

SYLLABUS

Meeting Times

Lectures: MWF 9:00-9:50 am

Room: Hugel Science Center 100

Office Hours:

M 11:30 am - 12:30 pm

W 2:30 pm - 3:30 pm

R 10:30 am - 11:30 pm

**office hours will be in Hugel 028*

Contact Information

Professor: Dr. Paul Stonaha

Office: Hugel Science Center 028

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Phone: 610-330-3376

Course Overview:

This course is a calculus-based introduction to the foundations of electricity and magnetism, intended for students majoring in science or engineering. Our emphasis will be on identifying, understanding, and applying the fundamental principles of electric fields and potentials, basic circuits, magnetic fields, and electromagnetic waves.

Learning Outcomes:

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

- Understand, identify, and apply the fundamental principles of electricity and magnetism in a variety of physical situations
- Apply Maxwell's equations and the principles of waves to appropriate physical situations
- Apply qualitative and quantitative problem-solving skills to answer concrete questions and communicate your reasoning to others
- Describe phenomena in the physical world using the language of mathematics including calculus concepts and vector quantities
- Engage in the process of *doing* physics, including such tasks as developing, testing, and evaluating models, graphing and interpreting experimental data, solving problems, and communicating results
- Collect and analyze experimental data relevant to testing a hypothesis and evaluate whether the evidence supports, refutes, or leads to the revision of the hypothesis

Key points in this syllabus:

- Attendance is mandatory
- Completing each weekly homework assignment requires submitting answers on *Mastering Physics* AND submitting handwritten work online (Moodle).

- There will be pop quizzes, usually every week or two.
- Exams are a hybrid take-home / in-class style.
- Programmable calculators are NOT ALLOWED for the exams.

Prerequisites:

PHYS 131 or PHYS 151, MATH 162 or permission of instructor

Course Text:

University Physics with Modern Physics, 15th ed. by Young and Freedman with *Modified Mastering Physics*

*If you did not purchase with *Modified Mastering Physics* with the text, you can buy it online at <http://www.mlm.pearson.com/>

Course Policies:

Attendance is mandatory. A significant component of this course will involve in-class participation and in-class group problem solving; these activities are designed to help you better learn the material and, as such, require your presence in order to be effective. Working with others will help inform your problem-solving by bringing potentially disparate approaches/opinions to the table, forcing you to discuss and debate with one another as you work towards a common solution.

I encourage you to read/review the relevant sections of the text (as listed in the schedule) *before* class so that the material is not completely unfamiliar to you when we start discussing it together. There's good stuff in the book. Please use it.

I expect your phone to be set to silent during the class. If you have an ongoing emergency and need your phone with you during class, please set it to vibrate. ***You may not speak on the phone in the classroom during class time.*** If your phone causes repeated disturbances during the class, you will lose an attendance credit (at the professor's discretion).

Mentored Study Group:

Lafayette College offers Mentored Study Group (MSG) hours to students enrolled in physics classes. MSG hours are opportunities for you to get assistance on homework problems or review for tests. MSG hours are hosted by MSG leaders – students who have taken PHYS 133 in the past and have excelled in the class. The MSG times and locations for this class are

Sunday: 5:00 pm - 7:00 pm @ ACOP 429

Sunday: 7.30 pm - 9.30 pm @ RISC 362

Monday: 7:00 pm - 9:00 pm @ ACOP 429

Friday: 11:00 am - 1:00 pm @ RISC 362

Grading:

Grades are determined on the following basis:

Attendance:	10%	Exam I:	10%
Labs:	15%	Exam II:	10%
Problem Sets:	20%	Exam III:	10%
Quizzes:	10%	Final Exam:	15%

Attendance:

Attendance is mandatory. You must arrive to class on time. You will start this course with 6 free ‘attendance credits’. Every tardy shall cost you one (1) attendance credit. Every unexcused absence will cost you two (2) attendance credits. If you use up these credits, subsequent tardies and unexcused absences shall add to your attendance demerits (two for absences, one for tardies). Each attendance demerit will cost you 0.25% of your final grade. ***If you lose at least 10% of your grade due to this mechanism, it is an automatic course failure.***

(Example: you can have up to 22 absences and 1 tardy and pass this class with up to a 90.25%. But one additional tardy or unexcused absence would cause you to fail the class.)

There will be a sign-in sheet at the beginning of each class meeting to help track attendance; please fill it out upon entering class with the provided pen. Excused absences (accompanied by a Dean’s Excuse) will not be marked down.

Laboratory:

The laboratory is an essential part of this course. There you will see and experiment with many of the concepts we cover in class and learn how to approach, analyze, and communicate details of an experiment. You must complete all of the assigned experiments; you will be unable to pass this course unless you both complete all laboratory activities and receive a passing grade for the laboratory part of the course. Further details will be provided by your laboratory instructor.

Problem Sets:

Homework will be assigned on a weekly basis and will be ***due on Wednesdays at 5pm.***

If you need extra time to complete the homework, let me know before the due date. You may have three (3) extra 2-day extensions on homework assignments. These extensions may be stacked for a single assignment, but never split. If you do not submit a homework on time without contacting me about an extension first, you will receive a zero for that assignment. Please plan to manage your time accordingly.

You will turn in homework in two (2) ways: You will submit answers through the Mastering Physics website AND you will turn in your written work for the Mastering Physics problems to me. I would like you to submit photographs of your handwritten homework through Moodle. I will grade the written work by examining randomly selected problem(s). The grade on the written work will be multiplied by the Mastering Physics grade to produce each weekly homework grade. The written work will be graded as follows:

No work or illegible work	×	40%
Legible but not complete or correct	✓−	60%
Legible and (complete or correct)	✓	80%
Complete, correct, & legible	✓+	100%

This grading rubric may be broken into finer demarcations when appropriate (e.g. a simple error, missing units, etc. may result in a 90%).

•Some tips and pointers for doing problem sets that will help keep your work clearly and logically organized are below. These steps are not required, but I guarantee that you will find your work easier to follow, explain to others, and learn from if you adhere to these suggestions.

- Write out the problem (or an abbreviated version containing all relevant information). Draw a picture/diagram if useful.
- Clearly work out the problem, commenting your work as you go. Solutions should never contain just the math; use words to describe what you are doing and to reference where in the text an equation came from and why it is relevant.
- Remember to keep track of units (by writing them out with all your calculations)! Do the units work out as you expect they ought to at the end of a problem? Dimensional analysis is the easiest check to ensure you have tackled the problem correctly.
- Box your final solutions or major milestones as you do the problem. This makes it easier for you to follow your own work when you look it over.
- Think about or comment on the significance of your answer. (Does it make sense? Is it what you expected? Why or why not?)
- Please see me if you have any questions about this! I know it seems a bit ridiculous listed out like this, but I promise that it will serve you well in the long run. Writing in science is different from the traditional humanities paper, but the point is the same: to clearly and effectively communicate something. This will help you to accomplish that, even with online assignments.

Exams:

There will be three (3) in-class exams and a comprehensive final exam. Each exam will comprise both long problems and comprehension questions. I will provide you with the long problems and a list of potential comprehension questions one (1) week before the exam date. During that week, you may work with each other and use any other resources to develop answers to the questions.

On the day of the exam, you will be asked to solve the same long problems that you were given in the previous week. Provided numeric values in the problems may be changed in a

trivial way from the initially distributed test. To receive full credit, you must show all work and ***convince me that you know how to solve the problem.*** On the day of the exam, you will also be asked to briefly solve some of the comprehension questions.

During the in-class exam, you must work alone and may not use any notes, books, etc. Numeric values on the in-class exam will be changed from what was distributed in the week prior.

Programmable calculators are not permitted during the exam. Do not ask to use a programmable calculator, even if you clear its memory. If I notice you using a programmable calculator for the exam, you will receive a grade of zero. I can supply four-function calculators for you if you do not supply your own non-programmable calculator.

Supplemental Instruction:

SIs will be holding problem help sessions multiple times during the week. These sessions are useful ways to practice applying the physics we discuss in class and work through book examples.

Academic Honesty:

I expect that you will abide by the "Principles of Intellectual Honesty" appearing in the Lafayette College Student Handbook. Posting homework or exam questions to an external site without my permission is a violation of the Academic Honesty Policy. The Physics department also has an Academic Honesty policy for rules regarding collaboration with others. This document is available on the Moodle page for this class. Please feel free to ask if you have any questions about this policy.

Accommodations:

In accordance with Lafayette College policy, reasonable academic accommodation and support services are available to students who have a documented disability. It is your responsibility to provide me with the appropriate paperwork from the Accessibility Services Office. More information is available at <https://hub.lafayette.edu/>.

Covid-19 Policy:

Masks are not required for healthy, non-exposed individuals in this course section. Lafayette College is following the CDC recommended guidelines for handling cases of exposure to / illness from Covid-19:

For students *exposed to someone who has tested positive* for COVID-19 (close contact):

- If asymptomatic, attend classes.
- Wear a mask for a full 10 days.
- Watch for symptoms. If feeling ill, isolate immediately except to get tested at Bailey Health Center. Students may also use self-supplied, at-home test kits. A minimum of two, preferably three, negative tests taken at least 24 hours apart is recommended.

For students who *test positive* for COVID-19:

- Isolate for a minimum of five days.
- Mask for 10 days.
- A standard Dean's Excuse will be given and the Office of Advising & Co-Curricular Programs will be notified.

Gender Inclusion:

This is a gender-inclusive classroom. I have been provided with a class roster and your legal names. I will gladly honor any requests to be addressed by a different name or pronoun than appears on the class. Please make me aware of any preferences.

Proper Usage of Course Materials & Classroom Recordings:

At Lafayette College, all course materials are proprietary and for class purposes only. This includes posted recordings of lectures, worksheets, discussion prompts, and other course

items. Reposting such materials or distributing them through any means is prohibited. Such materials should not be reposted or distributed through any means. You must request my permission prior to creating your own recordings of class materials, and any recordings are not to be shared or posted online even when permission is granted to record. If you have any questions about proper usage of course materials please ask me. Please also be in contact with me if you have any concerns with being recorded during the course.

Common Course of Study Outcomes Statement:

This course (and particularly the lab component) will promote the following outcomes for Natural Sciences (NS) within the Lafayette Common Course of Study:

- NS 1: Employ the fundamental elements of the scientific method in the physical and natural world by identifying and evaluating a testable scientific hypothesis.
- NS2: Create and evaluate descriptions and representations of scientific data via equations, graphs, tables, and/or models.

Moodle Privacy Statement:

Please note that 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.

Federal Credit Hour Compliance Statement:

Student work in this course is in full compliance with the federal definition of a four credit hour course. Please see the Registrar's Office website (<https://registrar.lafayette.edu/wp-content/uploads/sites/193/2013/04/Federal-Credit-Hour-Policy-Web-Statement.doc>) for the full policy statement.

Counseling Services:

Faculty recognize the important role that health and well-being have in your academic success. While stress is a normal and expected part of the college experience, many students face personal and environmental challenges that may interfere with their academic progress and overall well-being. Please reach out to me, your academic advisor or class dean about any difficulty you may be having in this course or others as soon as it occurs. In addition, please know that there are many resources at Lafayette to provide assistance and support during difficult times.

Counseling Center: Free, confidential counseling services as well as after-hours and weekend crisis support | 2nd Floor, Bailey Health Center | 610-330-5005

Academic Resource Hub: Peer tutoring, supplemental instruction, study skills, academic counseling, and accessibility services | 3rd Floor, Scott Hall | 610-330-5098

Class Deans: 3rd Floor, Scott Hall | 610-330-5080

Togetherall: Anonymous, peer-to-peer mental health support, 24/7, 365 days

Health Center: 1st Floor, Bailey Health Center | 610-330-5001

Financial Aid: 202 Markle Hall | 610-330-5055

One Pard: Centralized resources to help students support themselves and their peers

Tentative Lecture Schedule and Associated Readings

1	Aug. 28	Coulomb's Law	Ch. 21.1-3	
2	Aug. 30	Electric Fields	Ch. 21.4-5	
3	Sept. 1	Continuous Charge Distributions	Ch. 21.6-7	
4	Sept. 4	Electric Flux	Ch. 22.1-2	
5	Sept. 6	Gauss' Law	Ch. 22.3	PS 1 due
6	Sept. 8	Applications of Gauss' Law	Ch. 22.4-5	
7	Sept. 11	More App. of Gauss' Law Electrostatic	Ch. 22.4-5	
8	Sept. 13	Potential Energy	Ch. 23.1	PS 2 due
9	Sept. 15	Electric Potential, Equipot. Surface	Ch. 23:2,4	
10	Sept. 18	Calculating Electric Pot.	Ch. 23.3	
11	Sept. 20	Capacitance, Energy in E-field	Ch. 24.1,3	PS 3 due
12	Sept. 22	Exam I	Chs. 21-23	
13	Sept. 25	Capacitors in Series and Parallel	Ch. 24.2-3	
14	Sept. 27	Electric Current, Resistivity, & Resistance	Ch. 25.1-2, 26.1	PS 4 due
15	Sept. 29	Ohm's Law and Electromotive Force	Ch. 25:3-4	
16	Oct. 2	Power in Circuits & Kirchhoff's Rules	Ch. 25:5, 26.2	
17	Oct. 4	RC Circuits	Ch. 26.4	PS 5 due
18	Oct. 6	Kirchhoff's Rules Practice	Ch. 26.2	
	Oct. 9	<i>Fall Break</i>		
19	Oct. 11	Magnetic Fields	Ch. 27:1-3	PS 6 due
20	Oct. 13	Exam II	Chs. 24-26	
21	Oct. 16	Magnetic Forces on Charges	Ch. 27:4-5	
22	Oct. 18	Magnetic Forces on Currents	Ch. 27:6-8	PS 7 due
23	Oct. 20	Bio-Savart Law	Ch. 28:1-4	
24	Oct. 23	Ampère's Law	Ch. 28:5-6	
25	Oct. 25	Applications of Ampère's Law	Ch. 28:7	PS 8 due
26	Oct. 27	Faraday's Law and Lenz's Law	Ch. 29:1-4	
27	Oct. 30	Induction and Maxwell's Equations	Ch. 29:5-7	
28	Nov. 1	Inductance and Magnetic Field Energy	Ch. 30:1-3	PS 9 due
29	Nov. 3	RL, LC, and RLC Circuits	Ch. 30:4-6	
30	Nov. 6	Mechanical Waves	Ch. 15:1-5	
31	Nov. 8	Superposition	Ch. 15:6-8	PS 10 due
32	Nov. 10	Exam III	Chs. 27-30	

33	Nov. 13	Sound Waves	Ch. 16:1-4	
34	Nov. 15	Resonance	Ch. 16:5-7	PS 11 due
35	Nov. 17	Electromagnetic Waves	Ch. 32:1-3	
36	Nov. 20	Energy in Electromagnetic Waves	Ch. 32:4-5	
	Nov. 22	<i>Thanksgiving Break</i>		
	Nov. 24	<i>Thanksgiving Break</i>		
37	Nov. 27	Reflection and Refraction	Ch. 33:1-3	
38	Nov. 29	Polarization and Scattering	Ch. 33:4-7	PS 12 due
39	Dec. 1	Interference	Ch. 35:1-2	
40	Dec. 4	Diffraction & Diffraction Gratings	Ch. 36:1-6	
41	Dec. 6	BEMA Post Survey		
42	Dec. 8	Thin Film Interference	Ch. 35:4	PS 13 due

FINAL EXAM (comprehensive): date and time TBD by the Registrar