab notes and presentation	–
	R	Lab XII	Lab notes and presentation	–
	F	–	–	12. Final report
12/5/2022	M	–	–	Post-test Survey
	T - R	Poster Presentation: TBD		