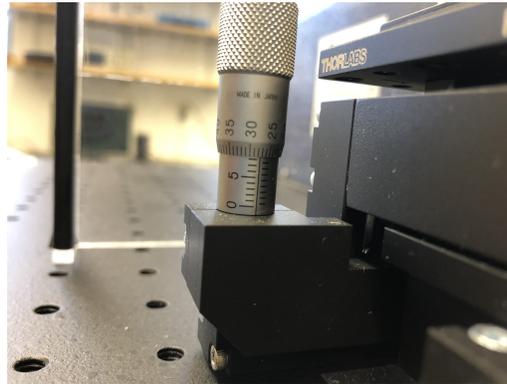


# Physics 338 - Advanced Physics Laboratory

## Lafayette College, Spring 2022



### **Professor**

Zoe Boekelheide

Hugel Science Center 026

boekelhz@lafayette.edu

Office hours: Weds 1-3pm  
Thur 1-3pm

### **Class meeting times**

Lecture: Tu Th 11:00am-12:15pm in HSC 017

Lab: Students work independently

### **About this course**

Physics is an experimentally-based science. Experiments have often paved the way for scientific revolution, and they remain the final arbiter among competing theories. However, experiments are rarely as straightforward as one might believe based on typical textbook descriptions, so it is important for an educated scientist to develop an understanding of, and an appreciation for, reliable, quality experimental research.

In this course, you will perform experiments from a variety of areas of physics, with emphasis on understanding the underlying physics, designing experiments, statistically analyzing observations, and writing reports.

## Prerequisites

Physics 218 and Math 264 are prerequisites for this course. Either may be waived with permission from the instructor.

## Expectations and workload

The student work in this course is in full compliance with the federal definition of a four credit hour course. The federal course credit rule requires a total of 180 hours (12 hours/week) of student work over an approximately 15-week semester for a full unit (four credit hour) course. See the Registrar's Office web site for the full policy and practice statement (<http://registrar.lafayette.edu/additional-resources/cep-course-proposal/>)

**You should therefore expect to spend about 12 hours/week on this course: 3 hours in lecture, and 9 hours working in the lab, on data analysis, or on your reports.**

## Course materials

It is recommended that you have access to John R. Taylor's An Introduction to Error Analysis, which you may have from a previous course.

## Course Website

I will use moodle to post class handouts and assignments: <http://moodle.lafayette.edu>.

I will use moodle or our class email list ([phys338-01-spring2022@lafayette.edu](mailto:phys338-01-spring2022@lafayette.edu)) to send email to the class if necessary (e.g. weather delays, assignment clarifications, etc.) so please check your Lafayette email regularly.

## Learning Outcomes

After completing this course, you should be able to

- Perform and interpret basic experiments involving magnetic properties of materials,
- Interpret spectroscopic results in terms of fundamental energy levels,
- Develop and refine appropriate experimental protocols,
- Estimate uncertainties in measurements, and use those uncertainties properly in experimental analysis, and
- Communicate results in standard journal article form.

Since Phys 338 counts as a writing course under the College's Common Course of Study, you should also be able to

- W2: Identify and employ a range of strategies for discovering, developing, organizing, revising, and editing.
- W3: Identify and apply the discourse conventions of a chosen academic discipline(s) or fields(s) (including conventions of genre, format, citation, structure, and vocabulary).

## Grades

Grades on various assignments serve multiple purposes:

- To provide feedback on your performance on given assessments (e.g. formal and informal reports). Your performance on such assessments should reflect your understanding of the material and competency at the required writing skills, i.e. the degree to which you have met learning outcomes.
- To provide more immediate incentives for certain behaviors which are beneficial to your learning (e.g. keeping a lab notebook, turning in assignments on time) or to the class as a whole (e.g. participating in peer review).

Here are some things that grades are completely irrelevant to:

- Your value as a human being.

Don't let grades take on more meaning than they deserve!

Your final course grade will be determined as follows:

Magnetic susceptibility informal report:	10%
ESR informal report	10%
Iodine formal report	25%
Magnetics research formal report	30%
Nuclear informal report	10%
Lab notebook	10%
Colloquium attendance	5%

## Detailed description of course components

### Lab Notebook:

You are required to keep an accurate and complete log of your work in this course in a laboratory **notebook**. This notebook must contain all the information needed to analyze the experiment, as was the case in your introductory physics course. I will collect the lab notebooks at the end of the semester to check for completion.

## **Lab Reports:**

For three of the experiments, you will submit a brief informal lab report. The report should be typed, though diagrams and calculations may be handwritten, as long as they are legible. These reports will not go through the peer-review and editing process.

For two of the experiments, you will submit a formal lab report in the style of a journal article. This report will have multiple drafts, and you will also use a peer-review process.

## **Colloquia:**

Throughout the semester, there will be various talks hosted by the Physics Department or Physics Club. These are a valuable opportunity to learn about diverse areas of physics, and attendance at all of them is strongly encouraged. For this course, you should plan on attending at least three talks during the semester; attendance will count for 5% of the total grade.

## **Attendance:**

Regular attendance is expected. It is **your** responsibility to keep advised of all assignments. If you will be absent, or will need to connect to class via Zoom, you should let me know in advance if possible.

## **Intellectual honesty**

You are expected to abide by the principles of intellectual honesty outlined in the Lafayette Student Handbook (available from <http://studentlife.lafayette.edu>). Here are some guidelines specific to this course:

All work you turn in must be your own. In this course, you will do the labs individually rather than with partners. You are allowed and encouraged to discuss the experiments with your classmates, but make sure that your data, computer files, and reports are all your own work.

If you want to share data or computer analysis files to help a friend, it is best to share screenshots of your work (\*.jpg, \*.png, \*.pdf), not the full file (\*.xlsx, \*.nb, \*.py). Your friend will learn more by creating their own file and typing in the commands themselves than by just using your file directly.

For written reports, it is important that you cite any and all sources that you refer to for information. Inappropriate citation can be referred to the Dean's office as an academic honesty violation, so please ask me if you are unsure of how to cite your sources appropriately!

## **Inclusion statement**

In Physics 338, all students are welcome. Students and professors bring diverse identities to class, and it is my intention that all students feel included in the intellectual community of the classroom. Unfortunately, the history of science is full of exclusion, so it's important to be explicit about inclusion.

Please contact me if you feel your identity is not being honored in class, if you have a preferred name or pronouns that I am not aware of, you observe religious holidays which conflict with coursework, or if there is something else that I can or need to address. I am still learning, too, and your feedback is important to me.

## **Accommodation**

It is important to me that nothing impedes your ability to do well in this course. If you have any disabilities which you feel may interfere with your ability to succeed and prosper in this class, please contact me to discuss ways of accommodating them.

*Mandatory statement for any Lafayette course with a disability policy.* In compliance with Lafayette College policy and equal access laws, I am available to discuss appropriate academic accommodations that you may require as a student with a disability. Requests for academic accommodations need to be made during the first two weeks of the semester, except for unusual circumstances, so arrangements can be made. Students must register with the Office of the Dean of the College for disability verification and for determination of reasonable academic accommodations.

## **Mandatory Moodle privacy statement**

Moodle contains student information that is protected by the Family Educational Right to Privacy Act (FERPA). Disclosure to unauthorized parties violates federal privacy laws. Courses using Moodle will make student information visible to other students in this class. Please remember that this information is protected by these federal privacy laws and must not be shared with anyone outside the class. Questions can be referred to the Registrar's Office.