

# Physics 233

## Laboratories

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Office Hours: TH 1:00 – 3:00 pm

### Overview

The course will cover Geometric Optics, Wave Optics, Introductory Quantum Mechanics, Thermodynamics, and Introductory Statistical Mechanics.

**This class will not be a lecture course.** Class participation is required. Frequent unexcused absences and tardiness will result in grade reduction. If you will be absent from class for a valid reason (such as university approved events), you **must** inform me well in advance in order to have any opportunity to make up missed work.

### Goals

After completing this course, students will be able to

- Use the basics of geometrical optics
- Discuss the experimental results which led to the overthrow of some of the concepts of classical physics.
- Explain and apply the rules of quantum mechanics to simple systems.
- Discuss the concepts of thermodynamics, including heat, temperature, and irreversibility.
- Calculate the entropy of a system using statistical mechanics.
- Discuss scientific concepts as well as work out mathematical problems.
- Use homework not only as practice, but as a means of communicating information.
- Methodically perform and clearly report experimental work

### Prerequisites

Physics 232 and Math 221. Knowledge of algebra, geometry, trigonometry, derivatives, integrals, and basic vector calculus will be assumed.

### Evaluation

Laboratory	25%
Homework	25%
Class participation & in-class work	15%
Exams	35%

### Texts

*Unit Q: Particles Behave Like Waves* 2<sup>nd</sup> edition, by Thomas A. Moore  
*Unit T: Some Processes are Irreversible* 2<sup>nd</sup> edition, by Thomas A. Moore  
*Unit O: Geometrical Optics* by Paul A. DeYoung available on class website  
The first two are from the series *Six Ideas that Shaped Physics*. For all books, we will be covering one chapter per class period, **which must be read before class.**

### Exams

**Wednesday, December 14 at 3:00 pm**

This time cannot be changed. This exam will cover Unit T and lab skills.

**Tuesday, October 25 at 1:00 pm**

This mid-term exam will cover Unit Q and Optics.

Both exams will be closed book and will contain both conceptual and quantitative problems. You may use a calculator for basic functions (addition, subtraction, multiplication, division, powers, exponentials, logarithms). You are on your honor not to use a calculator for advanced functions (including integration, differentiation, solving equations, unit conversions) or to store formulas or notes of any type in its memory. Calculators may not be shared

## Overview

This is the first laboratory course in the physics sequence where the goal is to learn laboratory skills **NOT** to reinforce what you learn in lecture

## Goals

By the end of the semester, you should be able to

1. Keep organized and complete records in a lab notebook
2. Propagate experimental uncertainties through calculations
3. Make linear plots from various types of data and extract values using linear regression
4. Write laboratory reports that are organized, concise, and clear.

## Notebooks

This semester we will be experimenting with electronic laboratory notebooks using Microsoft OneNote, which is available through my.redlands.edu. All data, calculations, plots, etc., should be uploaded to this site by the deadline.

## Evaluation

Reports are graded with a letter grade (no +/-) and are based on writing, clarity and conciseness as well as correctness. Each group will receive the same grade and the membership of the groups will be assigned and change every week.

## What does it take to get an A in Physics 233?

This class covers the same amount of material as earlier classes, but with only 2 meetings per week. Thus, you are expected to do more work outside of class. You will **NOT** be able to get an A just by going to class. You **MUST** be working outside of class. I intend for you to have questions that can't be answered during class, so you **must** talk to me outside of class.

- Attend class and participate.
- Do the assigned reading before class.
- Take notes on the reading.
- Do all the reading exercises in the book and check your answer in the back of the chapter.
- Do the daily homework on webassign before class.
- Start the weekly homework early, every problem should be read and attempted by Monday each week.
- Work on homework with a group. Physics is too hard to do alone.
- Look at assignments when they are returned. Understand what you did wrong and how to fix it.
- Talk in class, ask questions, make explanations, and join in discussion.
- Read the syllabus and know what it says.
- Come to office hours or come by any time I'm not busy (my schedule is online). If you're having trouble finding me when I'm in, send me an e-mail
- Work on Physics every day. A suggested schedule is shown below:

Monday: Reading & daily for tomorrow; correct weekly hw	Tuesday: Start lab & weekly hw	Wednesday: Finish weekly hw from Tuesday's chapter. Reading & daily for tomorrow	Thursday: Finish weekly hw, come to office hours for last minute questions on hw & lab	Weekend: Finish lab and do pre-lab for next week.
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## Texts

There is a Lab Reference Manual available on the course web site

## Due Monday 9 am

### Pre-lab

Before each lab, you will be assigned reading and problems that must be completed before lab. This is to ensure that experiments run smoothly and you will be able to complete the experiment in the allotted time. Problems are due by e-mail to the instructor. Failure to submit a pre-lab assignment results in a 0 for that lab.

### Post-lab

Each group will keep a single lab notebook for each experiment. At the end of lab, all lab records, plots, and calculations should be in the notebook. Some labs later in the semester will also require a written paper.

## Homework

Physics is not a spectator sport! You will not learn to solve problems without regular practice, so homework is an essential part of this course. There are 2 types of homework in this course:

- **Daily Reading Exercises** - Since you will be responsible for reading the book on your own, problems will be assigned for every class period. These will demonstrate that you understand the basic concepts in the chapter. You **must** purchase access to weassign in order to complete these problems. They are due at 9:30 am at the beginning of class and graded immediately, so under no circumstances will late homework be accepted. Since these problems are for practice, they will be graded with a 0 (for poor effort including not attempting all problems), 1 (for a good effort, indicated with a ✓), or 2 (for a good effort with correct results and reasoning, indicated with a ✓+). Homework will be handed back during class and solutions will be available. Corrections are due at the beginning of the next class and will be awarded an additional point if everything is suitably corrected and no points if major issues are uncorrected. Correcting your own homework is a valuable exercise that will help you understand the material better. You can expect to spend 2-3 hours per class on reading and daily homework.
- **Weekly** - More difficult problems will be collected once a week on Friday at 2 pm and again, no late homework will be accepted. These problems will be graded on a 3 point scale. You will receive a 0 for a poor effort (including not attempting all problems), a 1 (✓-) for a good effort to answer all assigned problems but some issues with presentation, a 2 (✓) for a good attempt at all problems and good presentation, and a 3 (✓+) for a completely correct assignment with excellent presentation. Excellent presentation includes clarity, with an assignment that is easy to follow, well organized, shows all logical steps, includes a diagram and definitions of all terms, includes units in calculations, does not include numbers until the last step, and includes an evaluation of the solution. If you received a ✓ initially, you can earn an extra point by correcting your homework. If you received a ✓- or 0, you can receive up to two additional points by turning in corrections. Corrections to the homework are due at the beginning of class on Tuesday. You can expect to spend 6-8 hours per week on weekly homework. You **MUST** begin this assignment early. You will **not** be able to complete it if you begin the night before it is due.
- You are encouraged to work together with your classmates on the homework provided each person comes to an understanding of the questions and problems and submits a separate set of solutions. Copying another student's homework or allowing your homework to be copied is cheating and neither will be taken lightly. For the first offense, neither student's homework will get credit and a letter will be placed in both student files.

## Accommodations

- I strive to make this course accessible to all students. Please come see me to discuss ways the course can be improved.
- Should you require academic accommodations, please consult with Amy Wilms, Assistant Dean of Academics and Student Life: <http://www.redlands.edu/DisabilityServices.asp>

## Statements Regarding Discrimination, Harassment, Sexual Misconduct, and Retaliation:

- I will not tolerate discrimination, harassment, sexual misconduct, or retaliation in this course, in class or in any work related to it. This includes, but is not limited to, anyone stating that a member of any group is inferior in ability to another. I've been told repeatedly that "girls can't do physics" or "boys are better at spatial analysis". Well, this full professor of physics has clearly demonstrated that these statements are not true.