SYLLABUS

Meeting Times

Lectures:	MWF 8:00-8:50 am
Room:	Hugel Science Center 100
Office Hours:	M 9:00 am - 10:30 am
	T 1:30 pm - 3:30 pm
	R 9:30 am - 11:00 am

**office hours will be in Hugel 023*

Contact Information

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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

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

Course Text

University Physics with Modern Physics, 14th 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.MasteringPhysics.com/

Course Policies Attendance is mandatory and I encourage you to read 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. 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.

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. Excused absences (accompanied by a Dean's Excuse) will not be marked down.

Grading Grades are determined on the following basis:

Participation:	10%	Mid-term Exam I:	13.75%
Labs:	15%	Mid-term Exam II:	13.75%
Problem Sets:	20%	Mid-term Exam III:	13.75%
		Final Exam (2 units):	27.5%

$*$ lowest exam "unit" will be dropped

Each mid-term counts towards an equally weighted "unit" with the final exam counting as two "units." I will drop the lowest "unit" in your final grade. Example 1: if Exam II is your lowest exam grade, it will be dropped from your final grade as though it never happened. Example 2: if your final exam is your lowest exam grade, then it will only count for 1/2 credit (one of the two "units" will be dropped). **You still must take all the exams in the course!** If you skip an exam, that zero will count towards your overall exam grade; only the lowest completed exam "unit" will be dropped.

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.

Assignments

Problem Sets: Homework will be assigned on a weekly basis and will generally be due on **Wednesdays** at the beginning of class. Late assignments are generally not accepted, unless you have received an exemption from me ahead of time. Please plan to manage your time accordingly.

Weekly problem sets will consist of a selection of online problems available through *Mastering Physics*. See the **Mastering Physics Introduction** on Moodle for more details.

A few notes about assigned problem sets:

- It is to your advantage to do the assigned homework. I have chosen the problems to help *you* learn the material. Physics can be a complicated thing, but repeatedly working with it (and at it) is essential in order to gain physical intuition and get comfortable with the mathematical theory.
- I encourage you to work on these problem sets collaboratively, though I do expect you to take 10-15 minutes to give a problem "the old college try" on your own so you enter into discussion with others having some ideas to contribute. You will make your life easier as well as improve your understanding if you work with others (either by explaining it or having it explained to you).
- Though the problem sets consist of online problems, you should still write down what you're doing. I recommend keeping a notebook where you can clearly show your work when solving a given problem. It will serve as an excellent study tool for exams and if you come to office hours for assistance, I wil expect to see your work so that I can help.
- 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 in-class exams and a comprehensive final. For each exam, I will provide you with an equation sheet which will be made available ahead of time so you may familiarize yourself with it. On the exams, I want you to demonstrate that you know and understand how to apply the concepts/formulas from class; I want you to focus on the physics, not on memorizing a bunch of equations.

The point of this class is to understand and be able to *use* the basic principles of physics, not to memorize the solutions to specific types of problems. Accordingly, exam problems will **not** be identical to any particular homework problems, but they will be based on the same principles and can be solved using similar strategies. Practice (via examples and problems in the text, SI session attendance, and homework assignments) will be **essential** in developing the skills and intuition of the physics needed to do well on exams.

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/.

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.

COVID-19 Mask Policy Wearing a mask is known to reduce the transmission of SARS-CoV-2, the virus responsible for COVID-19. Regardless of your vaccination status, to protect the health of our class, the College policy is that masks must be worn during all indoor class sessions. Masks should be worn properly over the nose and mouth and secured on the chin. Food and drink must also be eaten outside of the classroom. Students who show up to class without a mask will be asked to return to class wearing one in order to protect the health of our classroom community. In the event that you do not have access to a mask to wear during the class session, please let me know and I will make sure that you will able to obtain one.

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.

Tentative Lecture Schedule and Associated Readings

Aug. 30	Coulomb's Law	Ch. 21:1-3	
Sept. 1	Electric Fields	Ch. 21:4-5	
Sept. 3	Continuous Charge Distributions	Ch. 21:6-7	
Sept. 6	Electric Flux	Ch. 22:1-2	
Sept. 8	Gauss' Law	Ch. 22:3	PS 1 due
Sept. 10	Applications of Gauss' Law	Ch. 22:4-5	
Sept. 13	Electrostatic Potential Energy	Ch. 23:1-2	
Sept. 15	Electric Potential	Ch. 23:3	PS 2 due
Sept. 17	Equipotential Surfaces	Ch. 23:4-5	
Sept. 20	Capacitance	Ch. 24:1,3-5	
Sept. 22	Capacitors in Series and Parallel	Ch. 24:2	PS 3 due
Sept. 24	**Exam I**	**Chs. 21-23**	
Sept. 27	Electric Field Energy	Ch. 24:3-5	
Sept. 29	Electric Current, Resistivity, & Resistance	Ch. 25:1-3, 26:1	PS 4 due
Oct. 1	Ohm's Law and Electromotive Force	Ch. 25:3-4	
Oct. 4	Energy and Power in Circuits	Ch. 25:5-6	
Oct. 6	Kirchhoff's Rules	Ch. 26:1-2	PS 5 due
Oct. 8	RC Circuits	Ch. 26:4	
Oct. 11	**Fall Break**		
Oct. 13	Magnetic Fields	Ch. 27:1-3	PS 6 due
Oct. 15	**Exam II**	**Chs. 24-26**	
Oct. 18	Magnetic Forces on Charges	Ch. 27:4-5	
Oct. 20	Magnetic Forces on Currents	Ch. 27:6-8	PS 7 due
Oct. 22	Bio-Savart Law	Ch. 28:1-4	
Oct. 25	Ampère's Law	Ch. 28:5-6	
Oct. 27	Applications of Ampère's Law	Ch. 28:7	PS 8 due
Oct. 29	Faraday's Law and Lenz's Law	Ch. 29:1-4	
Nov. 1	Induction and Maxwell's Equations	Ch. 29:5-7	
Nov. 3	Inductance and Magnetic Field Energy	Ch. 30:1-3	PS 9 due
Nov. 5	RL, LC, and RLC Circuits	Ch. 30:4-5	
Nov. 8	Mechanical Waves	Ch. 15:1-5	
Nov. 10	Superposition	Ch. 15:6-8	PS 10 due
Nov. 12	**Exam III**	**Chs. 27-30**	

Nov. 15	Sound Waves	Ch. 16:1-4	
Nov. 17	Resonance	Ch. 16:5-7	PS 11 due
Nov. 19	Electromagnetic Waves	Ch. 32:1-3	
Nov. 22	Energy in Electromagnetic Waves	Ch. 32:4-5	
Nov. 24	**Thanksgiving Break**		
Nov. 26	**Thanksgiving Break**		
Nov. 29	Reflection and Refraction	Ch. 33:1-3	
Dec. 1	Polarization and Scattering	Ch. 33:4-7	PS 12 due
Dec. 3	Interference	Ch. 35:1-2	
Dec. 6	Thin Film Interference	Ch. 35:4	
Dec. 8	Diffraction	Ch. 36:1-4	
Dec. 10	Diffraction Gratings and Circular Apertures	Ch. 36:5-7	PS 13 due

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